

# City of Kingston

## CLIMATE ACTION PLAN

2010 Community-Wide & Local Government Operations  
Energy and Greenhouse Gas Emissions Inventory



September 2012







## CITY OF KINGSTON

OFFICE OF THE MAYOR  
CITY HALL  
420 BROADWAY  
KINGSTON, NEW YORK 12401  
[www.kingston-ny.gov](http://www.kingston-ny.gov)  
[mayorgallo@kingston-ny.gov](mailto:mayorgallo@kingston-ny.gov)

SHAYNE R. GALLO  
MAYOR

Phone (845) 334-3902  
Fax (845) 334-3904

Dear Friends and Neighbors

March 30, 2012

In October 2009, the City of Kingston demonstrated its commitment to environmental and climate protection by adopting the "Climate Smart and Green Jobs Community Pledge" and becoming a New York State "Climate Smart Community". In August 2011, the City of Kingston furthered that commitment by becoming a member of ICLEI – *Local Governments for Sustainability*, joining more than 600 other U.S. local governments as the most forward-thinking and adept local governments working to make their communities more livable, prosperous, equitable, and environmentally sound.

As a 'Climate Smart Community', the City of Kingston was able to secure funding to begin to implement the "Climate Smart and Green Jobs Community Pledge". Using tools available through ICLEI, a baseline energy assessment was assembled, greenhouse gas emissions were measured and this Climate Action Plan was developed. This Plan is consistent with other local efforts that seek to improve the efficiency of government operations, save taxpayer dollars, and improve the quality of life in the City of Kingston.

This plan focuses on six important topics, Energy & Renewables-Buildings & Facilities; Land Use, Transportation & Vehicles; Materials Management-Waste Reduction & Recycling; Sustainable Resource Management; Outreach Education and Training, and Climate Adaptation. Implementation of this plan will have an impact on all we do; from the amount and type of energy we use, the economic development we support, how we move about the City, where we get our food, and how we manage our 'waste'.

The success of this effort is due to the hard work of the Kingston Conservation Advisory Council and the Kingston Climate Smart and Green Jobs Community Task Force. These groups deserve our sincere thanks for volunteering their time to achieve these milestones and for their service to improving the quality of life in our community.

It is my hope that as part of our effort to improve the quality of life in the City of Kingston and continue to grow as a sustainable community, that you join me in the active participation of the endeavors set forth in this plan. We have a tremendous opportunity to be a 'model' of sustainability, not only for the Hudson Valley but for the entire State of New York.

Sincerely

Shayne R. Gallo  
Mayor, City of Kingston

## ACKNOWLEDGEMENTS

*City of Kingston Climate Action Plan and 2010 Community-Wide & Local Government Operations Energy and Greenhouse Gas Emissions Inventory\** was prepared by Rich Schiafo, Climate Analyst, City of Kingston. The Climate Analyst position was made possible through a grant from New York Energy Research and Development Authority.

### **Climate Smart and Green Jobs Community Task Force**

The author would like to thank the members for their advice and review of the content:

- |                          |                   |                  |
|--------------------------|-------------------|------------------|
| • Emilie Hauser          | • Julie Noble     | • Casey Schwarz  |
| • Melissa Everett        | • Steve Noble     | • Gregg Swanzy   |
| • Guy Kempe              | • Sarina Pepper   | • Kristen Wilson |
| • Victor-Pierre Melendez | • Brenna Robinson |                  |

Special thanks to Steve Noble, Julie Noble and the Kingston Conservation Advisory Council for making the project possible. Special thanks also to Maxine Segarnick and Casey Schwarz who were instrumental in collecting, analyzing and organizing the data and information necessary for the Plan and Inventory.

