

## I. INTRODUCTION

### A. How to Use this Report

The Red Hook Climate Action Plan (CAP) is intended to be a living, dynamic document that will motivate members of the community to take actions that will not only reduce their energy bills, but also reduce the amount of greenhouse gases (GHG) and other harmful emissions that have negative impacts on the environment. It presents a menu of options, or “actions,” that members of the community can use to reduce harmful air emissions, save on energy expenditures, and foster environmental sustainability in the Red Hook communities. This document is designed to educate readers, present strategies to improve energy efficiency and community health, and stimulate action and discussion that will lead to energy savings and GHG reductions within the Town of Red Hook, the Village of Red Hook, and the Village of Tivoli. The goal is to achieve the ambitious GHG reduction goal: **20% reduction in GHG emissions below 2005 levels by the year 2020.**

The CAP addresses actions within four major sectors – **Energy, Transportation, Waste & Sustainability, and Land Use & Water.** For each of these sectors, the CAP offers information and suggested activities for residents, commercial businesses, and municipalities. For many action items, monetary costs and benefits or avoided GHG emissions are estimated to provide the reader with an idea of how these actions will impact both their finances and environment. In addition, the CAP also recognizes the importance of empowering students of all ages to take action in addressing energy and environmental issues. To further this goal, the CAP offers a section dedicated to Student Involvement which also contains information and suggested action items.

The action items presented in this document are intended as a menu of suggestions, not an exhaustive “to do” list. Residents, community businesses, and municipal officials should review the CAP and engage in actions that suit them the best. When faced with a long list of energy efficiency actions, for example, it is important to weigh the GHG-reducing or energy-saving benefits against the costs of taking an action. Simple actions that produce the greatest GHG reductions or energy savings should be adopted before actions that may not deliver significant efficiencies for the cost of taking the action for a particular individual.

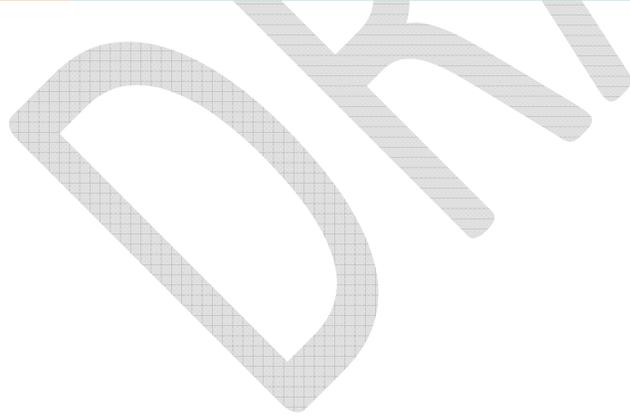
In order to help sort through this list of actions, the CAP has divided the list into three general groups in the CAP Action Guide found below: Short-term, Mid-term, and Long-term goals. The action items found in the Short-term category are those that could be completed within six months after the CAP is released; Mid-term action items could be completed within one year after the CAP is released; and Long-term action items will probably take more than one year after release of the CAP to be completed. The hope is that the reader will not feel overwhelmed by the scope of the document, but will instead be able to use this guide to focus their efforts.

# CAP Action Guide

		Short-Term	Mid-Term	Long-Term
		Energy		<b>Residential</b> Compact Fluorescent Bulbs/LEDs Energy Audits Maintaining/Upgrading Heating and Cooling Equipment Purchase ENERGY STAR-rated Products Rebates and Incentives through Central Hudson Kill-a-Watt Upgrade Seasonal Lighting Personal Energy Plans
<b>Commercial</b> NYSERDA FlexTech Energy Audit NYSERDA FlexTech Benchmarking Pilot Maintain/Upgrade HVAC Systems Upgrade Lighting Energy Star Rated Business Equipment & Appliances Energy Star Commercial Building Tax Deduction Energy Consumption Monitoring Outreach for Agricultural Community	Solar Installations Geothermal			Wind Use Light Colors on Roofs Green Leasing Policies
<b>Municipal</b> ICLEI CAPPA Software Occupancy Sensors Maintain/Upgrade HVAC Systems Purchase ENERGY STAR Products Upgrade Municipal Lighting Upgrade Seasonal Lighting	Review of Current Town and Village Ordinances Upgrade Traffic Signals and Streetlights Institute Environmentally Friendly Purchasing Policies			ENERGY STAR Building Code Solar Electric Solar Hot Water Wind Geothermal Anaerobic Digesters Explore Community-Scale DG Develop Locally Based Energy Efficiency Financing Program Home Energy Ratings

		Short-Term	Mid-Term	Long-Term		
		Transportation		<b>Residential</b> Promote Carpooling and Ridesharing Bicycle into Town Encourage Purchases of Environmentally Friendly Vehicles Keep Tires Inflated		
<b>Commercial</b> Expand Bike Parking	Centralized Distribution Center for Farm Products					
<b>Municipal</b> Make Bicycles More Accessible Support Bicycle Safety Through Motorist Education Expand Bike Parking	Require Bike Lanes in New Developments Institute Municipal Anti-Idling Law Expand Park-and-Ride Facilities			Create Bike-Friendly Roadway Infrastructure Improve Traffic Control at Intersections Add Infrastructure for Electric and Hybrid Vehicles Supplement LOOP Bus Service Use Biodiesel in all Diesel-Engine Municipal Vehicles Refit the Police Fleet with Bicycles and Electric/Hybrid Vehicles		
Waste & Sustainability				<b>Residential</b> Compost Organic Residential Wastes Recycle Reduce and Reuse Household Items	Conduct a Commercial Waste Audit Institute Agricultural Waste Management Practices Institute “Love ‘em and Leave ‘em” Policy for Leaves	Establish a Zero Waste System for the Town
				<b>Commercial</b> Compost Organic Wastes Reduce Use of Plastic Shopping Bags Recycle Expand Park-and-Ride Facilities		
				<b>Municipal</b> Municipal Composting Build a Red Hook Community Garden Encourage Sorting of Waste Promote Zero Waste Policies for Public Events	Organize Regular Farmers Markets Conduct a Municipal Waste Audit	

		Short-Term	Mid-Term	Long-Term
<b>Land Use &amp; Water</b>	<b>Residential, Commercial, Municipal</b>	Water Saving Shower Heads/Faucets High Efficiency Toilets Low Maintenance Landscaping Plant Trees to Shade Buildings Establish a Zero Waste System for the Town		Integrate Solar Space Heating Principles into Zoning
	<b>Commercial</b>	Use Conservation Easements to Protect Farmland		
	<b>Municipal</b>	Continue to Promote Smart Growth Principles		
<b>Student Involvement</b>		Gardening and Agriculture Composting Recycle Bard/Red Hook School District Collaborations Home Energy Plans Safe Biking	Teaching About Energy Issues District-Wide Sustainability: Plan for Operations and Curricula Promote Natural Lighting in Classrooms	



In an attempt to further simplify the implementation of the CAP, the following Express Lists have been developed with items that a homeowner or business with relative ease and at low cost.

## Express Lists

Residents	Businesses
Compact Fluorescent Bulbs/LEDs	Upgrade Lighting
Purchase ENERGY STAR-rated Products	Energy Star Commercial Building Tax Deduction
Kill-a-Watt	NYSERDA FlexTech Energy Audit
Personal Energy Plans	Energy Star Rated Business Equipment & Appliances
Bicycle into Town	Energy Consumption Monitoring
Keep Tires Inflated	Reduce Use of Plastic Shopping Bags
Recycle	Recycle
Water Saving Shower Heads/Faucets	Water Saving Shower Heads/Faucets
Energy Audits	
Rebates and Incentives through Central Hudson	

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## B. Implementation

Because the CAP is intended to not only educate the Red Hook community, but to also encourage action, it is critical that a system is in place to ensure that the actions in this document come to life in order to achieve the 20 by 20 Goal. In order for this implementation to occur, the entire community must be engaged, motivated, and educated about energy and environmental issues. While this is no easy task, the following list provides some of the elements that will be essential for implementing this ambitious plan.

**CAP Leaders.** It will be important for each section of the CAP to have a Task Force leading implementation efforts. By having this group take ownership of the CAP, it will help ensure that the actions included in that part are implemented in an efficient manner. The Conservation Advisory Council (CAC) will reach out to members of the community who have a particular interest or experience in a section of the CAP and ask if they would be willing to volunteer to guide implementation.

**Competitions, Challenges and Awards.** To help motivate people to action, the CAC will work with the CAP Leaders to establish competitions and challenges around particular elements of the CAP. Based on the success of the 10% Challenge, it is clear that competition is an important driver of action and commitment, and this principle will be carried on through the CAP. For example, if CAP Leaders were trying to encourage people to ride bicycles more often, they could organize a Bike Challenge which could involve a day of biking incorporating elements of a competition encouraging people to group in teams, donate old bikes, etc. In addition, awards could be given out to reward actions which support the CAP. An award could be designed, for example, in conjunction with the Red Hook Area Chamber of Commerce to recognize businesses who implement green or energy efficient practices.

**Education and Outreach.** Education and outreach efforts are described in greater detail throughout the CAP in the context of individual action items, but their overall importance in implementing the CAP cannot be overemphasized. People will be more likely to commit to engaging in the various action items in this document if they are informed— this education includes not only describing the environmental benefits, but also the financial costs and benefits. Education also includes informing citizens of steps that could be taken in order to pursue a particular action.

**Community Groups.** In order to effectively engage the community, various community groups and organizations will be involved and coordinated with to help with education, outreach and general implementation efforts. Such groups include the Bard College, the Chamber of Commerce, the Rotary Club, the Red Hook Central School District, the Red Hook Public Library, the religious community, and many other groups. Local community groups can also seek memberships with regional or national organizations to get support in achieving energy, climate and environmental goals. Such organizations include New York Interfaith Power & Light and the U.S. Green Chamber.

**Work with Surrounding Communities.** Climate change, environmental and energy issues are not limited to political boundaries – therefore, solutions to these challenges are not either. To the greatest extent possible, the Town will work with surrounding communities to coordinate efforts, especially those related to transportation and others that would benefit from intermunicipal cooperation.

### C. Red Hook History of Sustainability Leadership

The Town of Red Hook has a history of demonstrating leadership in the areas of energy and sustainability.

**Completed Greenhouse Gas (GHG) Inventory.** In 2009, the Town conducted its first GHG inventory, cataloging these emissions from various sectors of the community. Lindsay Chapman, a student attending the Bard College Center for Environmental Policy, undertook this effort, which involved gathering data from a variety of sources, organizing it and entering the data into software that estimates emissions from various sectors. This will be described in greater detail below.

**10% Challenge.** On 10/10/10, the Town committed to join the 10% Challenge. This effort, spearheaded by Melissa Everett of Sustainable Hudson Valley, along with Michael O’Hara and others, challenges residents to reduce energy use 10% communitywide and get 10% of the community involved as participating households and/or volunteers. Nearly 300 residents and businesses have already joined, and the Challenge has become a familiar symbol throughout the community representing the Town’s commitment to encouraging energy efficient behavior.

**Supporting State’s 80x50 Goal.** Red Hook was the first town in New York to pass a resolution in support of State legislation to reduce GHGs 80% by 2050 (A7572 Sweeney, S4315 Thompson).

**Strength in Numbers.** The Town has joined networks of other local governments with similar climate goals to both solidify its commitment to achieving environmental goals and to learn best practices. In 2009, Red Hook became a member of the New York State Department of Environmental Conservation’s (DEC) Climate Smart Communities (CSC) program. The objective of the CSC program is “to reduce greenhouse gas emissions and save taxpayer dollars through climate smart actions that also promote community goals of health and safety, affordability, economic vitality and quality of life.”<sup>1</sup> In addition, the Town has been a member of ICLEI, an international organization dedicated to supporting sustainability efforts in local communities, since 2007.

**Town Hall Energy Audit and Energy Efficiency.** In 2006, the New York State Energy Research and Development Authority (NYSERDA) conducted an energy audit of the Red Hook Town Hall, and as a result the Town performed a lighting retrofit, installed a programmable thermostat and weatherized its doors. The Town has also promoted the importance of energy efficiency through public meetings, including an Energy Technology Seminar held at Bard College (2005) which it co-sponsored with NYSERDA, a workshop for local builders on NYSERDA credits, a workshop for local businesses on NYSERDA energy efficiency programs, workshops on the New York ENERGY STAR program, and presentations on the Property Assessed Clean Financing (PACE) model.

**Solar Panels.** In 2008, the Town Hall had a 3.7 kW demonstration solar panel system installed on the roof. The following year, the Town’s Conservation Advisory Council (CAC) applied to NYSERDA for

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<sup>1</sup> New York State Department of Environmental Conservation, *Climate Smart Communities*, <http://www.dec.ny.gov/energy/50845.html>.

funding and was awarded over \$120,000 to install its current 23 kW solar panel system. This system, which was connected to the grid on June 22, 2011, is expected to provide roughly half of the electricity needs of Town Hall. In addition, solar panels were installed at the Town's Recycling Center, and the electricity generated is expected to meet all of the center's electrical needs.

**ENERGY STAR™ Building Code Requirements.** In 2009, the Town's Building Code was amended to require that all new residential construction meet ENERGY STAR™ rating. This means that all new residential buildings must meet specified standards regarding insulation, lighting, etc.

**Sustainable and Energy Efficient Land Use.** Red Hook has a long history of adopting smart growth programs that continue to provide energy efficiency strategies as well as cost savings to residents. They include a Farmland PDR bond initiative of \$3.5 million in matching funds (2003), a Conservation Easement Program (2005), and a Community Preservation Fund (2007). Two of these three initiatives were approved by voter referendum, underscoring the community's commitment to these measures. On July 12, 2011, the Town passed its smart growth-oriented Centers and Greenspace Plan, an incentive zoning initiative that will concentrate development in and adjacent to the Villages of Red Hook and Tivoli. The Task Force members who authored the zoning plan with public input received the 2009 Groundbreakers Award from Pace Land Use Law Center.

## D. Motivations for Drafting a Climate Action Plan

The Town of Red Hook is dedicated to creating a clean and sustainable environment for members of the community while at the same time ensuring responsible economic and growth-oriented policies. In making the decision to draft a CAP, the Town recognized that this would be an opportunity to set a course of action to help it achieve these goals. More broadly, the Town is motivated by three concerns: climate change, energy costs, and sustainability.

