INTRODUCTION

A. Red Hook History of Sustainability Leadership

The Town of Red Hook has a history of demonstrating leadership in the areas of energyand 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, astudent 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, challenges residents to reduce their energy consumption by 10% and to get 10% of their family and friends to join in the effort. Over 400 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 Hookwas the first town in New York to pass a resolution in support of State legislation to reduceGHGs80%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 theCSC 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."[1] In addition, the Town has been a member of ICLEI, an international organization dedicated to supporting sustainability efforts in local communities, since 200?.

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.

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

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 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.

B. 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 every-day lives, including transportation, recreational activities, where we get 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 different parts of the community emit. 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, and 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.[2]

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-20th century is *very likely* due to the observed increase in anthropogenic GHG concentrations."[3] Globally, these temperature increases affect water and food availability, weather events, human settlement patterns, ecosystems and biodiversity, human health, 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.

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

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

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 for these people to plan to invest in other areas of their lives and community. 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 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 what "sustainability" means 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.

II. CLIMATE ACTION PLAN

A. Energy

1. Residential

Compact Fluorescent Bulbs/LEDs

ACTION
Residents ✓ Replace incandescent bulbs with CFL/LED bulbs in fixtures used most often. *Town* ✓ Educate residents on benefits by producing and distributing brochures that include this and other energy-saving measures. ✓ When funding allows, distribute bulbs for free at public events.

Replacing traditional incandescent light bulbs with compact fluorescent light bulbs (CFLs) orlight 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
Residents ✓ Visit NYSERDA's website or call NYSERDA to get more information on home energy audits and various financing options. ✓ Fill out 1-page application form for free/low-cost home energy audit and take advantage of financing options. *Town* ✓ Educate residents on the audit application process and financing options through public presentations and information brochures. ✓ Train citizens, including town and village employees (Town & 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. ✓ Establish process with NYSERDA and the Town to see how many people have applied for audits and which measures they have implemented.

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.[4] In addition there are several financing options available to residents through the State:

[4] NYSERDA, Home Performance with Energy Star, http://www.getenergysmart.org/SingleFamilyHomes/ExistingBuilding/HomeOwner.aspx; 1-877-NYSMART.

- Green Jobs Green New York (GJGNY) Financing: NYSERDA's GJGNY program provides low interest financing for energy efficiency upgrades that have been recommended through NYSERDA's Home Performance with ENERGY STAR home energy audit. Loans of up to $25,000 are available.[5]
- Energy $mart 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.[6]
- 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.[7]
- 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.[8]

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.

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.

[5]Energy Finance Solutions, http://www.energyfinancesolutions.com/main/homeownersnyfour; 1-800-969-9322.
[6] Visit http://www.nyserda.org/loanfund/participating-res-loan-fund-lenders.pdffor a list of participating lenders.
[7]NYSERDA, Additional Incentives Based on Income Eligibility, http://www.getenergysmart.org/SingleFamilyHomes/ExistingBuilding/HomeOwner/LowIncomeEligible.aspx; 1-877-NYSMART.
[8]Dutchess County Community Action Agency, 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.

- 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.
- 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.
- 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
Residents ✓ 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
Residents ✓ Upgrade old appliances and take advantage of Central Hudson offerings when appropriate. *Town* ✓ Educate residents about these rebates by keeping current Central Hudson materials on hand that explain these programs. ✓ Establish a process with Central Hudson to keep track of how many residents take advantage of which programs.

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.[9]

Kill-a-Watt

ACTION
Residents ✓ 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. ✓ 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. *Town* ✓ Work with the Library to make sure staff people know how it works and can talk to residents about how to use it.

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.

Who's Doing It?: The Husteds 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 - the draw dropped to just a couple of watts.

Upgrade Seasonal Lighting

ACTION
Residents ✓ Replace low efficiency seasonal lights with LED-based models.

[9] Central Hudson, Savings Central, www.SavingsCentral.com

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.[10]

Residential-Scale Renewable Energy

ACTION
Residents ✓ Research renewable energy technologies and contact professionals, such as NYSERDA staff, to learn about system specific financial and environmental benefits. ✓ Adopt technologies as appropriate and take advantage of financial incentives. *Town* ✓ Educate residents about financial and environmental benefits of renewable energy by organizing a lecture series where experts can present opportunities to the community.