### **Peer Review**

The following individuals are thanked for offering their time and expertise in reviewing all or part of the draft Plan:

Michelle Bergkamp, Recycling Coordinator, Ulster County Resource Recovery Agency  
James Brigagliano, LC, IESNA, SELUX Corporation, Cliff Cooper, MS, CIH, LEED AP  
Barry Henck, Energy Efficiency Marketing Specialist, Central Hudson Gas & Electric  
Debbie Jackson, Environmental Program Specialist 2, Bureau of Waste, Reduction & Recycling, NYSDEC  
Mark Lowery, Climate Policy Analyst, Office of Climate Change, NYSDEC  
Kristin Marcell, Special Project Coordinator, Hudson River Estuary Program, NYSDEC  
Meridith Nierenberg, Mid-Hudson Energy Smart Communities  
Barbara Z. Restaino, RLA, LEED AP, Restaino Design Landscape Architects, PC  
Pat Courtney Strong, Courtney Strong Inc., an independent contractor to NYSEDA  
Ralph Swenson, City of Kingston Engineer, Leo Wiegman, Croton Energy Group Inc.

### **ICLEI - Local Governments for Sustainability**

Eli Yewdall, Program Officer, Membership and Customer Care, Northeast and Mid-Atlantic states

The author would also like to acknowledge the towns of Bedford and Red Hook, and cities of New Rochelle, Albany, Ithaca, and Ann Arbor MI for their leadership and inspiring work on climate action and sustainability planning. The author would also like to acknowledge the many city employees and other individuals, too numerous to list, who provided the information, data and advice necessary to develop the greenhouse gas inventories and the content of this Plan.

### **City of Kingston**

Shayne R. Gallo, Mayor  
James L. Noble, Jr., Alderman-at-Large  
Aldermen

Matt Dunn	Shirley Whitlock	Mary Ann Mills
Thomas Hoffay	William Carey	Robert Senor
Nathaniel Horowitz	Elisa Ball	Deborah Brown

Cover Photo: Sarina Pepper

**Suggested Citation:** City of Kingston, NY (2012) *City of Kingston Climate Action Plan and 2010 Community-Wide & Local Government Operations Energy and Greenhouse Gas Emissions Inventory*

\* Published by the City of Kingston 420 Broadway Kingston, NY 12401 (845) 331-0080 [www.kingstoncac.org](http://www.kingstoncac.org)

## EXECUTIVE SUMMARY

The City of Kingston recognizes that greenhouse gas (GHG) emissions from human activity are catalyzing profound changes in climate and weather, the consequences of which pose substantial risks to the future health, well-being, and prosperity of the community.

The ultimate goal of this effort is to locally reduce GHG emissions. In addition rising energy costs make it imperative that the City of Kingston local government take a leadership role in advancing energy saving measures and other sustainability initiatives that will stabilize and potentially reduce energy related expenditures for City government, local businesses and City residents.

The City of Kingston local government has a strong role to play in reducing GHG emissions. Through proactive measures around land use planning, transportation, energy efficiency, green building, waste reduction, and more, the City can dramatically reduce energy use and emissions in the community. Reducing GHG emissions will improve public health and safety and create a cleaner and more sustainable City.

In order to reduce energy use and GHG emissions an accounting of the current energy use and emissions was necessary to establish a baseline and set reduction goals. For what gets measured gets managed.

In response, the City of Kingston has taken action by completing comprehensive energy assessments and GHG emissions inventories for both the community and government operations.

### **COMMUNITY INVENTORY RESULTS**

The transportation sector in the City of Kingston consumes the largest percentage of the community's energy. The commercial sector is second, however the commercial and residential sectors combined, account for the largest proportion of the community's energy consumption.

Community-wide GHG emissions in the City of Kingston were approximately 225,097 tonnes of CO<sub>2</sub>e in 2010. The transportation sector accounted for the majority of the community's GHG emissions, with the commercial and residential sectors being second and third, respectively.

The GHG emissions of 225,097 tonnes of CO<sub>2</sub>e, is equal to the CO<sub>2</sub> emissions from the consumption of 25,235,090 gallons of gasoline, 523,481 barrels of oil, the electricity use of 28,067 homes for one year or the carbon sequestered by 47,995 acres of pine or fir forests.