**Climate Change.** Climate change presents a set of challenges that affect many aspects of our daily lives, including transportation, recreational activities, where we obtain our food from, and especially how much energy we use and how it is produced. The Town of Red Hook has already completed a greenhouse gas (GHG) inventory which identifies the amount of GHGs emitted by different parts of the community. The next step is to develop a plan targeted at reducing these emissions.

The greenhouse effect is a naturally occurring phenomenon that makes it possible for life on earth to exist. Light from the sun enters the earth's atmosphere and bounces off the surface of the earth. Some of it escapes back into space, but some of it also remains trapped by a layer of GHGs in the atmosphere, heating the earth to a range of temperatures which can sustain life. These GHGs include carbon dioxide, methane, water vapor, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride; each type traps different amounts of heat. In addition, the earth's climate changes naturally as a result of a variety of factors, including volcanic eruptions, changes in the intensity of the light emitted from the sun, and shifts in ocean currents.<sup>2</sup>

Recent scientific research, however, indicates that increases in the amount of GHGs that result from human activities, such as burning fossil fuels, have increased the average global temperature. One group that looks into the changing climate at a global level is the Intergovernmental Panel on Climate Change (IPCC). The IPCC is an international organization that does not conduct independent scientific research, but instead reviews the studies that have already been conducted and evaluates them. According to this group's latest report, "Most of the observed increase in global average temperatures since the mid-20<sup>th</sup> century is *very likely* due to the observed increase in anthropogenic GHG concentrations."<sup>3</sup> Globally, these temperature increases affect water and food availability, weather events, human settlement patterns, ecosystems and biodiversity, human health, and agriculture, among many other areas. New York State is expected to see a variety of changes to its environment as a result of climate change, such as an increase in the number of severe precipitation events, rising sea levels, earlier springs, and more exceptionally hot days in the summertime.

**Energy Costs.** Energy production and use are two of the primary areas of concern not only because of their environmental impacts, but also because of their economic impacts. Energy prices continue to fluctuate and rise, putting financial strains on residents, businesses, and governments. This uncertainty makes it increasingly difficult to invest in other areas of life. The CAP will identify ways in which the community can not only reduce GHG emissions, but also save money on their electric bills at the same time. For example, the CAP will discuss energy efficiency actions, meaning ways that people

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<sup>2</sup> U.S Environmental Protection Agency, "Past Climate Change," <http://www.epa.gov/climatechange/science/pastcc.html>.

<sup>3</sup> Intergovernmental Panel on Climate Change, "Climate Change 2007: Synthesis Report," p. 16.  
[http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4\\_syr.pdf](http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr.pdf).

can wisely invest in their homes or businesses to use energy more efficiently, which will ultimately lead to lower energy costs. This also leads to fewer GHGs and other pollutants being emitted because people will be using less power, so less energy will be produced. The CAP will also discuss possibilities for taking advantage of renewable energy opportunities. The Town, for example, had solar panels installed on the roofs of the Town Hall and the Recycling Center in June 2011, and it has saved hundreds of dollars on electricity costs since then.

**Sustainability.** In addition to climate change and energy considerations, Red Hook takes great pride in maintaining a clean, rural community with small town character. While a universal definition of “sustainability” is hard to pin down, it usually includes the ideas of environmental stewardship and making sure the current generation treats the environment in ways that ensure that future generations will be able to meet their own needs while ensuring economic vitality and social equity. To these ends, the Town already promotes composting and recycling, and it also works to preserve open space. As a way to further these efforts, the CAP will describe additional actions to promote responsible waste management and address the needs of the agricultural community.

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## E. Greenhouse Gas Inventory

**Introduction.** Red Hook has set an emission reduction goal of 20% below 2005 emissions by 2020. In order for Red Hook to define a pathway towards achieving this goal, year 2005 emissions from the town and villages have been estimated and will become the baseline against which future emission changes will be measured. The GHG inventory is a calculation of all GHG emissions that have originated within a defined area over a specified period of time. For the purposes of this document, Red Hook's greenhouse gas inventory will include emissions from the Town of Red Hook and the villages of Tivoli and Red Hook. The inventory accounts for greenhouse gases emitted over the course of one year. Estimations of Red Hook's annual greenhouse gas emissions were made from a combination of various methods. When available, data about buildings, vehicles, and fuel consumed were collected to estimate actual annual emissions. In cases where specific data did not exist or was unattainable, estimations were made to determine emission volumes.

**Background.**<sup>4</sup> In 2007, Red Hook joined ICLEI – Local Governments for Sustainability<sup>5</sup> (ICLEI) and committed to conducting a greenhouse gas emission inventory. In 2009, Red Hook's Conservation Advisory Council (CAC) worked with Lindsay Chapman to compile existing energy data and gather additional data. Government entities and communities in the Town of Red Hook, the village of Red Hook, and the village of Tivoli were considered in the inventory. In addition, Bard College, which had compiled its own greenhouse gas inventory in 2008, was also included in Red Hook's inventory. An ICLEI achievement award was presented to Red Hook in June of 2010 for the completion of Milestone 1, defined by ICLEI as "conducting a baseline greenhouse gas inventory and forecast."

**Methodology.** Red Hook's GHG inventory was estimated using ICLEI's Clean Air and Climate Protection (CACP) 2009 software. Data regarding fuel usage, fuel type, electricity usage, and population were entered into the CACP database. The CACP software estimates emissions from various sectors based on inputs.

Energy purchases and invoices were used to tabulate energy used within the government sector from years 2005 through 2008. When records were not available, utility companies were able to provide records of energy use. In the absence of utility records, data gaps were filled with estimates using pre and post months and years.

County population data along with state and regional fuel use estimates were used to assemble data for residential and commercial sectors.

In the absence of transportation data specific to the Town, the Pace Energy and Climate Center calculated emissions from the transportation sector using county level data. Authors calculated the annual miles travelled per person in Dutchess County Using Vehicle Miles Traveled (VMT) data measured at the County level<sup>6</sup> and Dutchess County population data. Authors then estimated total,

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<sup>4</sup> Background material taken from a summary assembled by Lindsay Chapman.

<sup>5</sup> ICLEI originally stood for the "International Council for Local Environmental Initiatives." In 2003, the organization changed its name to "ICLEI-Local Governments for Sustainability" to reflect a focus on sustainability.

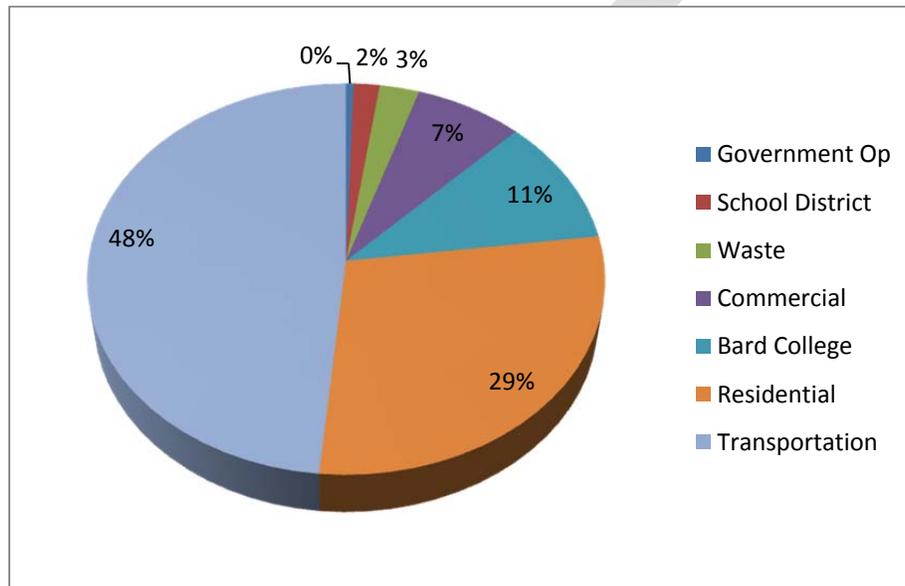
<sup>6</sup> US Environmental Protection Agency. *New York: Area designations for the 24-hour fine particle national ambient air quality standard*. 2006. Available at:

[http://www.epa.gov/pmdesignations/2006standards/final/TSD/tsd\\_4.0\\_4.2\\_4.2.2\\_r02\\_NY.pdf](http://www.epa.gov/pmdesignations/2006standards/final/TSD/tsd_4.0_4.2_4.2.2_r02_NY.pdf)

annual VMT for the Town using Red Hook population data.<sup>7</sup> ICLEI’s CACP software estimates associated GHG emissions based on total annual VMT for the Town.

Bard College conducted a GHG inventory in 2008. Emissions from Bard College were not entered into the ICLEI database, but are included when considering total emissions from the Town. For the purposes of this CAP, Bard College is considered as an individual sector, separate from the government, residential, and commercial sectors.

**Results.** The pie chart below shows the percentage of emissions each sector contributed to the total emissions in 2008. This includes emissions estimates from all sectors as well as Bard College. In 2008, total carbon dioxide equivalents<sup>8</sup> (CO<sub>2</sub>e) were 157,217 tons.



This table includes estimates of total emissions of the most common air pollutants. Estimates are based on 2008 data.

Pollutant	Symbol	Total 2008 Emissions
carbon dioxide	CO <sub>2</sub>	134,627 tons
nitrous oxide	N <sub>2</sub> O	9,583 lbs
methane	CH <sub>4</sub>	431,835 lbs
nitric oxide & nitrogen dioxide	NO <sub>x</sub>	2,407,747 lbs
sulfur oxides	SO <sub>x</sub>	328,718 lbs
carbon monoxide	CO	4,439,063 lbs
volatile organic compounds	VOC	557,687 lbs
particulate matter (≤10µm)	PM10	147,312 lbs

<sup>7</sup> <http://www.co.dutchess.ny.us/CountyGov/Departments/Planning/cen2010popchange.pdf>

<sup>8</sup> Greenhouse gases contribute to global warming at varying intensities. The warming potential of greenhouse gases can be compared by considering each in terms of the warming potential of CO<sub>2</sub>. The unit for considering the warming potential of a greenhouse gas in terms of CO<sub>2</sub> is defined as “carbon dioxide equivalents” or CO<sub>2</sub>e.

The Town's has set a goal of reducing overall emissions 20% of 2005 levels by 2020. Therefore, inventory data from year 2005 will be the baseline from which the Town will measure its success. The following table summarizes emissions data from year 2005.

Sectors	CO <sub>2</sub> e (tons)	CO <sub>2</sub> e (%)
Government Operations	755	0.5
School District	2791	1.8
Waste	3488	2.3
Commercial	8334	5.4
Bard College	16,571	10.7
Residential	45,739	29.7
Transportation	76,239	49.5
Total	153,917	100

**Looking Forward.** In order for the Town to measure success in moving towards its 2020 reduction goal, it is essential that the Town continue to conduct emission inventories at regular intervals moving forward. By assessing the changes in emissions over time, the Town will confidently be able to assess interim progress and adjust GHG reduction strategies, if needed. In order to compare inventories between years, future inventories should take into account emissions from all buildings and locations that were accounted for in prior inventories.

## II. CLIMATE ACTION PLAN

### A. Energy

#### 1. Residential

##### *Compact Fluorescent Bulbs/LEDs*

ACTION	
<i>Residents</i>	<ul style="list-style-type: none"> <li>✓ Replace incandescent bulbs with CFL/LED bulbs in fixtures used most often.</li> </ul>
<i>Town</i>	<ul style="list-style-type: none"> <li>✓ Educate residents on benefits by producing and distributing brochures that include this and other energy-saving measures.</li> <li>✓ When funding allows, distribute bulbs for free at public events.</li> </ul>

Replacing traditional incandescent light bulbs with compact fluorescent light bulbs (CFLs) or light emitting diodes (LEDs) is one of the simplest measures that residents can take to reduce energy consumption, save on electric bills, and reduce emissions. Low wattage bulbs produce the same amount of brightness as traditional incandescent bulbs while only using 1/3 of the electricity. In addition, CFL and LED bulbs last up to six times longer than incandescent bulbs. According to ENERGY STAR, exchanging one CFL bulb for an incandescent bulb can save \$40 over the life of the bulb.

**Energy Audits**

ACTION	
<i>Residents</i>	<ul style="list-style-type: none"> <li>✓ Visit NYSERDA's website or call NYSERDA to get more information on home energy audits and various financing options.</li> <li>✓ Fill out 1-page application form for free/low-cost home energy audit and take advantage of financing options.</li> </ul>
<i>Town</i>	<ul style="list-style-type: none"> <li>✓ Educate residents on the audit application process and financing options through public presentations and information brochures available at the Town Hall, post office and public library</li> <li>✓ Train citizens, including town and village employees (Town &amp; Village Clerks, Highway Supervisor), Bard work study students and representatives of relevant businesses (Williams, banks, lighting co.) to assist and follow up with residents individually to answer questions and complete initial application and financing forms.</li> <li>✓ Establish process with NYSERDA and the Town to see how many people have applied for audits and which measures they have implemented.</li> </ul>

Energy audits assess a home's energy use efficiency and create an energy use profile. These profiles are a necessary first step when developing plans for energy saving measures and efficiency upgrades. Audits take into account building size, type, location, heating and cooling systems, and other electrical appliances and equipment operating within the home or building. Homeowners can perform self-assessments, or hire professionals at relatively low or no-cost. Professional energy auditors use tools such as blower doors and infrared cameras to determine the integrity of insulation and the building envelope. An audit performed by a certified professional should include:

- a complete inspection of the structure
- recommendations for specific upgrades
- estimations of the cost and payback period for each recommendation

NYSERDA's Home Performance with ENERGY STAR program is available to residential customers, and can provide most homeowners with a free or reduced cost home energy audit.<sup>9</sup> In addition there are several financing options available to residents through the State:

- Green Jobs Green New York (GJGNY) Financing: NYSERDA's GJGNY program provides low interest financing for energy efficiency upgrades that have been recommended through

<sup>9</sup> NYSERDA, Home Performance with Energy Star, <http://www.getenergysmart.org/SingleFamilyHomes/ExistingBuilding/HomeOwner.aspx>; 1-877-NYSMART.