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.

Solar Thermal

Solar systems,which provide hot water for residential applications rather than produce electricity, can also be installed. Solar thermal systems use solar energy to heat hot water for domestic use

[10]Energy Star, Decorative Light Strings, http://www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&pgw_code=DS.

as well as for space heating, and they are regarded as being highly efficient. A solar thermal 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 thermal system.

Who's Doing It?:Solar thermal installations have been successfully installed in homes in Red Hook in the Village and Upper Red Hook.

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. There are currently no government incentives for geothermal systems, but interested residents should work with contractors to discuss financing arrangements.[11]

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

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 MyEnergyPlan[12] and Home Energy Saver.[13]

[11] NYSERDA, Geothermal Heat Pumps, http://www.nyserda.org/programs/geothermal/default.asp.
[12] My Energy Plan, http://myenergyplan.net/.

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_2.

2. Commercial

NYSERDA FlexTech Energy Audit

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

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 enablesproperty 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.[14]

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 for upgrading their control system at the gym. Since they had the audit and the engineer's recommendations, they were able to apply for ARRA funding and got grants to upgrade their gym systems that will save $__ annually.

NYSERDA FlexTech Benchmarking Pilot

ACTION
Businesses ✓ Research the FlexTech Benchmarking Pilot program to see if it would be beneficial to participate.

The NYSERDA FlexTech Benchmarking Pilot program provides an energy benchmark and individual energy savings recommendations to commercial, industrial, and institutional facilities

[13] Home Energy Saver, http://hes.lbl.gov/consumer/.
[14] Visit http://www.nyserda.org/programs/energyaudit.asp and http://www.nyserda.org/programs/flextech.asp for more information about the program.

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.[15]

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
Businesses ✓ Schedule regular maintenance for all heating and cooling equipment. ✓ Replace old equipment with energy efficient equipment when upgrading.

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 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
Businesses ✓ Participate in Central Hudson's Energy Efficient Commercial Lighting Program.

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 bulbsproduce 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 leads 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.[16]

[15]NYSERDA, FlexTech Benchmarking Pilot, http://www.nyserda.org/programs/flextech%2Dbenchmarking/.
[16]Central Hudson, Energy Efficient Commercial Lighting, http://www.centralhudson.com/savemoney/.

Who's Doing It?: Bard and Central Hudson have collaborated to install LED outdoor lighting in 10 parking lot lights near the Fisher Center. More light at less cost!

Energy Star Rated Business Equipment & Appliances

ACTION
Businesses ✓ Replace old office equipment with ENERGY STAR rated models.

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

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.[17]

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.

[17]Energy Star, Tax Deductions for Commercial Buildings, http://www.energystar.gov/index.cfm?c=tax_credits.tx_comm_buildings.

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 thermal 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 thermal 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 thermal 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 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.[18]

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.

Energy Consumption Monitoring

ACTION

Businesses

- ✓ 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.
- ✓ 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.

[18]

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.

Use Light Colors on Roofs

ACTION
Businesses ✓ Paint dark colored roofs white to reflect the sunlight rather than absorb it; this leads to reduced demand on cooling equipment. *Town* ✓ 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.

Green Leasing Policies

ACTION
Businesses ✓ 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 withintenant occupied spaceif 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).

- Requiring that energy-efficient products be used in tenant operations.
- Sub-meter leased areas.
- 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. ✓ 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.

3. Municipal

ICLEI CAPPA Software

ICLEI offers a Climate and Air Pollution Planning Assistant (CAPPA) decision-support tool that assists municipalities in achieving their emission reduction goals. The CAPPA 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 ENERYG 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
Town ✓ Schedule regular maintenance for all heating and cooling equipment. ✓ Replace old equipment with energy efficient equipment when upgrading.

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
Town ✓ Adopt formal ENERGY STAR purchasing guidelines for all government entities. ✓ Purchase ENERGY STAR-rated commercial products when upgrading, replacing or acquiring new equipment.

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

Clean and Renewable Energy

ACTION
Town ✓ Conduct feasibility studies and work with experts to determine how more renewable and clean energy can be installed in government-owned buildings.

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.