### **GOVERNMENT INVENTORY RESULTS**

The City of Kingston government energy costs in 2010 were \$1,590,415, 4.6% of the 2010 budget. Taking into account the energy costs of the Kingston Water Department (KWD), (\$97,034), the Kingston Housing Authority (KHA), (\$268,389), and Dietz Stadium (\$19,564) the overall 2010 total energy costs for City government related operations comes to \$1,975,402. Adding in the estimated employee commuting fuel costs of \$119,904, energy related expenses in 2010 were \$2,095,306.

For 2010, the GHG emissions from the City of Kingston government, including the emissions from the KWD, the KHA, Dietz Stadium and employee commuting are estimated at 7,281 tonnes of CO<sub>2</sub>e.

Excluding the KWD, KHA, Dietz Stadium and employee commuting, that is just looking at the operations that are traditionally part of the City government budgeting process, the GHG emissions were estimated at 4,587 tonnes of CO<sub>2</sub>e.

While GHG emissions were looked at with and without the KWD, KHA, Dietz Stadium and employee commuting, the City of Kingston government has some degree of operational control over or ability to influence and affect each of these areas to reduce the overall total GHG emissions of 7,281 tonnes of CO<sub>2</sub>e.

The GHG emissions of 7,281 tonnes of CO<sub>2</sub>e, is equal to the CO<sub>2</sub> emissions from the consumption of 816,256 gallons of gasoline, 16,933 barrels of oil, the electricity use of 908 homes for one year or the carbon sequestered by 1,552 acres of pine or fir forests.

### **ENERGY AND GHG EMISSIONS REDUCTION TARGET**

The proposed overall goal is to reduce energy usage and GHG emissions 20% by 2020 or '20 by 20.'

### **CLIMATE ACTION RECOMMENDATIONS**

This draft City of Kingston Climate Action Plan (CAP) includes recommendations for comprehensive policies and programs that will reduce greenhouse gas emissions, enhance operational and energy efficiencies, reduce energy costs, support local job growth, and adapt to a changing climate while improving quality of life, saving taxpayer dollars, and promoting social justice. Implementation of many of the initiatives in this Plan will create 'green' jobs.

While Climate Action Plans ordinarily focus on reducing GHG emissions; this plan more broadly addresses many important initiatives that fall under the broad umbrella of 'sustainability.'

It is recommended that the City of Kingston Common Council adopt the Climate Action Plan through a resolution that supports and formally recognizes the goals and initiatives of the Plan as City of Kingston policy and intent. Council adoption and recognition of the Plan will not result in the blanket acceptance or approval of its goals and initiatives. Advancing many of the goals and initiatives will require further administrative and legislative action. Actions taken on specific initiatives will be based on prioritization of the initiatives and the human and financial resources available to implement such actions.

Proposed goals and initiatives are presented according to six different subject areas:

- A. Energy and Renewables: Buildings and Facilities
- B. Land Use, Transportation & Vehicles
- C. Materials Management: Waste Reduction, Re-Use, Recycling & Composting
- D. Sustainable Resource Management
- E. Outreach, Education & Training
- F. Climate Adaptation

## **CLIMATE ACTION PLAN SUMMARY**

### **ENERGY AND RENEWABLES: BUILDINGS AND FACILITIES**

#### **PROPOSED GOALS**

- Reduce energy consumption, improve energy efficiency and reduce energy related costs.
- Support and promote the use of renewable forms of energy.
- Improve awareness of opportunities for energy efficiency and GHG emissions reductions.

#### **By 2020:**

- Reduce overall energy consumption and GHG emissions in the City and in municipal government operations by at least 20%.
- City of Kingston government will get at least 20% percent of its energy from renewables sources.