NYSERDA's Home Performance with ENERGY STAR home energy audit. Loans of up to \$25,000 are available.<sup>10</sup>

- **Energy Smart Loans:** Loans to finance energy efficiency upgrades are also available to State residents through a network of Participating Residential Loan Fund Lenders. Loans of up to \$20,000 are available.<sup>11</sup>
- **Income Qualified Financing:** Income-qualified residents may take advantage of subsidies to help finance energy efficiency improvements in their homes. Households with an income equal to or lower than 80% of the area median income may receive financial assistance to cover up to 50% of the cost of energy improvements.<sup>12</sup>
- **Weatherization Assistance Program (WAP):** According to the U.S. Department of Energy, homeowners have saved an average of over \$400 per year on utility bills by using weatherization services. New York administers WAP for income-eligible individuals and families to help reduce costs for energy efficiency measures. Households with incomes at or below 60% of New York's median income are eligible for weatherization services. For more information, contact the Dutchess County Community Action Agency.<sup>13</sup>

### ***Maintaining/Upgrading Heating and Cooling Equipment***

#### ACTION

##### *Residents*

- ✓ Speak with a professional about scheduling regular maintenance of heating/cooling equipment; it should be included as part of your contract.
- ✓ Replace inefficient equipment with more energy efficient models.
- ✓ Install programmable thermostat which can be purchased at any hardware store.

##### *Town*

- ✓ Educate residents by inviting technicians to give presentations explaining what is involved in maintenance and the benefits.
- ✓ Teach residents about using programmable thermostat. The thermostats are typically inexpensive, and could be periodically provided to residents in small batches to encourage electricity

<sup>10</sup> Energy Finance Solutions, <http://www.energyfinancesolutions.com/main/homeownersnyfour>; 1-800-969-9322.

<sup>11</sup> Visit <http://www.nyserra.org/loanfund/participating-res-loan-fund-lenders.pdf> for a list of participating lenders.

<sup>12</sup> NYSERDA, Additional Incentives Based on Income Eligibility, <http://www.getenergysmart.org/SingleFamilyHomes/ExistingBuilding/HomeOwner/LowIncomeEligible.aspx>; 1-877-NYSMART.

<sup>13</sup> Dutchess County Community Action Agency, [www.DutchessCAP.org](http://www.DutchessCAP.org); 1-845-452-5104; or visit the Dutchess County Community Action Partnership, 44-46 E-Market Street, Red Hook, NY 12571, 1-845-876-1611, Ext 182.

According to ENERGY STAR, up to half of home energy costs go to heating and cooling. For the homeowner, heating and cooling equipment upgrades can lead to significant energy savings as well as emissions reductions all while providing greater comfort to the homeowner.

- **Maintain heating and cooling equipment:** One way to get the most out of home heating and cooling equipment is to perform regular maintenance, which will increase the life of equipment. Professional technicians have the tools and knowledge to perform maintenance and repairs and keep home heating and cooling systems operating efficiently. Be sure to rate relative merits of these actions against cost. Residents exploring upgrading their home heating and cooling systems should consider speaking with a professional as to whether it would be best to install a heat pump rather than a central air conditioning unit. Heat pumps can perform both heating and cooling functions, but which units are installed should be determined on a case-by-case basis.
- **Install a programmable thermostat:** Programmable thermostats allow the homeowner to save energy costs by regulating a home's temperature while the owner is away. Reducing heating or cooling when home owners are not there saves energy costs as well as emissions. When upgrading thermostats, care should be taken to dispose of old thermostats properly, as they often contain liquid mercury.
- **Upgrade equipment:** Much of the heating and cooling equipment available today operates more efficiently than older systems, requiring less fuel or electricity to perform better than older equipment. When the time comes to replace older equipment, homeowners should consider the efficiency rating of new equipment. Rating systems, like ENERGY STAR, identify appliances that use less electricity than non-ENERGY STAR rated appliances while achieving minimum performance standards.

#### ***Purchase ENERGY STAR-rated Products***

ACTION	
<i>Residents</i>	✓ Replace old appliances with ENERGY STAR rated models.

The ENERGY STAR label identifies products designed to use energy efficiently without sacrificing popular features and performance. The ENERGY STAR program rates products across broad consumer categories, including home-use appliances (clothes washers, refrigerators, dish washers, etc.), computers and electronics, lighting fixtures and bulbs, heating and cooling equipment (water heaters, boilers, furnaces, air conditioners, etc.), and building products (windows, doors, roofing materials, insulation, etc.). ENERGY STAR products are widely available for homeowners as well as commercial consumers.

***Rebates and Incentives through Central Hudson***

ACTION	
<i>Residents</i>	<ul style="list-style-type: none"> <li>✓ Upgrade old appliances and take advantage of Central Hudson offerings when appropriate.</li> </ul>
<i>Town</i>	<ul style="list-style-type: none"> <li>✓ Educate residents about these rebates by keeping current Central Hudson materials on hand that explain these programs.</li> <li>✓ Establish a process with Central Hudson to keep track of how many residents take advantage of which programs.</li> </ul>

A number of rebates and incentive programs are offered to Central Hudson customers for upgrading to energy efficient equipment and recycling old appliances. For example, some offerings have included \$50 rebates for recycling old refrigerators and up to \$600 for home sealing. The details of available incentives and rebates change on a regular basis, so it is important to check the Central Hudson website to be certain of the offerings that are currently taking place.<sup>14</sup>

***Kill-a-Watt***

ACTION	
<i>Residents</i>	<ul style="list-style-type: none"> <li>✓ Borrow the Kill-a-Watt device from the Red Hook Public Library and use it at home to measure how much electricity your appliances use.</li> <li>✓ Take action to reduce energy usage based on what you learn from the Kill-a-Watt – unplug devices when not in use, upgrade to more efficient appliances, etc.</li> </ul>
<i>Town</i>	<ul style="list-style-type: none"> <li>✓ Work with the Library to make sure staff people know how it works and can talk to residents about how to use it.</li> </ul>

Monitoring the electricity usage of electrical devices at home will allow residents to determine where electricity bills are being spent and the efficiency of any appliance in the home. The Kill-a-Watt is an example of a meter that measures the amount of electricity consumed by individual appliances in the home. By learning which appliances drive up electricity bills, informed homeowners can decide to reduce electricity costs by reducing the use of particular appliances, or replacing them with more efficient models. The Library can also allow residents to write about their experience with this device, including actions they've taken to reduce energy use and how successful they've been.

<sup>14</sup> Central Hudson, Savings Central, [www.SavingsCentral.com](http://www.SavingsCentral.com)

*Who's Doing It?: The Hustedts borrowed the Kill-a-Watt meter from the Red Hook Public Library and measured the electricity used by their household plug-ins. Their fifth grader was surprised to find that the family desktop computer used more energy when on screen saver mode than when in active use! His answer – put it on sleep mode whenever he stepped away and the drawdown dropped to just a couple of watts.*

### **Upgrade Seasonal Lighting**

ACTION	
<i>Residents</i>	<ul style="list-style-type: none"> <li>✓ Replace low efficiency seasonal lights with LED-based models.</li> </ul>

Traditional incandescent-based lighting, even with only seasonal use, can be a significant source of electricity consumption. By replacing traditional decorative holiday lighting fixtures and light strings with higher-efficiency systems like LEDs, residents can significantly reduce seasonal energy consumption, thereby saving money while simultaneously reducing GHG emissions due to the reduced energy demand. Additionally, LEDs (compared to traditional incandescent lighting) have a longer operating life and a lower rate of failure, which lead to additional savings due to lower maintenance costs. Energy Star qualified LED strings generally consume 70-90% less electricity than traditional incandescent strings, and can last up to 10 times longer. Additionally, LED lighting is significantly cooler than traditional lighting during operation, which reduces the risk of fires commonly associated with seasonal holiday lighting.<sup>15</sup>

### **Residential-Scale Renewable Energy**

ACTION	
<i>Residents</i>	<ul style="list-style-type: none"> <li>✓ Research renewable energy technologies and contact professionals, such as NYSERDA staff, to learn about system specific financial and environmental benefits.</li> <li>✓ Adopt technologies and take advantage of financial incentives.</li> <li>✓ Explore possibility of purchasing electricity from renewable sources through Central Hudson</li> </ul>
<i>Town</i>	<ul style="list-style-type: none"> <li>✓ Educate residents about financial and environmental benefits of renewable energy through a lecture series where experts can present opportunities to the community, and advertise the lectures in busy public places such as the library and post offices.</li> </ul>

<sup>15</sup> Energy Star, Decorative Light Strings, [http://www.energystar.gov/index.cfm?fuseaction=find\\_a\\_product.showProductGroup&pgw\\_code=DS](http://www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&pgw_code=DS).

### Solar Hot Water

Solar systems, which provide hot water for residential applications rather than produce electricity, can also be installed. Solar hot water systems use solar energy to heat hot water for domestic use as well as for space heating, and they are regarded as being highly efficient. Solar heating of domestic hot water is perhaps the most cost-effective and, where suitable, may produce the largest carbon benefits, displacing fossil fuels directly. Because this system is highly efficient and may be cost-effective for many households, residents should work with a professional to see if it is right for them. A solar hot water system may save fuel costs associated with domestic hot water and reduce emissions. There are also several tax incentives available to residents interested in pursuing the installation of a solar hot water system.

*Who's Doing It?: Solar hot water installations are in homes in Red Hook in the Village and Upper Red Hook.*

### Solar Electric

Solar photovoltaic (PV) panels can offer residents economic advantages and emission reductions. Solar PV systems convert solar energy into electricity, which is then used to supply a portion of electricity used to power the home. Grid-connected solar PV systems still allow residents to use power from the grid when the solar PV system is not supplying electricity (at night or on cloudy days). When the solar system produces electricity in excess of what the resident consumes, the amount of excess electricity is purchased from the homeowner by the electricity utility. The utility provides a credit for electricity purchased on the homeowner's electricity bill. If more electricity is produced than the homeowner consumes, homeowners can eliminate their annual electricity bills. There are also several tax incentives available to residents interested in pursuing the installation of a solar PV system.

### Geothermal

Geothermal systems work by providing heating and cooling for a building by taking advantage of the constant temperature of the earth. The system circulates fluid in pipes embedded in the earth. The earth keeps the circulating fluid at a constant temperature. By circulating this fluid through a building, geothermal systems can satisfy heating and cooling needs. By harnessing the nearly constant temperature of the earth (between 50°F and 55°F in New York), circulating fluids provide cooling during warm summer months and heat during the cold winter season. Circulating water through the earth means that less electricity is used for heating and cooling, and this may lower energy bills. It is important to note that this technology is most cost effective when a site is first developed or when an existing unused well or lake or stream is available because it can be more costly to retrofit an existing site. There are currently no government incentives for geothermal systems, but interested residents should work with contractors to discuss financing arrangements.<sup>16</sup>

*Who's Doing It?: Denis Colet has been using geothermal. Along with this solar hot water and PV system, he's nearly a net zero home.*

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<sup>16</sup> NYSERDA, Geothermal Heat Pumps, <http://www.nyserda.org/programs/geothermal/default.asp>.

**Personal Energy Plans**

## ACTION

*Residents*

- ✓ Complete an energy plan for your home to keep track of usage and identify areas where you will commit to reduce energy use. Be sure to include the entire family in the planning process.
- ✓ Compete with neighbors/host energy parties to compare energy goals and discuss energy saving strategies.

*Town*

- ✓ Use volunteers/Bard students to provide one-on-one assistance to people as they complete their plans and follow up with them to ensure follow through and track results.

There are a number of tools designed to help residents develop and implement personalized energy plans. Using these tools, homeowners capture information specific to their home and energy usage, compare energy usage to other nearby homes, and design a customized plan to increase energy efficiency and reduce costs. Examples of programs that support home energy plans include My Energy Plan<sup>17</sup> and Home Energy Saver.<sup>18</sup>

*Who's Doing it?: Sixty-six Red Hook residents have made their energy plans saving \$41,276 in energy costs and 322,564 pounds of CO<sub>2</sub>.*

**2. Commercial*****NYSERDA FlexTech Energy Audit***

## ACTION

*Businesses*

- ✓ Research the FlexTech Energy Audit program to see if it would be beneficial to participate.

*Town*

- ✓ Educate businesses about the importance of energy audits and inform them of other energy efficiency opportunities available to them.

The NYSERDA FlexTech Energy Audit program provides energy audits to facilities with an average electric demand of 100kW or less. The audit is free for small businesses and not-for-profits, and is also available to local governments on a cost-sharing basis. The audit provides the facility owner with facility-specific information regarding energy use and potential savings. This information enables

<sup>17</sup> My Energy Plan, <http://myenergyplan.net/>.

<sup>18</sup> Home Energy Saver, <http://hes.lbl.gov/consumer/>.

property owners to make informed decisions by identifying economically viable energy saving strategies. The scope of the audit includes an evaluation of lighting and HVAC equipment.<sup>19</sup>

Potential recommendations include:

- Weatherizing – replacing windows, sealing leaks, adding insulation
- Automated HVAC controls, temperature zones
- Upgrade HVAC/furnace/boiler
- Upgrade appliances, IT equipment

*Who's Doing It?: Bard College had a FlexTech audit of their library and gym. They identified annual energy savings if they upgrade their lights at the gym. Since they had the audit and implemented the engineer's recommendations, they were able to apply for ARRA funding and got grants to upgrade their gym systems and will save money annually.*

#### ***NYSERDA FlexTech Benchmarking Pilot***

ACTION
<p><i>Businesses</i></p> <ul style="list-style-type: none"> <li>✓ Research the FlexTech Benchmarking Pilot program to see if it would be beneficial to participate.</li> </ul>

The NYSERDA FlexTech Benchmarking Pilot program provides an energy benchmark and individual energy savings recommendations to commercial, industrial, and institutional facilities 50,000 square feet or greater that contribute to the System Benefits Charge. This program augments the traditional FlexTech program by covering costs up to the first \$7,000 per facility, with the costs shared 50/50 by the applicant and NYSERDA above \$7,000.<sup>20</sup>

*Who's Doing It?: Bard is doing a benchmarking pilot on the Richard B. Fisher Center for the Performing Arts.*

#### ***Maintain/Upgrade HVAC Systems***

ACTION
<p><i>Businesses</i></p> <ul style="list-style-type: none"> <li>✓ Schedule regular maintenance for all heating and cooling equipment.</li> <li>✓ Replace old equipment with energy efficient equipment when upgrading.</li> </ul>

The majority of energy consumed in commercial buildings is used for heating, venting, and cooling. Ensuring that building envelopes and ducts are insulated and sealed correctly and maintaining existing

<sup>19</sup> Visit <http://www.nyserdera.org/programs/energyaudit.asp> and <http://www.nyserdera.org/programs/flextech.asp> for more information about the program.