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 Thermal

Solar thermal 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 thermal systems for municipal buildings. The feasibility of a solar thermal system will depend on available solar irradiation, the area available for solar collectors, and hot water demand. NYSERDA offers incentives for solar thermal installations as well, and nonresidential facilities may receive up to $25,000 in incentives (typically 15-20% of the total cost). [19]

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.

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

[19] NYSERDA, Solar Technologies, http://www.nyserda.ny.gov/en/Page-Sections/Renewables/Solar-Technologies.aspx.

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. Farm scraps and animal waste are collected and placed in a digester which breaks down these materials. The resulting products include biogas and digestate. Some forms of digestate can be used as fertilizer, and biogas can be used as natural gas to power vehicles, and it can also be used to generate electricity to power a building or to sell 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.

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 can gain a net energy benefit without making any investment 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 technologies, 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 ratesthan 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.[20]

Interior

Upgrades to indoor lighting 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% 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
Town ✓ 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. When you couple this with a bulb lifespan that 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

[20]U.S. Department of Energy, Solid-State Lighting, http://www1.eere.energy.gov/buildings/ssl/gatewaydemos_results.html.

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 andpedestrian signals may be a viable option to cut the Town's energy consumption.

Upgrade Seasonal Lighting

ACTION
Town ✓ 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.[21]

Home Energy Ratings

ACTION
Town ✓ Require that a Home Energy Rating (HER) score be included in real when buying and selling real estate.

A Home Energy Rating (HER) 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 HER 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 requiring property owners to include a HER 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

[21]Energy Star, Decorative Light Strings, http://www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&pgw_code=DS.

transactions and that purchasers have the necessary information to make informed energy decisions.[22]

[22] RESNET, What is a Home Energy Rating?,http://www.resnet.us/home-energy-ratings.

B. Transportation

1. Residential

Promote Carpooling and Ridesharing

ACTION
Residents ✓ Coordinate with friends and neighbors to carpool whenever possible. ✓ Use rideshare websites to find additional ways to carpool. *Town* ✓ Organize a local carpooling match list to encourage people to carpool. ✓ Direct people to MetroPool's website or 511NYRideshare for further rideshare information.

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.[23] Employers in Red Hook should also be directed to MetroPool's Employer Services website or 511NY for tips on establishing workplace ride sharing programs.[24]

Bicycle into Town

ACTION
Residents ✓ Bike instead of drive for local errands as often as possible. *Town* ✓ Hold bike workshops at community events.

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

[23]MetroPool, NuRide, http://www.metropool.com/freecommuterservices/ridematch.html; 1-800-FIND-RIDE; 511NYRideshare, http://nycommute.org/.
[24]MetroPool, Employer Services, http://www.metropool.com/employerservices/emp_es.html; 511NYRideshare, http://nycommute.org/.

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.

2. Commercial

Centralized Distribution Center for Farm Products

ACTION
Farmers ✓ Coordinate efforts to organize centralized distribution center to transport goods in a cost-efficient manner when selling them abroad. *Town* ✓ Work with agricultural community to assist with siting and organizing this effort as necessary.

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. They 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
Businesses ✓ Sponsor an ARTBike Rack as seen at Migliorelli's Farm Stand, Taste Budd's, Holy Cow and Town & Village Hall.

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.

3. Municipal

Create Bike-Friendly Roadway Infrastructure

ACTION
Town ✓ 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.

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. They can also make it easier for families to travel by bike instead of by car.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.

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 and children could ride bikes to neighbor's homes or walk instead of driving, which would greatly reduce GHG emissions, but oftentimes it is 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 be developed requiring decisionmakers to assess the impact on bike and pedestrian traffic when reviewing or fixing already-existing roads.

Install Traffic Signals for Cyclists at Busy 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.

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 that drivers are kept aware of the flow of cycle traffic.Some cities, such as Portland, Oregon and Bakersfield, California have installed demand-activated bicycle traffic signals.[25] 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. also installed a bike signal at one of its busy intersections.[26]

Make Bicycles More Accessible

ACTION
Town ✓ 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
Town ✓ Organize public meetings and develop informational materials on new cycling features in the Town and how to safety navigate the shared roadways.