#### **PROPOSED SUMMARY OF INITIATIVES**

- Create a local financing mechanism for energy retrofits such as a Property Assessed Clean Energy (PACE) program.
- Adopt Local Energy Conservation Code.
- Provide training for local code enforcement on 2010 Energy Conservation Construction Code of New York State (ECCCNYS).
- Create and Adopt Local 'Green Building' Standards.
- Actively promote the use on 'on-bill financing' for residential energy efficiency home improvements.
- Explore potential for a 'Commercial Energy Policy.'
- Adopt a City Lighting Ordinance.
- Consider a Community Energy Awareness or Energy Challenge Program.
- Create, fund and sustain City 'Office of Energy & Sustainability.'
- Adopt and implement 'Municipal Energy Conservation Policy.'
- Create and implement 'Government Facility Energy Improvement Plan.'
- Upgrade street lights and traffic signals.
- Develop and implement 'Energy Efficiency Improvement Plan' for WWTP.
- Use Central Hudson's Energy Manager Program to track and manage energy use at the WWTP.
- Explore expanded use of Hess Demand Response Program.
- Adopt and implement 'Municipal Green Building Policy.'
- Adopt and implement 'Municipal Energy Efficient Procurement Policy.'
- Track and take advantage of federal, state and utility energy efficiency programs and Incentives.
- Conduct energy audits at all Kingston Housing Authority facilities to identify opportunities to reduce electricity and natural gas usage.
- Advance solar and geothermal renewable energy opportunities as part of City clean energy program.
- Explore Green Power Options and use of Renewable energy certificates (RECs).
- Remove barriers to and provide incentives to promote the use of renewable forms of energy in the City of Kingston.
- Monitor and evaluate energy usage and greenhouse emissions.
- Take advantage of USDOE Technical Assistance Programs.

## **CLIMATE ACTION PLAN SUMMARY**

### **LAND USE, TRANSPORTATION**

#### **PROPOSED GOALS**

- Capitalize on existing compact development and promote various modes of transportation and efficiency in providing public services and infrastructure.
- Reduce travel demand specifically that of single-occupancy private vehicles, reducing vehicles miles traveled in the City of Kingston.
- Improve existing sidewalk network to promote safe walking.
- Promote consistency and coordination between land use and transportation policies, improvements strategies and decision-making.
- Protect and enhance the environment, promote energy conservation, improve the quality of life.

#### **By 2020**

- 20% reduction of single occupancy vehicle use and VMTs.
- 20% increase in use of transit.
- 20% reduction in single occupancy vehicle commuting by City employees.
- Local sidewalks are all in good repair.
- Bike infrastructure is in place including designated bike lanes in appropriate places and bike racks at all public facilities implemented as a result of the City of Kingston Bicycling Master Plan.
- A network of trails, bike paths, and complete streets exist in the City of Kingston connecting rail trails from the Wallkill Valley, Rondout Valley, Catskill Mountains and Kingston Point to a Midtown Hub along the Broadway Corridor.

#### **PROPOSED SUMMARY OF INITIATIVES**

- As part of Comprehensive Master Plan and Zoning Code Update adopt goals and policies that promote a compact, transit-oriented, bikeable and walkable community; promote infill development; prohibit new development in floodplains and preserve and protect open space, biodiversity, and water supplies.
- Integrate sustainable development goals and initiatives of this Plan.
- Integrate and advance Transit Oriented Design.
- Promote and expand accessibility to transit.
- Expand promotion of Citibus, UCAT and other transit options.
- Promote ridesharing, car and van pooling by offering free or discounted parking within City.
- Actively support, promote and implement the City's Complete Street Policy.
- Develop a Bicycling Master Plan.
- Improve Bike Infrastructure, Create Bicycle Friendly Zones.
- Develop a Pedestrian Master Plan.
- Improve sidewalks.
- Support Safe Routes to School program.
- Create rail trails.
- Use the authority of the City's planning board to assure that new development projects reflect the community's desires for a low carbon/low emissions future.
- Develop City government policies that promote the use of transit, carpooling, vanpooling, flex scheduling, and examine tele-commuting where appropriate.

## **CLIMATE ACTION PLAN SUMMARY**

### **VEHICLES**

#### **PROPOSED GOALS**

- Improve overall government fleet fuel efficiency and reduce vehicle miles traveled.
- Promote and further the use of alternative fueled vehicles and alternative fueled transit technology.
- Reduce transportation related emissions.