<sup>20</sup> NYSERDA, FlexTech Benchmarking Pilot, <http://www.nyserdera.org/programs/flextech%2Dbenchmarking/>.

heating, venting, and air conditioning (HVAC) equipment will keep existing municipal facilities operating efficiently. Upgrading HVAC equipment can lead to long-term energy savings as well as emissions reductions. When the time comes to upgrade older equipment, municipal decision-makers should consider the efficiency rating of new equipment. Rating systems, like ENERGY STAR, identify appliances that use less electricity than non-ENERGY STAR rated appliances while achieving comparable performance.

### **Upgrade Lighting**

ACTION
<p><i>Businesses</i></p> <ul style="list-style-type: none"> <li>✓ Participate in Central Hudson’s Energy Efficient Commercial Lighting Program.</li> </ul>

One of the easiest steps a business can take to reduce energy costs is to replace traditional lighting with newer, more efficient lighting technology, such as compact fluorescent (CFL) or light-emitting diode (LED) bulbs. CFL and LED bulbs produce the same luminosity as traditional incandescent lighting while consuming substantially less electricity. In addition, CFL and LED bulbs also last significantly longer than their incandescent counterparts, which lead to lower maintenance costs. This savings helps to offset the initially higher cost of CFL and LED technology. Central Hudson offers (when funding permits) a program where it funds 60% of lighting upgrade costs, while allowing the business to cover the balance at 0% financing.<sup>21</sup>

*Who’s Doing It?: Bard and Central Hudson have collaborated to install LED outdoor lighting in 10 parking lot lights near the Fisher Center.*

### **Energy Star Rated Business Equipment & Appliances**

ACTION
<p><i>Businesses</i></p> <ul style="list-style-type: none"> <li>✓ Replace old office equipment with ENERGY STAR rated models.</li> </ul>

In addition to home appliances, many pieces of commercial equipment are available with ENERGY STAR ratings. Business owners who elect to replace older existing equipment with newer ENERGY STAR rated units will typically see a significant reduction in energy consumption and therefore realize a corresponding savings in energy costs. A non-exhaustive list of equipment available with the ENERGY STAR rating is:

- Computers
- Printers
- Vending machines
- Water coolers
- Printers

<sup>21</sup> Central Hudson, Energy Efficient Commercial Lighting, <http://www.centralhudson.com/savemoney/>.

***Energy Star Commercial Building Tax Deduction***

## ACTION

*Businesses*

- ✓ Talk with your tax advisor to see how you can take advantage of a tax deduction available for businesses who invest in energy efficiency.

A Federal tax deduction is available to owners or designers of new or existing commercial buildings that consumes 50% or less of the energy consumed in a comparable building. The credit is \$0.60 per square foot, up to \$1.80 total, for measures taken that affect any one of three building systems: the building envelope, lighting, or heating and cooling systems. The deduction is available for systems placed in service between January 1, 2006 and December 31, 2013.<sup>22</sup>

***Renewable Energy***

## ACTION

*Businesses*

- ✓ Work with the Chamber of Commerce to research how renewable energy technologies could be incorporated into businesses.
- ✓ Ask the Chamber of Commerce to notify businesses of various renewable energy incentives and programs.

**Solar Installations**

Business owners and landlords can reduce their facility's energy costs by installing a self-contained solar system. There are two types of solar installations that can provide an energy savings: a photovoltaic (PV) system, which generates electricity from sunlight, and a solar hot water system, which uses solar energy to provide thermal energy for heating water and even the building itself. Depending on the size of the installation and the solar exposure, it is possible to meet all of one's electricity needs with a PV installation, and the reduction in electricity costs after installing a PV array may eventually pay for the system. Additionally, PV systems are not susceptible to power outages; as long as the sun is shining, they are generating electricity, regardless of the condition of the grid. Solar hot water systems can also offer significant energy savings when used to heat water. Traditional hot water heaters are often very inefficient, particularly units that are old or poorly maintained. With sufficient exposure, a solar hot water system can achieve comparable results while costing nothing to operate.

**Geothermal**

Geothermal heat pumps utilize the relatively stable temperature of sub-surface earth to heat and cool buildings efficiently while reducing energy consumption. In place of traditional heating and cooling units, these systems use thermal exchangers to control a building's interior temperature by drawing

<sup>22</sup> Energy Star, Tax Deductions for Commercial Buildings,  
[http://www.energystar.gov/index.cfm?c=tax\\_credits.tx\\_comm\\_buildings](http://www.energystar.gov/index.cfm?c=tax_credits.tx_comm_buildings).

warmth from the earth in winter (when the sub-surface temperature is higher than the ambient temperature), and reversing the process in summer. In addition, they do away with seasonal spikes in energy costs, are inexpensive to maintain, and eliminate the need for heating with fossil fuels, as well as the resultant air pollution. NYSERDA offers incentives for geothermal installation for both new construction and existing facilities.<sup>23</sup>

### Wind

Wind turbines convert the energy contained in moving wind into mechanical energy, which can then be converted into electricity. Wind turbines range in size, from small residential units to large commercial turbines. To determine whether there is enough wind resource to warrant the installation of wind turbines, facility owners could conduct a feasibility study. Particular attention should be paid to agricultural areas because there may be more wind resource in open fields. NYSERDA has offered incentives for small turbine installations targeted at homeowners, businesses, and municipalities. It is important to emphasize, however, that other renewable energy options should be considered first as the wind resource in the Red Hook area is not optimal for small scale wind power development. Open fields such as farms or other spaces, however, could be better suited for such projects.

### **Energy Consumption Monitoring**

ACTION	
<i>Businesses</i>	<ul style="list-style-type: none"> <li>✓ Borrow the Kill-a-Watt device from the Red Hook Public Library and use it in your business to measure how much electricity your appliances use.</li> <li>✓ Take action to reduce energy usage based on what you learn from the Kill-a-Watt – unplug devices when you’re not using them, upgrade to more efficient ones, etc.</li> </ul>

Many electronic devices, including computers, network adapters, and other telecommunications equipment, are known to consume marked amounts of electricity, even when in an “off” or “standby” state. Due to this constant use of electricity, such devices can significantly increase bills without the owner’s knowledge. Several devices are available for monitoring and evaluating the amount of electricity a particular device consumes, including the Kill-A-Watt. Business owners and residents can check this device out from the Red Hook Public Library.

<sup>23</sup> NYSERDA, Geothermal Heat Pumps, <http://www.nyserdera.org/programs/geothermal/>.

***Use Light Colors on Roofs***

ACTION	
<i>Businesses</i>	✓ Paint dark colored roofs white to reflect the sunlight rather than absorb it; this leads to reduced demand on cooling equipment.
<i>Town</i>	✓ Implement building code to require white roofs on new commercial buildings.

Dark colors absorb heat, and light colors reflect it. Most roofs are dark in color, meaning that heat is absorbed, leading to increased demand on cooling equipment during summer months and therefore higher energy prices. As the roof heats it also expands, and constant expansion and contraction can lead to increased stress and damage on the roof. Painting a roof white could lead to unexpected savings on electric bills. It is important, however, to consider your home's unique circumstances before engaging in this action.

***Green Leasing Policies***

ACTION	
<i>Businesses</i>	✓ Work with the Chamber of Commerce to include green provisions in leases to encourage energy efficient behavior.

One of the biggest obstacles to encouraging businesses to engage in energy efficient behavior is what is called the “split incentive” – tenants are reluctant to take measures to reduce energy use because they may not realize the financial benefit, depending upon who is responsible for the utility bills. For example, a tenant would not have a financial incentive to invest in energy saving measures if energy savings are not passed on through lower rents. Alternatively, a building owner may not have a financial incentive to improve energy efficiency within tenant occupied space if energy costs can simply be passed onto the tenant. In this way, the “split incentive” may prevent energy efficiency investments in situations where only the tenant or the landlord would benefit from efficiency gains, not both. ICLEI suggests the following provisions that can be incorporated into leases to encourage energy efficient behavior by attempting to overcome this barrier (ICLEI's *Commercial Energy Policy Toolkit, Green Leasing*, available at [www.icleiusa.org](http://www.icleiusa.org)).

- Requiring that energy-efficient products be used in tenant operations.
- Sub-meter leased areas so the cost of electricity used by each tenant is more accurately reflected.
- Establish energy performance standards for leased areas.

***Outreach for Agricultural Community*****ACTION*****Town***

- ✓ Educate farmers about renewable energy options, such as solar electric, wind, and biomass for electricity generation by organizing expert presentations.
- ✓ Assist farmers in responsible use of fertilizers by offering soil testing and helping to develop proper fertilizer composition, volume, and frequency. This will help curtail methane production while reducing farmers' costs.
- ✓ Encourage farmers and residents to consider a community-sustained agriculture program.
- ✓ Use volunteers or Bard students to work with agricultural community to make them aware of government incentives and programs.

The agricultural sector in the Town is a critical component of the local economy and community. It also faces unique sets of challenges when it comes to energy issues. Agriculture is highly energy intensive, so special attention should be paid to meeting their energy needs. Renewable energy sources such as solar, wind, and biomass could be beneficial, and fuel alternatives (such as electric tractors instead of diesel-fuels models) should be made available to them. Farmers could benefit from subsidized or free soil evaluations, which would allow them to develop a more targeted approach to fertilization, which can reduce methane production and fertilizer runoff while also reducing farmers' costs. Community-sustained agriculture can benefit both farmers and residents by providing fresh, local produce to residents, ensuring business for farmers, and eliminating the carbon footprint associated with purchasing out-of-state produce.

**3. Municipal*****ICLEI CAPP Software***

ICLEI offers a Climate and Air Pollution Planning Assistant (CAPP) decision-support tool that assists municipalities in achieving their emission reduction goals. The CAPP spreadsheet estimates energy and emission savings for a variety of measures that can be implemented at the municipal level. In this way, decisionmakers are able to identify projects and design a plan in accordance with Red Hook's emission reduction goals.

**ENERGY STAR Building Code**

## ACTION

*Town*

- ✓ Provide periodic training/informational presentations for contractors given by ENERGY STAR professionals.
- ✓ The Town of Red Hook should work with the Village of Red Hook and the Village of Tivoli to consider the inclusion of ENERGY STAR building requirements in their laws.

The Town of Red Hook's building code requires new construction to achieve ENERGY STAR status, meaning that new residential buildings will be between 20%-30% more energy efficient than standard homes. To more effectively meet this requirement, contractors working within the town should be familiar with the ENERGY STAR program, the methods used to assess a building's status, and the materials used in ENERGY STAR construction. An educational program sponsored by Red Hook and surrounding municipalities can increase the knowledge of contractors in the region. ENERGY STAR education will help ensure that commercial and residential buildings maximize energy savings through the ENERGY STAR program. In addition, the Village of Red Hook and the Village of Tivoli could consider adopting similar requirements for their building code.

**Review of Current Town and Village Ordinances**

## ACTION

*Town*

- ✓ Review all ordinances in the Town of Red Hook, the Village of Red Hook, and the Village of Tivoli to assess whether any provisions impede the implementation of energy-related improvements, such as renewable energy, energy efficiency, waste management or more environmentally friendly transportation alternatives.

In addition to implementing new and innovative measures in the Town to promote alternative energy solutions, it is important to assess where we currently are. Reviewing current laws in the Town and Villages will ensure that any new energy and sustainability strategies will have minimal roadblocks.

**Occupancy Sensors**

## ACTION

*Town*

- ✓ Install occupancy sensors throughout government-owned buildings where appropriate.

Occupancy sensors save electricity by turning lights on when someone enters a room or area, and turning lights off in empty rooms. By automatically turning lights off when not in use, occupancy sensors can save electricity in municipal buildings. Occupancy sensors in conjunction with energy efficient lighting systems will allow municipal facilities to make the most of lighting energy expenditures.

### ***Maintain/Upgrade HVAC Systems***

ACTION	
<i>Town</i>	<ul style="list-style-type: none"> <li>✓ Schedule regular maintenance for all heating and cooling equipment.</li> <li>✓ Replace old equipment with energy efficient equipment when upgrading.</li> </ul>

The majority of energy consumed in commercial buildings is used for heating, venting, and cooling. Ensuring that building envelopes and ducts are insulated and sealed correctly and maintaining existing heating, venting, and air conditioning (HVAC) equipment will keep existing municipal facilities operating efficiently. Upgrading HVAC equipment can lead to long-term energy savings as well as emissions reductions. When it comes time to upgrade older equipment, municipal decision-makers should consider the efficiency rating of new equipment. Rating systems, like ENERGY STAR, identify appliances that use less electricity than non-ENERGY STAR rated appliances while achieving comparable performance.

### ***Purchase ENERGY STAR Products***

ACTION	
<i>Town</i>	<ul style="list-style-type: none"> <li>✓ Adopt formal ENERGY STAR purchasing guidelines for all government entities.</li> <li>✓ Purchase ENERGY STAR-rated commercial products when upgrading, replacing or acquiring new equipment.</li> </ul>

Many products used by municipalities in conducting day to day business are included in the ENERGY STAR rating system. Products with the ENERGY STAR label are designed to be energy efficient, which saves energy costs and emissions over the product's lifetime. Municipalities can ensure the use of ENERGY STAR rated products by adopting and implementing procurement guidelines that instruct personnel to purchase ENERGY STAR labeled products, if available. Commercial products with the ENERGY STAR label include:

- Computers
- Imaging equipment
- Lighting systems
- Commercial food service equipment
- Vending machines

- Water coolers
- Building products

### ***Institute Environmentally Friendly Purchasing Policies***

ACTION	
<i>Town</i>	<ul style="list-style-type: none"> <li>✓ Institute environmentally friendly purchasing policies to encourage the use of products that were made in a way that considers environmental impacts, such as GHG emissions.</li> </ul>

In addition to purchasing ENERGY STAR products, the Town should also consider implementing an environmentally friendly purchasing policy. Wherever it would not be cost prohibitive, the Town could require that any purchases meet certain environmental standards. The EPA, through its Environmentally Preferable Purchasing (EPP) program, offers guidelines on purchasing considerations related to everything from carpets to office supplies.<sup>24</sup> The Responsible Purchasing Network (RPN) also offers guidance regarding environmental and sustainable procurement policies and a support network of dozens of other government, academic and non-profit entities.<sup>25</sup>

### ***Develop Locally Based Energy Efficiency Financing Program***

ACTION	
<i>Town</i>	<ul style="list-style-type: none"> <li>✓ Develop an energy efficiency financing program that will allow homeowners and businesses to finance these improvements through property tax assessments.</li> <li>✓ Educate residents and businesses about the on-bill recovery legislation passed by New York State which will allow energy efficiency loans to be repaid through utility bills.</li> </ul>

Implementing energy efficiency improvements in your home or business can be very challenging. The two greatest obstacles faced are (1) the high upfront cost, and (2) the payback period. To counter these and other related concerns, New York State passed legislation supporting the Property Assessed Clean Energy (PACE) Program whereby local governments could provide loans (funded through municipal bonds) to homeowners to implement energy efficiency improvements, and they would be paid back through that building's property taxes. The upfront cost problem is removed, and, because it would be paid back through taxes, the next homeowner would be responsible for those assessments because they are still enjoying the benefit of the improvements. The White House was also supportive of PACE programs nationwide. Due to recent litigation, however, PACE programs and similar ones are on hold. Still, the Town can follow the developments in this area and explore alternative means to finance such improvements. In June 2011, New York State passed on-bill recovery legislation which

<sup>24</sup> U.S. Environmental Protection Agency, Environmentally Preferable Purchasing (EPP), <http://www.epa.gov/epp/>.