If bicycle use increases, many motorists may be uncertain of how to handle the influx of bikers on municipal 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

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

[26] 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

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

ACTION
Town ✓ Install bike racks in Red Hook in busy areas to encourage cycling as an alternative to driving.

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
Town ✓ Work with appropriate agencies to study the feasibility of installing charging infrastructure in the Town to promote the purchase of clean electric vehicles. ✓ Establish priority parking for hybrid or electric vehicles.

Although electric vehicle technology is becoming increasingly accessible, those interested in purchasing them 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
Town ✓ Work with the county and appropriate transportation agencies to develop more stringent local anti-idling laws.

New York State has laws limiting the amount of time for which 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 HS. Mill Road Elementary School can join in, too.

Supplement LOOP Bus Service

ACTION
Town ✓ Work with the Dutchess County Department of Planning and Development to enhance LOOP bus service by increasing the locations and times of stops. ✓ Encourage the use of cleaner-burning fuels such as compressed natural gas (CNG).

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.

Use Biodiesel in all Diesel-Engine Municipal Vehicles

ACTION
Town ✓ Fuel all government-owned diesel-fuels vehicles with biodiesel. ✓ Explore ways to procure biodiesel fuel in the community.

Diesel fuel is one of the dirtiest fuels in terms of air emissions. Biodiesel (fuel derived from recycled grease or certain plants), on the other hand, burns much more cleanly. 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.[27]All municipal vehicles currently equipped with diesel engines can use biodiesel fuel at no additional capital cost. Diesel engines are capable of running on biodiesel fuel without conversion of the existing engine.

Refit the Police Fleet with Bicycles and Electric/Hybrid Vehicles

ACTION
Town ✓ Institute a policy of replacing current police vehicles with electric or hybrid vehicles if economically beneficial. ✓ Encourage police officers to use bicycles whenever it is safe to do so.

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 2007and estimates that the substitution of an electric engine for a combustible model saves nearly $3-$5 in daily operating costs.[28] 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.[29] Therefore, the Town of 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 can 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.

[27] Biodiesel Emissions, http://www.biodiesel.org/pdf_files/fuelfactsheets/emissions.pdf.
[28] City of Connellsville, Pennsylvania, Prototype Electric Police Cruiser, http://www.connellsville.org/news/20070926184531.php.
[29]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.

C. WASTE & SUSTAINABILITY

1. Residential

Compost Organic Residential Wastes

ACTION
Residents ✓ Compost organic waste you produce at home. ✓ Purchase a composting bin or similar structure to contain the materials as it undergoes the composting process. ✓ Use the decomposed matter in your garden. *Town* ✓ Encourage residents to compost by organizing expert presentations on how to compost safely and effectively at home.

When organic material is deposited into landfills, it releases methane as it decomposes. Methane 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 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.

Who's Doing It?: The Urbins have been backyard composting since they moved to the Village of Red Hook. They send no organic materials to the landfill and create "Black Gold," keeping about 20 pounds of food scraps out of their trash bags each week.

Recycle

ACTION
Residents ✓ Sort your waste and make sure you collect glass, paper, corrugated cardboard, and #1 and #2 plastics for recycling. ✓ Teach children about the importance of recycling.

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 and profits shared.

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 when you examine the extraction of petroleum, the manufacturing of it and transportation, a significant amount of GHGs are emitted throughout this entire process. 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.

Recycle

ACTION
Businesses ✓ Sort waste and collect glass, paper, corrugated cardboard, and #1 and #2 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 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. In instances where there is light industrial or construction and demolition (C&D) debris, efforts should be made to reuse or sell this material.

3. Municipal

Municipal Composting

ACTION
Town ✓ Start municipal composting program on publicly owned land. ✓ Work with Chamber of Commerce and other businesses to coordinate efforts to collect their organic waste. ✓ Invite residents to contribute organic waste. ✓ Encourage businesses to implement waste sorting policies to streamline collection of organic waste. ✓ Sell or donate composted material. ✓ Educate residents about composting through public presentations.

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 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 it deposits into landfills. Composting can also reduce the cost of soil needed for municipal landscaping.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.

Build a Red Hook Community Garden

ACTION
Town ✓ Work with volunteers to establish a community garden for Town residents. ✓ Grow food for residents and local social services groups. ✓ Use the garden as a venue to teach residents about the value of locally sourced food and other sustainability issues.