#### **By 2020:**

- Electric vehicle infrastructure is in place at several locations city-wide, including municipal government facilities.
- City government has doubled the fuel efficiency of its fleet.
- Fuel usage (gas and diesel) has been reduced by 20%.
- 20% of City government vehicle fleet is hybrid and alternative fuel vehicles.
- Alternative-fueled Transit vehicles and refuse packers are part of the City hybrid and alternative fuel fleet.
- An active and successful car-share program exists in the City of Kingston.

#### **PROPOSED SUMMARY OF INITIATIVES**

- Explore the feasibility of planning, permitting, zoning, and providing infrastructure necessary to accommodate electric vehicles.
- Adopt local anti-idling ordinance.
- Promote the use of hybrid and alternative fueled vehicles.
- Develop a comprehensive and consistent City government vehicle fleet management program to better track fuel usage miles traveled and fuel efficiency of the City's fleet.
- 'Green' the City's Fleet by:
  - Doubling the overall current fuel efficiency of City Fleet by requiring minimum fuel efficiency for city owned vehicles.
  - Adopt goal of 20% of City fleet replaced with hybrid and alternative fuel vehicles by 2020.
  - Using smaller more fuel efficient vehicles for appropriate City tasks.
  - Explore the use of hybrid or other alternative fueled (propane, compressed natural gas) vehicles when new refuse packers and buses are purchased.
  - Initiated and promote car-sharing.
  - Examine and use idle-reduction technologies.
  - Explore the use of bio-diesel as appropriate.
  - Develop a clean diesel program.

## **CLIMATE ACTION PLAN SUMMARY**

### **MATERIALS MANAGEMENT: WASTE REDUCTION, RE-USE, RECYCLING & COMPOSTING**

#### **PROPOSED GOALS**

- Reduce the overall waste generated in the City of Kingston.
- Reduce the overall waste generated in City government operations.
- Promote waste reduction, re-use, recycling and composting.
- Reduce greenhouse gas emissions associated with the transportation and disposal of waste.

#### **By 2020:**

- Reduce the overall waste generated in the City of Kingston by 20%.
- Increase the overall recycling rates in the City of Kingston by 20%.
- Achieve an annual 10% reduction in overall annual waste generated in local government operations as measured against a base year of Fiscal Year 2013. (10% waste reduction per year beginning in FY 2013) Long-term Goal: Zero-waste.
- Achieve an annual 10 % reduction in annual paper use (copy and janitorial) as measured against a base year of FY2013. (10% paper use reduction per year beginning in FY2013).

#### **PROPOSED SUMMARY OF INITIATIVES**

- Develop Materials Management Plan for City of Kingston.
- Establish a 'Pay-As-You-Throw' Program.
- Establishing waste reduction and recycling standards for local building and development.
- Consider a local ban or fee on throw-away plastic and paper bags.
- Develop a recycling marketing campaign to promote waste reduction, reuse, recycling and composting programs.
- Consider feasibility of instituting a curbside food waste collection.
- Create, fund and sustain a recycling enforcement program.
- Develop a City Government Waste Reduction and Recycling Policy, Plan and Program
  - Establish procedures to track total municipal government waste generated.
  - Conduct baseline waste audit.
  - Conduct periodic waste audits.
  - Adopt a zero-waste goal.
  - Develop City government waste reduction program.
  - Develop City department waste reduction and recycling plans.
  - Provide training for City staff on re-use, waste reduction and recycling programs.
- Adopt a Local Government Paper Use Reduction Policy.
- Adopt a Local Government Environmentally Preferable Product or 'Green' Procurement Policy.

## **CLIMATE ACTION PLAN SUMMARY**

### **SUSTAINABLE RESOURCE MANAGEMENT**

#### **PROPOSED GOALS**

- Promote the use of ‘green infrastructure.’
- Protect water resources, reduce water usage and associated energy costs.
- Reduce water and energy inputs associated with landscape management.
- Plant, manage, maintain and protect street trees and urban forests.
- Promote local food production.
- Integrate sustainable practices in building operations and maintenance.