<sup>25</sup> Responsible Purchasing Network (RPN), <http://www.responsiblepurchasing.org/index.php>.

operates through a similar mechanism whereby energy efficiency loans are repaid through utility bills. The Town should watch for its implementation which should be in late 2012.

### ***Clean and Renewable Energy***

ACTION	
<i>Town</i>	<ul style="list-style-type: none"> <li>✓ Conduct feasibility studies and work with experts to determine how more renewable and clean energy can be installed in government-owned buildings.</li> </ul>

Long-term emissions reductions are not possible without the use of clean energy and renewable energy solutions. Clean energy technologies are able to produce energy with increased efficiency and reduced emissions. Renewable energy technologies produce energy without emissions associated with energy production. In addition to the options listed below, community solar or wind should be explored. This means that individual residents could invest in a solar or wind installation and use that electrical power.

Red Hook has already taken measures to incorporate renewable energy to reduce municipal energy costs. Red Hook Town Hall and the Recycling Center generate electricity from rooftop solar panels, which supply a portion of the buildings' electrical loads. In addition to generating renewable electricity and reducing emissions, Red Hook's solar panel project provides real world experience in adopting renewable technology. Based on the advantages gained from the solar installation at the Town Hall building, Red Hook may decide to incorporate additional clean energy or renewable energy solutions. The following technologies represent possible pathways towards clean or renewable energy. It is important to remember that the feasibility and actual benefits of these options are specific to each application and may vary based on location.

#### *Solar Electric*

Solar photovoltaic (PV) panels convert solar energy into electricity, which can be used to supply a portion of electricity demand for municipal buildings. Solar PV installations reduce reliance on the electrical grid, reduce electricity bills, and reduce emissions. The Town may examine other municipal buildings to determine the feasibility of additional solar PV installations. Using actual data from the Town Hall rooftop solar panels would allow municipalities to conduct specific cost-benefit analyses for future solar PV installations.

#### *Solar Hot Water*

Solar hot water systems use solar energy to heat hot water by circulating water between a reservoir and solar collectors. They can also be installed in municipal applications, either in place of or in conjunction with PV systems. These systems typically operate at a far greater efficiency than traditional water heaters, and do so at a far lower operating cost and without any of the associated environmental burdens. The Town may examine the feasibility of solar hot water systems for municipal buildings. The feasibility of a solar hot water system will depend on available solar irradiation, the area available for solar collectors, and hot water demand. NYSERDA offers incentives

for solar hot water installations as well, and nonresidential facilities may receive up to \$25,000 in incentives (typically 15-20% of the total cost).<sup>26</sup>

### Wind

Wind turbines convert the energy contained in moving wind into mechanical energy, which is then converted into electricity. Wind turbines range in size, from small residential units to large commercial turbines. To determine whether the Town has enough wind resource to warrant the installation of wind turbines, the Town could conduct a feasibility study. In the past, NYSERDA has offered incentives for small turbine installations targeted at homeowners, businesses, and municipalities. If Red Hook decides to explore its wind resources, it should secure available assistance or funding from NYSERDA. It is likely that this will be most feasible at a large-scale level.

### Geothermal

Geothermal systems take advantage of the nearly constant temperature of the earth to provide efficient heating and cooling. Ground temperatures are warmer than the air during winter months and cooler than the air during summer months. By linking a building's HVAC system to the ground, a facility can sink heat in the ground during the summer and draw heat from the ground during the winter months. Geothermal heating and cooling systems provide low energy heating and cooling with low maintenance and low environmental impacts. Geothermal systems operate most efficiently for large buildings or as a distributed heating/cooling system for adjacent buildings. For example, Bard College operates a geothermal system to provide energy efficient heating and cooling needs for a recent nine-building dormitory expansion. The Town may explore the feasibility of geothermal heating and cooling systems for their facilities.

### Anaerobic Digesters

Anaerobic digestion is a process that converts organic waste and manure into useful forms of energy. Organic waste, such as farm scraps and animal waste, are collected and placed in a digester. Microorganisms break down the organic waste in the absence of oxygen into products including biogas and digestate. Some forms of digestate can be used as fertilizer, and biogas can be used as natural gas to power vehicles, or to generate electricity which can power a building or be sold back to the grid. In addition, heat from the digestion process can be captured to warm a greenhouse, allowing crops to be produced even through the colder months. Because the Town has a strong agricultural community, it is possible that anaerobic digesters would benefit the local economy.

### Explore Community Scale Distributed Generation

Distributed generation (DG) systems produce energy closer to the end user from sources much smaller than large centralized power plants, and they can operate on biomass, natural gas, and certain renewable power. DG systems reduce reliability on the traditional power grid and may provide more dependable power supply during times of peak demand or power outages. Renewable or energy efficient DG systems can also reduce emissions.

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<sup>26</sup> NYSERDA, Solar Technologies, <http://www.nyserdan.ny.gov/en/Page-Sections/Renewables/Solar-Technologies.aspx>.

***Upgrade Municipal Lighting***

## ACTION

*Town*

- ✓ Replace incandescent bulbs with CFLs in frequently used areas.
- ✓ Upgrade lighting equipment in all government-owned buildings to energy efficient electronic ballasts.
- ✓ Replace exterior lighting with LEDs and motion sensors.
- ✓ Install solar tubes to redirect outside sunlight to inside the buildings.

A potentially significant step the Town could take to reduce its energy consumption and GHG emissions is to upgrade indoor and outdoor municipal lighting systems to more efficient technology. Additionally, by evaluating current municipal energy use and reducing lighting levels or hours of use, the municipality may gain a net energy benefit without investments in new or upgraded infrastructure.

*Exterior*

Outdoor systems, such as street lights and exterior lights on buildings, can be replaced with newer, more efficient lighting, and supplemented with devices that manage electricity consumption in a more efficient manner. Conventional bulb technologies for street and exterior lighting, including incandescent, fluorescent, and sodium-based bulbs, are far less efficient and have higher failure rates than newer LED technology. LED street lights can match the light output of traditional technologies while consuming 50-60% less electricity on average, and the nature of their construction gives them a lifespan that is generally 2-3x as long as traditional bulbs, potentially as long as 15 years. While LED street light retrofitting generally involves a high upfront cost, the significant energy and maintenance savings often result in a system payback within a few years. The savings resulting from reduced energy use is even greater when more advanced control technology is implemented simultaneously, such as occupancy sensors with multiple output settings. This type of sensor allows lights to be shut off when they are not in use, and can tailor lighting output based on the amount of motion the sensor detects.<sup>27</sup>

*Interior*

Indoor lighting upgrades can also yield significant reductions in energy consumption and maintenance costs compared to traditional lighting technologies. The Town could consider replacing incandescent bulbs with higher-efficiency CFL or LED bulbs and installing electricity management devices that operate based on motion detection. According to ENERGY STAR, exchanging one CFL bulb for an incandescent bulb can save \$40 over the life of the bulb. Low wattage bulbs produce the same amount of brightness as traditional incandescent bulbs while only using 1/3 of the electricity. In addition, CFL and LED bulbs last up to six times longer than incandescent bulbs. Energy efficient electronic ballasts are also available for commercial lighting systems. Additionally, the Town may further benefit from retrofitting municipal buildings with light tubes, which can provide more than ample interior lighting during daylight hours. Light tubes, also known as light pipes, are reflective and refractive tubes that are designed to redirect sunlight inside a building to provide indoor lighting without consuming any electricity. Light tubes are inexpensive, have zero maintenance costs, and can redirect well over 90%

<sup>27</sup> U.S. Department of Energy, Solid-State Lighting, [http://www1.eere.energy.gov/buildings/ssl/gatewaydemos\\_results.html](http://www1.eere.energy.gov/buildings/ssl/gatewaydemos_results.html).

of visible light from a building’s exterior to its interior when properly installed. Additionally, light tubes carry potential health benefits for office workers, as they provide natural, rather than artificial, light.

### ***Upgrade Traffic Signals and Streetlights***

ACTION	
<i>Town</i>	✓ Replace traffic signals and pedestrian signals with LEDs.

Due to their constant use, traditional traffic lights using filament bulb technology can be a big source of electricity consumption. Because bulb lifespan is usually between 1-3 years, maintenance and operation costs can be significant. Replacing these lights with LED technology can yield significant energy savings and decrease maintenance costs, in addition to other benefits. Unlike traditional filament bulb-based signals which are rendered useless when a bulb fails, LED traffic signals utilize multiple diodes, so a failure of an individual diode will not impact the overall functionality of the signal. Additionally, LED signals do not contain reflectors, so this eliminates “phantom signals” (the appearance that a signal is lit, when the signal is actually reflecting sunlight falling directly upon its lens). In light of these benefits, replacing traditional traffic lights and pedestrian signals may be a viable option to cut the Town’s energy consumption.

### ***Upgrade Seasonal Lighting***

ACTION	
<i>Town</i>	✓ Replace low efficiency seasonal lights with LED-based models.

Traditional incandescent-based lighting, even with only seasonal use, can be a significant source of electricity consumption. By replacing traditional decorative holiday lighting fixtures and light strings with higher-efficiency systems like LEDs, the Town can significantly reduce seasonal energy consumption, thereby saving money while simultaneously reducing GHG emissions due to the reduced energy demand. Additionally, LEDs (compared to traditional incandescent lighting) have a longer operating life and a lower rate of failure, which lead to additional savings due to lower maintenance costs. Energy Star qualified LED strings generally consume 70-90% less electricity than traditional incandescent strings, and can last up to 10 times longer. Additionally, LED lighting is significantly cooler than traditional lighting during operation, which reduces the risk of fires commonly associated with seasonal holiday lighting.<sup>28</sup>

<sup>28</sup> Energy Star, Decorative Light Strings, [http://www.energystar.gov/index.cfm?fuseaction=find\\_a\\_product.showProductGroup&pgw\\_code=DS](http://www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&pgw_code=DS).

**Home Energy Ratings**

## ACTION

*Town*

- ✓ Encourage Home Energy Rating System (HERS) scores to be included in real estate transactions when buying and selling buildings.

A Home Energy Rating System (HERS) score is an evaluation of the energy efficiency of a particular house. The system, created by the Residential Energy Services Network (RESNET), is designed to provide homeowners and potential buyers with a frame of reference for the efficiency of a particular home, the efficiency of that home relative to similar houses locally and nationwide, and a starting point to evaluate potential improvements that may be made to the home to increase its energy efficiency. A HERS score is obtained by conducting an energy audit, which is performed by an accredited auditor and commonly includes an evaluation of a home's insulation, window efficiency, HVAC efficiency, solar orientation, and water heating system. By recommending that property owners include a HERS score and associated documentation at the time of sale when transferring a property, the Town could ensure that energy efficiency is featured prominently during real estate transactions and that purchasers have the necessary information to make informed energy decisions.<sup>29</sup> There is an effort in the Hudson Valley to include HERS scores in real estate transactions, and some local municipalities have sanctioned this practice as well.

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<sup>29</sup> RESNET, What is a Home Energy Rating?, <http://www.resnet.us/home-energy-ratings>.

## B. Transportation

### 1. Residential

#### *Promote Carpooling and Ridesharing*

ACTION	
<i>Residents</i>	<ul style="list-style-type: none"> <li>✓ Coordinate with friends and neighbors to carpool whenever possible.</li> <li>✓ Use rideshare websites to find additional ways to carpool.</li> </ul>
<i>Town</i>	<ul style="list-style-type: none"> <li>✓ Organize a local carpooling match list to encourage people to carpool.</li> <li>✓ Direct people to MetroPool’s website or 511NYRideshare for further rideshare information.</li> </ul>

Oftentimes people travel to the same place for work or leisure, but they are not aware that others are going to the same destination and that they could have saved gas money and emissions by carpooling. Residents should communicate with one another to find ways to travel in a coordinated manner. The Town could also ask interested residents to apply to list their names on a carpool match list, which may then be distributed online or via residential mail. The match list would contain details on each person’s approximate home address, place of business, work hours, and contact information. The Town should also encourage residents to sign up for the free on the NuRide ride networking website or by phone, or the 511NY website.<sup>30</sup> Employers in Red Hook should also be directed to MetroPool’s Employer Services website or 511NY for tips on establishing workplace ride sharing programs.<sup>31</sup>

#### *Bicycle into Town*

ACTION	
<i>Residents</i>	<ul style="list-style-type: none"> <li>✓ Bike instead of drive for local errands as often as possible.</li> </ul>
<i>Town</i>	<ul style="list-style-type: none"> <li>✓ Hold bike workshops at community events.</li> <li>✓ Provide bike lanes connected Red Hook, Bard, Tivoli</li> <li>✓ Establish Used Bike Program/Bike Share Program and a Free Bike Helmet Program/Safety Program</li> </ul>

<sup>30</sup> MetroPool, NuRide, <http://www.metropool.com/freecommuterservices/ridematch.html>; 1-800-FIND-RIDE; 511NYRideshare, <http://nycommute.org/>.

<sup>31</sup> MetroPool, Employer Services, [http://www.metropool.com/employerservices/emp\\_es.html](http://www.metropool.com/employerservices/emp_es.html); 511NYRideshare, <http://nycommute.org/>.