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.

Organize Regular Farmers Markets

ACTION
Town ✓ Work with Chamber of Commerce and agricultural community to organize a regular farmers market.

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
Town ✓ Conduct a municipal waste audit to determine where most of the Town's waste comes from. ✓ Develop targeted waste reduction strategies based on the findings of the audit.

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 on 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.

Promote Zero Waste Policies for Public Events

ACTION
Town ✓ Implement zero waste policies for public events. ✓ Encourage residents to bring their own reusable plates and utensils. ✓ Work with the Chamber of Commerce and local food vendors to encourage them to use biodegradable plates and utensils when possible.

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.

D. Land Use & Water

1. Residential, Commercial and Municipal

Water Saving Shower Heads/Faucets

ACTION
Everyone ✓ Replace old or inefficient showerheads and faucets with water saving models. *Town* ✓ 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 they use, and thus reduce their energy demand. 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.

High Efficiency Toilets

ACTION
Everyone ✓ Replace old or inefficient toilets with high efficiency models.

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. 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
Everyone ✓ Design yards and open spaces to reduce the amount of yard waste and maintenance, such as pesticides and mowing, that would otherwise be required. *Town* ✓ Educate the public and businesses about low maintenance landscaping practices by inviting professional landscapers to give public presentations.

Grooming lawns and maintaining landscapes often have adverse environmental consequences such as water usage, pesticides, irrigation, and reliance on gasoline powered equipment for many types of machinery. However, a low maintenance landscaping involves designing open spaces such as lawns and open community areas with layouts and vegetation that will lead to a reduction in the amount of pesticides used, less frequent mowing and thus a reduction in the energy used to mow the lawn, and the use of native plants which not only reduces the energy to transport plants, but is better for the health of the local ecosystem. 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
Everyone ✓ Plant shade trees close to buildings when possible to keep buildings cool and reduce energy costs and GHG emissions.

Direct sunlight significantly heats up a building, requiring more energy to cool it during the summer months. Properly placed trees can help buildings from heating up and thus, require up to 10% less energy to cool them. Additionally, trees are able to capture carbon dioxide, which will reduce the Town'sGHG emissions.

2. Commercial

Use Conservation Easements to Protect Farmland

ACTION
Town ✓ Continue to preserve farmland with conservation easements as appropriate.

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 from being implemented and allow only specified types of uses, such as agriculture. The Town has done this in the past, and it should continue to do so in the future.

3. Municipal

Continue to Promote Smart Growth Principles

ACTION
Town ✓ Promote Smart Growth principles in future rezoning considerations.

As mentioned above, the Town has already adopted its ambitious Centers and Greenspace Plan which seeks to, among other things,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.

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 make real 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 doing a garden in school. ✓ Talk to farmers to learn about how they grow food and other things. ✓ 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 would be able to 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. The District could recognize 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 make 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 would have otherwise been emitted from the landfill. It would also reduce the amount of waste that needs to be 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

Students

- ✓ Sort your garbage before you throw it away! Put these in a separate bin:
  - Plastic that has a #1 or a #2 inside a triangle on it
  - Glass bottles
  - Newspaper and regular paper
  - Cardboard with ridges in it

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 they can talk to their parents and try to recycle 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

Students

- ✓ Talk to your teacher about working with college kids from Bard on different activities you can do to help protect the environment.

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: o http://www.epa.gov/climatechange/kids/calc/index.html

Reducing the amount of energy used at home can be achieved 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.[30] Specially made 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 to get from place to place 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.[31]

[30]U.S. Environmental Protection Agency, A Student's Guide to Global Climate Change – Calculator, http://www.epa.gov/climatechange/kids/calc/index.html.
[31]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.[32] 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.[33]

[32]U.S. Department of Energy, Energy Education & Workforce Development, http://www1.eere.energy.gov/education/lessonplans/.
[33]Energy Star, Purchasing & Procurement, 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 can get costly, even with efficiency upgrades. Therefore, implementing a policy that promotes use of natural lighting in classrooms in place of fluorescent lighting, when appropriate. Classrooms can also have sensors installed to turn off automatically when no one is in the room (with the ability of the teacher to override it).