#### **By 2020:**

- 30 rain gardens have been created in the City, 15 on City owned property.
- Pervious pavement or pavers are being used to repave City lots and streets.
- Water and energy use at all City buildings and facilities is being tracked and monitored.
- [\*WaterSense\*](#) high efficiency water saving fixtures are being used to replace or upgrade fixtures in City owned buildings.
- The number of community and school gardens has doubled.
- Each school and city building has developed a successful ‘green’ cleaning program.

#### **PROPOSED SUMMARY OF INITIATIVES**

##### **Water Conservation and Efficiency**

- Adopt a local ‘green infrastructure’ ordinance.
- Establish standards and guidelines to encourage or require the use of ‘green infrastructure.’
- Encourage the development of ‘green infrastructure’ by providing outreach and guidance consistent with the building code.
- Use, demonstrate and promote green infrastructure in City projects, on City properties.
- Consider requiring new construction & major renovations to install [\*WaterSense\*](#) high efficiency water saving fixtures.
- Establish a Water Use Reduction Policy for government buildings and facilities.
- City government should use EPA’s Portfolio Manager or similar software to track City government water use.
- Encourage local businesses to track energy and water use with EPA Portfolio Manager.
- To promote *WaterSense* and water efficiency it is recommended that the City of Kingston become an EPA *WaterSense* partner.
- Identify and implement energy efficiency and renewable energy projects opportunities to improve the overall energy efficiency of the Kingston water delivery system.

##### **Landscape Management**

- Enhance municipal codes and regulations to:
  - Encourage non-toxic land management practices.
  - Encourage and promote the use of native plants.
  - Encourage and promote the use of water conserving landscape plants and techniques known as xeriscaping.
  - Support and strengthen tree planting and management.
  - Integrate standard ‘green’ principles for tree planting and permeability requirements.

## **CLIMATE ACTION PLAN SUMMARY**

### **SUSTAINABLE RESOURCE MANAGEMENT**

#### **PROPOSED SUMMARY OF INITIATIVES**

##### **Landscape Management continued**

- Support the Kingston Tree Commission's efforts to strengthen local codes, fund tree planting and maintenance initiatives, and promote urban forestry.
- Consider the development of a comprehensive Urban Forestry Master Plan as part of the Comprehensive Master Planning process.
- Develop best practices to advance the health of street trees and the use of trees to conserve water and energy.
- Use and promote the use of native plants.
- Use and promote the use of water conserving landscape plants and techniques known as xeriscaping.
- Adopt a non-toxic landscape management policy to eliminate or reduce the amount of fertilizers and pesticides used on City owned properties.
- Develop and adopt a procedure to improve the tracking of fuel usage by off road landscape equipment so as to be able to better manage it.
- Evaluate, initiate and implement a reduced mowing program for City-owned properties.
- Actively support and promote *"LEAVE IT ON THE LAWN, KINGSTON!"* Leaf Management Plan.

##### **Local Food Production**

It is recommended that the City:

- Continue to actively support the efforts to advance community and school gardens in the City of Kingston to encourage local food production.
- Work with the Kingston Land Trust, Kingston CAC, Kingston Schools and others to provide financial and other resources needed to advance local food production.
- 'Grow' the number of community gardens.
- Continue to support programs such as 'The Dig Kids.'
- Actively support and promote the Kingston Farmers Market.
- Use local produce and local food products at City events, meetings etc.
- Promote the use of locally produced food and local products.
- Start a City government employee operated community garden.

##### **Sustainable Building Operation and Maintenance**

It is recommended that the City:

- Adopt local 'green' building standards that encourage, supports and promote sustainable green operations and maintenance for existing commercial buildings within the City.
- Work with the Kingston Business Alliance and others to promote 'green' practices to help business owners reduce energy use, reduce waste and provide a healthier work environment for employees.
- Work with the Kingston CAC, the Kingston City School District as well as private schools, day care centers and pre-schools to support the development and implementation of 'green' cleaning programs.
- Create and implement a non-toxic or 'green' cleaning program for all City of Kingston buildings and facilities using the NY State green cleaning program as a resource.
- Create and implement an Environmentally Preferable or 'Sustainable' Purchasing Policy.
- Create, fund and sustain City Office of Energy & Sustainability.