Transportation exhaust is one of the largest contributors to GHG emissions. Local driving is a substantial contributor because of the idling that takes place at intersections. This not only contributes to climate change, but is also adversely impacts local air quality. When it is safe to do so, people should use their bicycle for local errands instead of taking their car. It is also important that the town encourage safe bike use, and an easy way in which to do this is to promote the use of helmets for riders over the age of 12, where it is not legally required for them to wear helmets. Semi-annual bicycle helmet giveaways can encourage increased helmet use, especially among young riders.

### ***Encourage Purchases of Environmentally Friendly Vehicles***

ACTION	
<i>Residents</i>	<ul style="list-style-type: none"> <li>✓ Research environmentally friendly types of vehicles, such as hybrids, electric vehicles, or partial zero emissions vehicles (PZEVs) if considering purchasing a new one.</li> </ul>
<i>Town</i>	<ul style="list-style-type: none"> <li>✓ Educate residents about different types of vehicles.</li> </ul>

Transportation constitutes a large portion of Red Hook’s GHG inventory, so it is important for residents to consider the possibility of purchasing low emissions vehicles if they are looking to purchase a new car or truck. The U.S. Department of Energy has released a new tool called the “Vehicle Cost Calculator” which allows people to enter their driving habits and compare fuel economy and cost.<sup>32</sup>

### ***Keep Tires Inflated***

ACTION	
<i>Residents</i>	<ul style="list-style-type: none"> <li>✓ Check with your owner’s manual to ensure that the tires on your vehicle are inflated properly to ensure highest fuel economy.</li> </ul>
<i>Town</i>	<ul style="list-style-type: none"> <li>✓ Educate residents about importance of maintaining optimum tire pressure and demonstrate this to residents at Town and Village events as appropriate.</li> </ul>

While this may seem like a minor action, keeping the tires properly inflated on your car or truck can greatly improve fuel efficiency. According to a government website, keeping your tires inflated to the

<sup>32</sup> U.S. Department of Energy, Alternative & Advanced Vehicles, Vehicle Cost Calculator, [http://www.afdc.energy.gov/afdc/calc/?\\_\\_utma=1.1822736006.1321317637.1321317637.1321317637.1&\\_\\_utmb=1.1.10.1321317637&\\_\\_utmc=1&\\_\\_utmz=1.1321317637.1.1.utmcsr=links.govdelivery.com|utmccn=\(referral\)|utmcmd=referral|utmctt=/track&\\_\\_utmv=-&\\_\\_utm=52925480](http://www.afdc.energy.gov/afdc/calc/?__utma=1.1822736006.1321317637.1321317637.1321317637.1&__utmb=1.1.10.1321317637&__utmc=1&__utmz=1.1321317637.1.1.utmcsr=links.govdelivery.com|utmccn=(referral)|utmcmd=referral|utmctt=/track&__utmv=-&__utm=52925480).

vehicles specifications can improve fuel efficiency by about 3% which could lead to a savings of \$0.11/gallon.<sup>33</sup> The Town could educate its residents about the importance of this practice and also demonstrate this at public events as appropriate.

## 2. Commercial

### ***Centralized Distribution Center for Farm Products***

ACTION	
<i>Farmers</i>	<ul style="list-style-type: none"> <li>✓ Coordinate efforts to organize centralized distribution center to transport goods in a cost-efficient manner when selling them abroad.</li> </ul>
<i>Town</i>	<ul style="list-style-type: none"> <li>✓ Work with agricultural community to assist with siting and organizing this effort as necessary.</li> </ul>

When farmers want to sell their goods to areas outside of the Red Hook area (often as far as New York City), they have to transport them in trucks, which is very energy-intensive and costly. In order to reduce costs and emissions from those multiple trucks, farmers could coordinate efforts by organizing a centralized distribution center. Farmers could bring their goods there and load them into fewer trucks, cutting back on the repetitive costs associated with driving several trucks long distances.

### ***Expand Bike Parking***

ACTION	
<i>Businesses</i>	<ul style="list-style-type: none"> <li>✓ Sponsor an ARTBike Rack as seen at Migliorelli's Farm Stand, Taste Budd's, Holy Cow and Town &amp; Village Hall.</li> </ul>

Bike racks provide an important function in transportation infrastructure because they allow cyclists to park without inconveniencing pedestrians or property owners. By increasing bicycle parking in commercial districts, the Town will facilitate the smooth integration of cycle traffic into these areas and increase business.

<sup>33</sup> U.S. Department of Energy, [www.fueleconomy.gov](http://www.fueleconomy.gov), <http://www.fueleconomy.gov/feg/maintain.shtml>.

### 3. Municipal

#### ***Create Bike-Friendly Roadway Infrastructure***

ACTION	
<i>Town</i>	<ul style="list-style-type: none"> <li>✓ Work with the Dutchess County Planning Board, New York State Department of Transportation, and other appropriate agencies to conduct studies examining feasibility and economic impacts of implementing bike lanes on state and county roads.</li> <li>✓ Construct a dedicated bike/pedestrian path connecting residential areas and commercial hubs.</li> <li>✓ Ensure biker safety through road and path maintenance.</li> <li>✓ Coordinate with efforts in surrounding communities, such as Kingston and Rhinebeck.</li> </ul>

Bicycles offer a healthy, emission-free transportation alternative to automobiles and are especially convenient for short trips around town. Dedicated bike lanes, shared roadways and paths can encourage increased ridership among community members and can provide safe access to areas where vehicle traffic may deter frequent bike use. Dedicated bicycle infrastructure can also make it easier for families to travel by bike instead of by car. Bike/run/walk paths offer additional municipal green space and offer safe, car-free routes for families to travel between their homes and public or commercial facilities. These paths would be exceptionally useful if they are designed to connect key destinations, such as schools, stores, public transportation and employment centers. On-road dedicated bike lanes may be distinguished by painted symbols, signage, differing lane colors, or some combination of these methods. Recent state legislation also supports the use of bike lanes. On August 16, 2011, Governor Cuomo signed “Complete Streets” legislation into New York state law. The new law requires state officials to consider all modes of transportation in roadway projects and places the same requirements on local projects receiving federal or state funding.

All paths and roadways should be maintained to ensure that the right-of-way is clear of potentially dangerous debris. This includes branches, fallen tree limbs, gravel accumulation, and buildup of wet leaves. Municipal maintenance workers should regularly inspect bike paths and dedicated bike lanes to ensure that they are free of such hazards.

***Require Bike Lanes and Sidewalks in New Developments***

## ACTION

*Town*

- ✓ Establish policy requiring that bike lanes and sidewalks be implemented when new roads are being constructed.
- ✓ Assess the impact on bike and pedestrian traffic when reviewing or fixing already-existing roads.

Bike lanes and sidewalks are not only important for traveling on main roads, but also for going through neighborhoods. Many people, including children, could ride bikes to neighbor's homes or walk instead of driving, which would greatly reduce GHG emissions. However, it is often not safe to do so. When new roads or developments are being constructed, a policy could be established to implement bike lanes and sidewalks as part of those plans. While it is more difficult to implement these into residential roads that are already established, another policy could require decisionmakers to assess the impact on bike and pedestrian traffic when reviewing or fixing already-existing roads.

***Improve Traffic Control at Intersections***

## ACTION

*Town*

- ✓ Work with the Dutchess County Planning Board, New York State Department of Transportation, and other agencies as appropriate to conduct studies examining feasibility and economic impacts of installing traffic signals at appropriate intersections.
- ✓ Restrict parking in vicinity of intersection to promote biker safety.
- ✓ Install motion censored traffic lights to discourage vehicle idling at larger intersections
- ✓ Install traffic circles or other alternate traffic measures on Route 9G that are less environmentally damaging.

Cyclists should be able to easily navigate busy intersections and crosses, but it is not always clear when it is safe to traverse the roadway. Special traffic signals for bikers can ensure that cyclists know when it is safe to cross intersections and keep drivers aware of cycle traffic. Some cities, such as Portland, Oregon and Bakersfield, California have installed demand-activated bicycle traffic signals.<sup>34</sup> This technology can detect the metal rims on bicycle wheels as they approach the intersection and can guarantee that bikers only need to wait through one signal pattern for a green light. Washington, D.C.

<sup>34</sup> Portland Bureau of Transportation, Bike Signal at Interstate and Oregon, <http://www.portlandonline.com/transportation/index.cfm?c=34772&a=301555>.

also installed a bike signal at one of its busy intersections.<sup>35</sup> Additionally, there are several improvements that intersections can undergo to better direct automobiles that will decrease idling time, and thus, GHG emissions. One of those ways is to replace traffic lights with a roundabout or to install traffic lights that can detect oncoming traffic, most especially during evening hours.

### ***Make Bicycles More Accessible***

ACTION	
<i>Town</i>	✓ Work with volunteers in the community and agencies as appropriate to determine the best locations for operating bike share stations.

While biking is beneficial to the environment and personal health, many people do not have access to bicycles. Although bike shares are often associated with big cities (such as D.C. and Paris), many smaller communities have established municipal bike share programs to encourage bicycle use among residents who may not own or have regular access to a reliable bicycle. A bike share may operate out of a centralized location but allow users to borrow bicycles from multiple access points – such as near transit hubs, parks, or business districts – and then return bikes to other locations within the system. The share may operate on a pay-per-rental basis, or residents can acquire free or subscription-based memberships. A municipal bike share can also provide free or affordable bicycle maintenance at its central location, ensuring that residents choose a more environmentally friendly transportation option for years to come.

### ***Support Bicycle Safety Through Motorist Education***

ACTION	
<i>Town</i>	✓ Organize public meetings and develop informational materials on new cycling features in the Town and how to safely navigate the shared roadways.

If bicycle use increases, many motorists may be uncertain of how to handle the influx of bikers on municipal roadways; likewise, cyclists may not know how to safely navigate busy roadways. Motorist education programs can help inspire both cyclists and drivers with the confidence to safely navigate the shared roads and can also ease tensions between drivers and bikers. These classes can take place through existing adult education programs or may be offered separately by the municipality at community centers. High school drivers' education programs can also incorporate lessons on how to handle bicycle traffic. Educational mailings can also be distributed to all homes in the municipality as a way of reminding both drivers and cyclists of the rules of the road.

### ***Expand Bike Parking***

<sup>35</sup> The District of Columbia, DDOT Activates Districts First Bicycle Traffic Signals, <http://ddot.dc.gov/DC/DDOT/About+DDOT/News+Room/DDOT+Activates+Districts+First+Bicycle+Traffic+Signals>

ACTION	
<i>Town</i>	<ul style="list-style-type: none"> <li>✓ Install bike racks in Red Hook in popular areas to encourage cycling as an alternative to driving.</li> </ul>

Bike racks provide an important function in transportation infrastructure because they allow cyclists to park without inconveniencing pedestrians or property owners. By increasing bicycle parking in busy downtown and commercial districts, the Town will facilitate the smooth integration of cycle traffic into these areas. Racks should be installed in high-trafficked pedestrian areas, such as the Tivoli business district, and around the Bard College campus.

#### ***Add Infrastructure for Electric and Hybrid Vehicles***

ACTION	
<i>Town</i>	<ul style="list-style-type: none"> <li>✓ Work with appropriate agencies to study the feasibility of installing charging infrastructure in the Town to promote the purchase of clean electric vehicles.</li> <li>✓ Establish priority parking for hybrid or electric vehicles.</li> </ul>

Although electric vehicle (EV) technology is becoming increasingly accessible, those interested in purchasing EVs might be discouraged from doing so because of the lack of vehicle charging infrastructure. The Town of Red Hook could improve its infrastructure for electric and hybrid electric automobiles by installing a public electric vehicle charging station. Commercial stand-alone stations can be outfitted along the curb in parking facilities or bordering streets. Charging models fitted with SAE J1772 standard electrical connectors are compatible with a number of popular electric car models, such as the Toyota Prius, the Chevrolet Volt, the smart electric, and the Nissan Leaf. The Town can also maintain a page accessible on its municipal website which displays all available charging stations, so residents can plan their trips accordingly.

#### ***Institute Municipal Anti-Idling Law***

ACTION	
<i>Town</i>	<ul style="list-style-type: none"> <li>✓ Work with the county and appropriate transportation agencies to develop more stringent local anti-idling laws.</li> <li>✓ Conduct an emissions inventory from idling vehicles in an effort to discourage idling</li> </ul>

New York State law limits the amount of time that heavy duty vehicles and school buses may stand idle. These laws improve air quality by reducing emissions from vehicles which can have adverse

impacts on health and the environment. Westchester County went further and implemented a law prohibiting cars, trucks and SUVs from idling more than three minutes during certain weather conditions. The Town can pass similar legislation to improve health and reduce harmful air emissions.

*Who's Doing It?: Red Hook Central School District has anti-idling signage at the middle school and High School. Mill Road Elementary School can join in, too.*

### **Supplement LOOP Bus Service**

ACTION	
<i>Town</i>	<ul style="list-style-type: none"> <li>✓ Work with the Dutchess County Department of Planning and Development to enhance LOOP bus service by increasing the locations and times of stops.</li> <li>✓ Encourage the use of cleaner-burning fuels such as compressed natural gas (CNG).</li> </ul>

The County's LOOP bus service currently operates one route through the Town of Red Hook. Dutchess County's Route C bus stops at two locations in Tivoli (at the post office and on Route 9G at Broadway) and at five locations in Red Hook (Annandale Road at Route 9G, Bard College, River Road, Route 9G at Route 199, and Route 9 at Route 199). The Town could work with the Dutchess County Department of Planning and Development to improve and increase service of the LOOP bus system in the Town. In this way, more town residents will have access via public transportation to the greater Dutchess County region, and more businesses will see the benefits of increased access to their storefronts. The service should consist initially of small shuttle busses powered by clean technology. The Town may choose to utilize compressed natural gas (CNG) vehicles, electric vehicles, or biodiesel engines. In addition, the Town can encourage the buses to have bike racks installed on the fronts of the buses so that people can travel on the bus and still take their bikes with them for riding at their destination.

### **Biodiesel**

ACTION	
<i>Town</i>	<ul style="list-style-type: none"> <li>✓ Explore feasibility of fueling government-owned diesel-fuels vehicles with biodiesel.</li> <li>✓ Explore ways to procure biodiesel fuel in the community.</li> </ul>

Biodiesel (a diesel-fuel replacement derived from recycled grease or certain plants), presents certain environmental benefits as compared to diesel. For example, pure biodiesel fuel reduces carbon monoxide, particulate matter and sulfur oxides by 40%, 47%, and almost 100%, respectively, as compared to using regular diesel.<sup>36</sup> It does, however, emit more nitrogen oxides than traditional diesel fuel. Municipal vehicles currently equipped with diesel engines may use biodiesel fuel at no additional

<sup>36</sup> Biodiesel Emissions, [http://www.biodiesel.org/pdf\\_files/fuelfactsheets/emissions.pdf](http://www.biodiesel.org/pdf_files/fuelfactsheets/emissions.pdf).

capital cost. Manufacturers may void engine warranties if a certain blend of biodiesel is used, however, so this concern should be explored before the Town commits fleet vehicles to biodiesel.

### ***Refit the Police Fleet with Bicycles and Electric/Hybrid Vehicles***

ACTION	
<i>Town</i>	<ul style="list-style-type: none"> <li>✓ Institute a policy of replacing current police vehicles with electric or hybrid vehicles if economically beneficial.</li> <li>✓ Encourage police officers to use bicycles whenever it is safe to do so.</li> </ul>

The Town can establish a policy of incorporating electric vehicles into its fleet of police cruisers. Although all-electric police cruisers are still a rarity in the United States, the town of Connellsville, PA added a retrofitted Chevrolet Impala to its fleet in 2007 and estimates that the substitution of an electric engine for a combustible model saves nearly \$3-\$5 in daily operating costs.<sup>37</sup> Other cities, including a number in New Jersey, have included hybrid vehicles in their fleets and attest to saving thousands of dollars on gasoline per year.<sup>38</sup> Therefore, the Town could institute a policy that, when the need arises to purchase a new police cruiser, priority will be given to hybrid and electric vehicles. The Town can also incorporate additional bicycles into its patrol fleet. If police officers are encouraged to patrol dense downtown and residential areas by bike instead of in a cruiser, the Town may save considerable money on driving and idling costs.

*Who's Doing It?: Village Police have Bike Officers, and Bard's Security office uses a Prius.*

### ***Expand Park-and-Ride Facilities***

ACTION	
<i>Town</i>	<ul style="list-style-type: none"> <li>✓ Expand existing or add new Park-and-Ride facilities so people can leave cars as a convenient location to promote easier carpooling.</li> </ul>

Park-and-ride facilities are a low cost option to promoting carpooling. There are several located on the Taconic State Parkway that are highly used, and they could be added to the Town as well to encourage people to leave their cars at a convenient location and share a ride.

<sup>37</sup> City of Connellsville, Pennsylvania, Prototype Electric Police Cruiser, <http://www.connellsville.org/news/20070926184531.php>.

<sup>38</sup> NJ.com, N.J. Counties, Towns Add Environmentally Friendly Hybrid Police Patrol Cars, [http://www.nj.com/news/index.ssf/2010/10/hybrid\\_vehicles\\_making\\_way\\_int.html](http://www.nj.com/news/index.ssf/2010/10/hybrid_vehicles_making_way_int.html).

**C. WASTE & SUSTAINABILITY****1. Residential*****Compost Organic Residential Wastes***

ACTION	
<i>Residents</i>	<ul style="list-style-type: none"> <li>✓ Compost organic waste you produce at home.</li> <li>✓ Purchase a composting bin or similar structure to contain the materials as it undergoes the composting process.</li> <li>✓ Use the decomposed matter in your garden.</li> </ul>
<i>Town</i>	<ul style="list-style-type: none"> <li>✓ Encourage residents to compost by organizing expert presentations on how to compost safely and effectively at home.</li> </ul>

When organic material is deposited into landfills, it releases methane as it decomposes. Methane is twenty-one times more potent as a GHG than carbon dioxide. The Town can therefore reduce the production of methane by reducing the amount of waste it deposits into landfills by encouraging its residents to compost and teaching them how to do it safely and effectively. Not only does composting reduce methane that would otherwise be released in landfills, but it also reduces the need for chemical fertilizers, thereby benefitting the local environment as well.

***Recycle***

ACTION	
<i>Residents</i>	<ul style="list-style-type: none"> <li>✓ Sort waste and collect glass, paper, corrugated cardboard, plastics for recycling.</li> <li>✓ Teach children about the importance of recycling.</li> </ul>

Many people already know about the benefits of recycling, but it is an essential component of a plan to reduce GHG emissions. Plastics are made from petroleum, which is a fossil fuel and requires a lot of energy and the release of GHG emissions to extract. Paper products are also energy intensive and diminish forests which capture carbon. Recycling these and other products not only avoids the need to re-produce these products, but it also reduces the amount of material that must be transported to landfills.

## 2. Commercial

### ***Compost Organic Wastes***

#### ACTION

##### *Businesses*

- ✓ Work together and with the Chamber of Commerce to organize a composting system for organic waste from businesses, and work with the Town to explore starting municipal composting system to which businesses can contribute.
- ✓ Sell composted material.

Restaurants in the Town can also work together to take advantage of the benefits of composting. They can encourage their patrons to separate organic waste from other waste (as Taste Budds does), and then coordinate efforts to compost these materials in an organized manner. The resulting soil can then be sold or distributed freely.

### ***Encourage Sorting of Waste***

#### ACTION

##### *Businesses*

- ✓ Institute waste-sorting policies in local businesses.

Sorting of waste before it is thrown away can greatly facilitate composting and recycling practices. Bins can be set up at garbage disposal locations for glass, paper, plastics, organic waste, etc. Each bin can then be disposed of properly for recycling, composting, or waste. This practice is especially useful in restaurants and other businesses selling food.

### ***Conduct a Commercial Waste Audit***

#### ACTION

##### *Businesses*

- ✓ Work with Bard students to conduct a waste audit to analyze the waste streams, pollution impacts, and economic opportunities associated with reducing waste.

Businesses, especially those involved with food sale and preparation, can produce a lot of waste material. Much of this could be recycled, composted or put to other uses. Compostable waste that would otherwise go to a landfill and release methane, for example, could be sorted, composted, and sold as soil. A waste audit could be conducted to analyze these opportunities and provide economic and financial information about how businesses could be more environmentally friendly while at the same time saving money.

***Reduce Use of Plastic Shopping Bags***

## ACTION

*Businesses*

- ✓ Work with the Chamber of Commerce to reduce the use of plastic bags and instead encourage people to use reusable bags for shopping.
- ✓ Sell reusable bags for shopping.

*Town*

- ✓ Distribute reusable shopping bags at public events, as funding permits.

Most plastic shopping bags are made from petroleum, and significant amounts of GHGs are associated with petroleum extraction, manufacture, and transportation. In addition, these bags take up space in landfills and can have adverse impacts on the environment and wildlife if not properly disposed of. To discourage the use of plastic bags, local businesses and the Town can work to provide alternatives to residents, such as the use of reusable bags for shopping. To encourage residents, local businesses may offer a discount, or some other financial reward, for bringing and using their own shopping bags.

***Recycle***

## ACTION

*Businesses*

- ✓ Sort waste and collect glass, paper, corrugated cardboard, plastics for recycling.
- ✓ Explore the possibility of reusing or selling light industrial or construction and demolition (C&D) debris.

Many people already know about the benefits of recycling, but it is an essential component of a plan to reduce GHG emissions. Plastics are made from petroleum, which is a fossil fuel and requires a lot of energy to extract and process. Paper products are also energy intensive and may impact the carbon capturing services offered by healthy forests. Recycling these and other products not only avoids the need to extract raw materials, but it also reduces the amount of material transported to landfills. Plastic bags can be recycled at some local businesses, and Styrofoam packaging products can be recycled at certain UPS locations. In instances where there is light industrial or construction and demolition (C&D) debris, efforts should be made to reuse or sell this material.

***Institute Agricultural Waste Management Practices***

ACTION	
<i>Farmers</i>	<ul style="list-style-type: none"> <li>✓ Consider adopting practices that reduce the amount of GHGs emitted from agricultural practices, such as proper application of nitrogen-rich fertilizers and improved manure management practices.</li> </ul>
<i>Town</i>	<ul style="list-style-type: none"> <li>✓ Educate farmers on best crop and manure management practices through expert presentations and distribution of educational materials.</li> </ul>

Agriculture accounts for large portions of national GHG emissions.<sup>39</sup> According to one report, 70% of total nitrous oxide emissions come from soils, and 25% of agricultural methane emissions come from manure.<sup>40</sup> To reduce nitrous oxide emissions from soil, farmers can adjust the timing, duration, and application of nitrogen-rich fertilizers, and engaging in low-till practices reduces carbon dioxide emissions. To reduce methane emissions from livestock, the manure could be used in an anaerobic digester (suggested in this document) to generate biogas or electricity.

**3. Municipal*****Municipal Composting***

ACTION	
<i>Town</i>	<ul style="list-style-type: none"> <li>✓ Start municipal composting program on publicly owned land.</li> <li>✓ Work with Chamber of Commerce and other businesses to coordinate efforts to collect their organic waste.</li> <li>✓ Invite residents to contribute organic waste.</li> <li>✓ Encourage businesses to implement waste sorting policies to streamline collection of organic waste.</li> <li>✓ Sell or donate composted material.</li> <li>✓ Educate residents about composting through public presentations.</li> </ul>

A municipal composting system can reduce the amount of organic material that enters the waste stream. It can also reduce the amount of waste that must be transported to area landfills, thereby reducing GHG emissions from sanitation trucks. When organic material is deposited into landfills, it

<sup>39</sup> This section is based on the following report issued by the Pew Center on Global Climate Change: Agriculture's Role in Greenhouse Gas Mitigation, <http://www.pewclimate.org/docUploads/Agriculture%27s%20Role%20in%20GHG%20Mitigation.pdf>.

<sup>40</sup> Agriculture's Role in Greenhouse Gas Mitigation, p. 14.

decomposes and releases methane which is twenty-one times more powerful as a GHG than carbon dioxide. The Town can therefore reduce the production of methane by reducing the amount of waste deposited into landfills. Composting can also reduce the cost of soil needed for municipal landscaping. The Village of Red Hook has a composting facility that could be taken advantage of and improved to encourage more resident participation. Restaurants often produce large amounts of organic, compostable materials from vegetable scraps, fruit peelings, and leftover customer portions. The Town could mandate that business owners separate such materials from the rest of their waste.

***Institute “Love ‘em and Leave ‘em” Policy for Leaves***

ACTION	
<i>Town</i>	<ul style="list-style-type: none"> <li>✓ Institute policy encouraging residents, businesses and government to let leaves remain on the ground rather than collect them.</li> </ul>

The time and expense involved in raking leaves during the Fall can be exorbitant. Where appropriate, the Town could consider implementing a policy whereby leave could remain on the ground and shredded rather than collecting them. This would relieve the labor involved in collecting the bags while at the same time improving soil quality. The Town of Irvington, for example, has passed a resolution on this topic and provides education to residents and landscapers on this practice. The Town of Red Hook could use this as a model for consideration.<sup>41</sup>

***Build a Red Hook Community Garden***

ACTION	
<i>Town</i>	<ul style="list-style-type: none"> <li>✓ Work with volunteers to establish a community garden for Town residents.</li> <li>✓ Grow food for residents and local social services groups.</li> <li>✓ Use the garden as a venue to teach residents about the value of locally sourced food and other sustainability issues.</li> </ul>

Many of the vegetables and fruits sold in local grocery stores are transported from geographically distant regions – such as Central and South America and the Pacific Coast. Transport of these foods contributes to climate change through GHG from planes, trucks, and freight trains. Town residents can reduce their carbon footprints by sourcing their produce from closer to home. The Town can work with volunteer groups to develop a community garden on publicly owned land. Residents can participate in the garden at a zero or minimal fee, and food grown can be used for the residents themselves or to donate to food banks or other social services. In addition, a community garden would serve as a venue for the Conservation Advisory Council and other community groups to teach people about gardening, composting, etc.

<sup>41</sup> Town of Irvington, Your Leaves: Love 'Em & Leave 'Em, <http://www.irvingtonny.gov/index.aspx?NID=228>.

**Organize Regular Farmers Markets**

ACTION	
<i>Town</i>	<ul style="list-style-type: none"> <li>✓ Work with Chamber of Commerce and agricultural community to explore the possibility of organizing a regular farmers market.</li> </ul>

Another way to encourage residents to purchase locally is to coordinate a regular farmers market. If these events were scheduled on a regular basis, residents would plan on attending and would make a point of regularly purchasing their produce from these local sources. It could possibly be located in an empty storefront.

*Who's Doing It?: Red Hook's WinterMarket is open biweekly and carries produce and local goods at Elmendorph. Farm stands throughout the area offer goods Spring through Fall.*

**Conduct a Municipal Waste Audit**

ACTION	
<i>Town</i>	<ul style="list-style-type: none"> <li>✓ Conduct a municipal waste audit to determine where most of the Town's waste comes from.</li> <li>✓ Develop targeted waste reduction strategies based on the findings of the audit.</li> </ul>

The Town could conduct an audit of its total average waste production. The audit could focus on each discrete department within the municipality, as well as individual public schools, and should be designed to track the total amount of recyclable, non-recyclable, and compostable waste generated by each unit over the course of the year. Each department should also keep a report on the contents and origins of its waste. For example, a school should record how many bags of paper waste are generated in the cafeteria, distinguished from paper disposed in classrooms. After the results of the study have been tabulated, the Town can then determine where it can reduce waste generation by encouraging product reuse. For instance, it may become apparent that certain departments produce a large sum of paper waste. The Town may mandate that those departments make an effort to conduct the majority of communications in-person or electronically.

**Encourage Sorting of Waste**

ACTION	
<i>Town</i>	<ul style="list-style-type: none"> <li>✓ Institute waste-sorting policies in government-owned buildings.</li> </ul>

Sorting of waste before it is thrown away can greatly facilitate composting and recycling practices. Bins can be set up at garbage disposal locations for glass, paper, plastics, organic waste, etc. Each bin can then be disposed of properly for recycling, composting, or waste.

***Promote Zero Waste Policies for Public Events***

ACTION	
<i>Town</i>	<ul style="list-style-type: none"> <li>✓ Implement zero waste policies for public events.</li> <li>✓ Encourage residents to bring their own reusable plates and utensils.</li> <li>✓ Work with the Chamber of Commerce and local food vendors to encourage them to use biodegradable plates and utensils when possible. Include an identification plaque for businesses that reduce their energy use to hang in their window, so potential customers can select businesses they perceive to be environmentally friendly.</li> </ul>

Zero Waste policies consider the life cycle of all products and attempt to extend their productive lives as well as to reduce the number of products needed. This approach encourages efficiency by reducing the production of waste. The Town can implement Zero Waste policies at public events by encouraging residents to bring their own utensils and encouraging vendors to use biodegradable plates and utensils. In addition, the Town can provide free water dispensing stations for people to fill up reusable water bottles.

***Establish a Zero Waste System for the Town***

ACTION	
<i>Town</i>	<ul style="list-style-type: none"> <li>✓ Work with local professionals to develop a Zero Waste System for managing local waste.</li> </ul>

In a Zero Waste System, nearly all of the waste in a community is put through a process that converts it into useful soil which could be sold for gardening. Using this composted material has environmental benefits: for example, roughly 14 tons of compost offset about 1 ton of synthetic fertilizers made by natural gas. Implementing such a system would also greatly reduce the amount of methane that would have otherwise been released if the waste was brought to a landfill. The Town should explore its options and work with a professional to design a sustainable plan.

**D. Land Use & Water****1. Residential, Commercial and Municipal*****Water Saving Shower Heads/Faucets***

ACTION	
<i>Everyone</i>	✓ Replace old or inefficient showerheads and faucets with water saving models.
<i>Town</i>	✓ Educate residents about water efficiency through the development of informational materials that can be distributed at public events.

While federal regulations require showerheads to have a flow rate of less than 2.5 gallons per minute, there are remaining showerheads that may need to be replaced, dispensing up to 5.5 gallons per minute. Additionally, many brands of showerhead makers have designed showerheads that with a 1.75 gallons-per-minute flow rate, which can help residents lower the amount of water consumed, and thus reduce energy expenditures. Regarding faucets, the amount of water that comes out of a faucet is controlled by a device called an aerator, which generally restricts gallons per minute to around 2.0 in the kitchen and around 0.5 gallons per minute in the bathroom. Aerators can be easily and inexpensively replaced without replacing an entire faucet. This can help a family or a commercial building in reducing its water usage and thus, its energy consumption.

***Use Rain Barrels***

ACTION	
<i>Everyone</i>	✓ Use rain barrels to collect water for gardening and other outdoor uses to eliminate the cost of electricity associated with pumping the water.

According to an EPA report, moving 1,000 gallons of water from a public storage unit to households uses 1.5 kWh of electricity.<sup>42</sup> By using rain barrels to collect water for outdoor usage, residents, businesses and the government can reduce energy consumption by avoiding the electricity costs associated with pumping water.

<sup>42</sup> U.S. Environmental Protection Agency, "Methodology and Assumptions for Estimating WaterSense® Annual Accomplishments," [http://www.epa.gov/watersense/docs/methodology\\_and\\_assumptions\\_formatted\\_508.pdf](http://www.epa.gov/watersense/docs/methodology_and_assumptions_formatted_508.pdf).

**High Efficiency Toilets**

ACTION
<p><i>Everyone</i></p> <ul style="list-style-type: none"> <li>✓ Replace old or inefficient toilets with high efficiency models.</li> </ul>

Toilets typically use between 1.6 and 5 gallons of water per flush. However, there are high efficiency toilets available that use less than 1.6 gallons of water per flush, which can help the Town reduce its overall water usage, making a significant impact on its energy use. In addition, waterless urinals are widely available and eliminate water use altogether. Less water flushed into a toilet is not only less water used, but it also means that less energy is required to treat the water at the local waste water treatment plant.

**Low Maintenance Landscaping**

ACTION
<p><i>Everyone</i></p> <ul style="list-style-type: none"> <li>✓ Design yards and open spaces to reduce the amount of yard waste and maintenance, such as pesticides and mowing, that would otherwise be required.</li> </ul>
<p><i>Town</i></p> <ul style="list-style-type: none"> <li>✓ Educate the public and businesses about low maintenance landscaping practices by inviting professional landscapers to give public presentations.</li> </ul>

Grooming lawns and maintaining landscapes may have adverse environmental consequences if irrigation, synthetic chemicals, and gasoline powered equipment are used intensively. Low maintenance landscaping involves designing open spaces such as lawns and community areas with layouts and vegetation that require less chemical applications, less frequent mowing, and thus a reduction in the energy required to maintain the space. In addition, the amount of yard waste can also be reduced, which means reductions in methane emissions from decomposing vegetation in landfills.

**Plant Trees to Shade Buildings**

ACTION
<p><i>Everyone</i></p> <ul style="list-style-type: none"> <li>✓ Plant shade trees close to buildings when possible to keep buildings cool and reduce energy costs and GHG emissions.</li> </ul>

Direct sunlight significantly heats up a building, requiring more energy to cool it during the summer months. Properly placed trees may prevent buildings from absorbing excessive heat from solar

irradiation, and may help reduce energy for cooling needs. Additionally, trees are able to capture carbon dioxide, which will reduce the Town's GHG emissions.

## 2. Commercial

### ***Use Conservation Easements to Protect Farmland***

ACTION	
<i>Town</i>	<ul style="list-style-type: none"> <li>✓ Continue to preserve farmland with conservation easements as appropriate.</li> </ul>

While the Town's Centers and Greenspace plan has created an Agriculture Business District to help preserve farmland, it may be important in some circumstances to also protect farmland with conservation easements. These legal devices prevent certain types of land uses or may allow only specified types of uses, such as agriculture. The Town has conserved land through easements in the past, and it should continue to do so in the future.

## 3. Municipal

### ***Continue to Promote Smart Growth Principles***

ACTION	
<i>Town</i>	<ul style="list-style-type: none"> <li>✓ Promote Smart Growth principles in future rezoning considerations.</li> </ul>

The Town has already adopted its ambitious Centers and Greenspace Plan which seeks to, among other goals, permanently protect important farmland and use close-in smart growth development to help finance sewer systems. To achieve these goals, this Plan has developed an Agriculture Business District, Conservation Subdivision, Traditional Neighborhood Development District, and Incentive Zoning. Going forward, the Town should continue to be mindful of these important objectives and consider smart growth principles in any rezoning considerations.

### ***Integrate Solar Space Heating Principles into Zoning***

ACTION	
<i>Town</i>	<ul style="list-style-type: none"> <li>✓ Incorporate optional solar space heating principles into zoning and/or site plan approval processes.</li> <li>✓ Educate local contractors on how to design homes so as to meet these standards.</li> </ul>

In addition to the solar technologies mentioned above that generate electricity or use the sunlight for heating hot water, strategies can also be devised to use the sunlight for the simple heating of a home. Known as solar space heating, this idea promotes the use of sunlight for heating the space in a home to

reduce reliance on other heating systems. For example, the orientation of a house, planting of trees, and placement and design of windows, skylights, doors, etc. all affect how much sunlight enters a building, and these can be adjusted to allow for maximum exposure. Solar space heating guidelines could be developed for the Planning Board to consider, and contractors can be encouraged to consider these ideas when designing a new structure.

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## E. Student Involvement

In order to achieve environmental change in the long term, it is not enough that adults take action. The youth in the community must also be educated and empowered to realize that they can affect real and positive change in their community. This section explores actions students can take to reduce energy use and promote sustainable living as well as ideas for teachers and others in the educational community to help support student efforts.

### ***Gardening and Agriculture***

#### ACTION

##### *Students*

- ✓ Plant a garden at home, and talk to your teachers about maintaining a school garden.
- ✓ Talk to farmers to learn about how they grow food and manage land responsibly.
- ✓ Talk to your parents about planting trees around your house.

Gardening is an activity that has environmental and social benefits. Whether the garden consists of flowers, food crops or other plants, they help clean the air, reduce carbon dioxide emissions, and provide an educational and collaborative opportunity for students. Students may feel more connected to their physical, local environment by taking on responsibility for maintaining the garden, learning about the science behind the plants and associated environmental impacts, and the importance of local agriculture and food systems. The District could celebrate Arbor Day by planting a tree as a school community to recognize the importance of the natural environment. Teachers could also supervise students of any grade level and incorporate lessons into their curricula as appropriate. Local farmers could assist students, and field trips to local farms could be organized. Funding opportunities may be sought to support these efforts, such as those offered by the National Gardening Association.

### ***Composting***

#### ACTION

##### *Students*

- ✓ Talk to your parents or teacher about how you can sort your garbage and start composting at home or at school.

According to the U.S. Environmental Protection Agency, organic waste such as yard waste and food scraps makes up 26% of the waste in the U.S. Composting this material rather than delivering it into the waste stream reduces methane emissions, a serious GHG, that may have otherwise been emitted from the landfill. Composting reduces the amount of waste transported to landfills and improves soil quality. Students could be educated either in class or as an after school activity on how composting works, why it is important, and what opportunities there are to compost at home.

*Who's Doing It?: Mill Road Elementary School's K-2 librarian will lend any faculty member the Golden Bucket so students can compost their lunch remnants and compost them onsite in one of two tumblers.*

### **Recycle**

ACTION
<p><i>Students</i></p> <ul style="list-style-type: none"> <li>✓ Sort your garbage before you throw it away! Put these in a separate bin:               <ul style="list-style-type: none"> <li>○ Plastics</li> <li>○ Glass bottles</li> <li>○ Newspaper and regular paper</li> <li>○ Cardboard with ridges in it</li> </ul> </li> </ul>

Recycling is a very important part of the Town's sustainability efforts, and it has been mentioned in other parts of this Plan. Regarding recycling efforts in the schools, the programs that exist should be supported. Students can take turns being in charge of recycling materials in the classroom for a period of time, and they can be taught how to talk to their parents about recycling at home. A field trip to the Town's Recycling Center can be organized to show where the materials end up and how they are sorted.

### **Bard/Red Hook School District Collaborations**

ACTION
<p><i>Students</i></p> <ul style="list-style-type: none"> <li>✓ Talk to your teacher about working with college kids from Bard on different activities you can do to help protect the environment.</li> </ul>

The Town of Red Hook has a great resource in the student community at Bard College. Through the Bard Sustainability Council, Bard students have the opportunity to actively engage with the community on issues involving environmental and related social matters. Bard students can develop regular activities with students in the Red Hook Central School District centered around reducing GHG emissions, energy conservation, sustainability, and any other topics that would further the goals of this Plan.

**Home Energy Plans**

## ACTION

*Students*

- ✓ Make an energy plan at home or for your classroom to reduce the amount of energy you use.
- ✓ Ask your parents about checking out this website to help you make your own home energy plan:
  - <http://www.epa.gov/climatechange/kids/calc/index.html>

Students can reduce the amount of energy used at home through a variety of actions – including something as simple as turning off the lights when no one is in a room. Students should feel empowered to make a difference in terms of how much electricity they and their families use at home. They can do this by creating their own Home Energy Plans. This could be done as a classroom activity as well – students can create them at home and bring them in for discussion, for example. One good resource is an emissions calculator developed for the U.S. Environmental Protection Agency.<sup>43</sup> Specially designed for students, this calculator allows them to enter data on whether they turn lights out at home, use CFLs, carpool, etc. It then provides information on the quantity of carbon emissions avoided and other related facts.

**Safe Biking**

## ACTION

*Students*

- ✓ Ask your parents if you can bike with friends instead of having them drive you places. Biking reduces bad air emissions that are emitted from cars, and these emissions can cause health problems like asthma. If you can bike, you can help a friend with asthma!

In order to support non-motorized forms of transportation as an alternative to fossil fuel-based modes, students could be encouraged to use a bicycle for transportation as long as it is safe and they have permission. The schools could organize a student biking event on a weekend where they could decorate their bicycles with recycled materials and then ride on a pre-determined, safe route. The district could reach out to the Safe Routes to School program to apply for grants to evaluate the safety of having students walk or bike to school and to find resources for teachers and administration to help promote these activities.<sup>44</sup>

<sup>43</sup> U.S. Environmental Protection Agency, A Student's Guide to Global Climate Change – Calculator, <http://www.epa.gov/climatechange/kids/calc/index.html>.

<sup>44</sup> Safe Routes to School, <http://www.saferoutesinfo.org/>.

**Teaching About Energy Issues**

## ACTION

*Students*

- ✓ Ask your teacher if you can learn about energy issues in class.

Energy issues will remain serious concerns, and it is important that students learn about how they can make a difference. In order to do that, teachers could incorporate lessons about energy into various lesson plans where appropriate. For example, the U.S. Department of Energy provides lesson plans for teachers in various energy-related areas for grades K-12, such as biomass, energy efficiency, and vehicles.<sup>45</sup> These lessons could also be developed into a school-wide project, and this could culminate into an annual “Energy Day” or a similar event which would peak students’ interest in energy and environmental issues and motivate them to take action in their own lives.

*Who’s Doing It?: The IB Art students contributed art the 10% Challenge, realizing that the message of reducing energy consumption has to come visually as well as in words.*

**District-Wide Sustainability Plan for Operations and Curricula**

## ACTION

*Students*

- ✓ Talk to your teacher or principal about where they get supplies from. If they buy paper or certain machines, you can ask whether or not they are made from recycled materials or if they use less energy.

The Red Hook School District can lead by example by implementing a district-wide Sustainability Plan. It would require the district to include environmental considerations in the general operations of the district as well as in curriculum development, where appropriate.

The district can make an effort to purchase products that meet established standards in terms of energy use, recycled material, etc., when financially appropriate. For example, the District could make an effort to purchase copy paper made from recycled paper, or purchase ENERGY STAR rated appliances. The federal government’s Energy Star program offers suggestions on how to implement these policies.<sup>46</sup>

<sup>45</sup> U.S. Department of Energy, Energy Education & Workforce Development, <http://www1.eere.energy.gov/education/lessonplans/>.

<sup>46</sup> Energy Star, Purchasing & Procurement, [http://www.energystar.gov/index.cfm?c=bulk\\_purchasing.bus\\_purchasing](http://www.energystar.gov/index.cfm?c=bulk_purchasing.bus_purchasing).

***Promote Natural Lighting in Classrooms***

## ACTION

*Students*

- ✓ Ask your teachers if you can turn the lights out and instead use the sunlight on a sunny day.

Studies have shown that natural lighting can have beneficial impacts on classroom learning. In addition, fluorescent lighting for an entire school building may impose significant costs, even with efficiency upgrades. Therefore, implementing a policy that promotes natural lighting in classrooms in place of fluorescent lighting may improve the classroom environment as well as reduce electricity costs. Electric lighting efficiency can be maximized in classrooms with the use of occupancy sensors.