## **CLIMATE ACTION PLAN SUMMARY**

### **OUTREACH EDUCATION AND TRAINING**

#### **PROPOSED GOALS**

- Engage people who live, work and play in the City of Kingston in energy and climate action.
- Improve awareness of opportunities to improve energy efficiency and reduce GHG emissions.
- Promote and create 'green' jobs.
- Empower and expand the Climate Smart and Green Jobs Community Task Force.

#### **PROPOSED SUMMARY OF INITIATIVES**

- Develop strategic partnerships to advance energy efficiency and renewable energy in the City of Kingston.
- Use City facilities to demonstrate energy leadership and existing environmental education programs to advance energy awareness and sustainability.
- Continue to integrate sustainability education into the City's overall education and interpretation programming, with topics such as energy conservation and renewable energy.
- Work with local partners to determine the potential to successfully engage the community in an energy challenge program or energy awareness in the City of Kingston. Energy Awareness and Outreach should envelop the energy programs and incentives available through NYSERDA, Central Hudson and other federal and state agencies.
- Develop a well-designed Sustainability Ambassador Program, involving key city leaders as trained and recognized ambassadors to advance the goals of the Plan.
- Use web-based social networking tools to engage the community in plan implementation the energy and local climate action.
- 'Brand' this effort as 'Sustainable Kingston' or 'Kool Kingston'.
- Maintain the Climate Action page on the City's web site.
- Develop a separate 'Sustainable Kingston' web page.
- Develop a simple tri-fold brochure on 'Reducing Your Ecological Footprint' with a particular focus on energy saving and money saving tips that will also benefit the environment.
- Integrate the goals and initiatives of the draft Climate Action Plan into the current Comprehensive Plan outreach and communications.
- Create Green Jobs through implementation of the Plan.
- Organize a regional 'Energy, Climate and Green Jobs Conference' in the City of Kingston.
- The City adopt an energy efficiency and conservation policy providing for the training and education of City employees.
- Develop a comprehensive energy and sustainability training program for City government personnel.
- Develop specific sustainability training modules on energy conservation, waste reduction and recycling and green procurement.
- Obtain and distribute free materials from NYSERDA and others to encourage community and staff to participate in reducing energy consumption.
- Adopt a resolution recognizing Task Force as an official body of the City government; rename the Task Force as the 'Energy and Sustainability Task Force' and expand the membership and role of the Task Force by appointing and encouraging active participation of City departments.

## **CLIMATE ACTION PLAN SUMMARY**

### **CLIMATE ADAPTATION**

#### **PROPOSED GOAL**

- A commitment, a Plan and systems are in place to be prepared for and adapt to a changing climate.

#### **PROPOSED SUMMARY OF INITIATIVES**

- Prepare and adopt a City of Kingston Climate Adaptation Plan.
- Integrate climate adaptation planning, preparation and response, including sea level rise, flooding, threats to the local drinking water supply, changes in precipitation and temperature and the associated public health risks into the Comprehensive Master Planning and Zoning Update process.
- Utilize and adapt existing reports, plans, and studies to assess local impacts of a changing climate.
- Conduct additional local and on-site analysis of potential impacts and risks, if necessary and feasible.
- Assess potential risk to the local water supply and prepare accordingly.
- Identify and address climate/environmental justice areas in the City.
- Involve all sectors of City government, including emergency management.
- Involve stakeholders and actively seek expert advice in Plan development and implementation.
- Evaluate alternative adaptation strategies based risk, costs, and benefits to human and natural systems.
- Carry out targeted and general outreach on climate change adaptation issues and actions.
- Collaborate with neighboring municipalities and county government, to plan, prioritize and implement climate preparedness actions that are best accomplished on a larger scale.
- Create a 'Citizen Science Monitoring Program.'
- Utilize the climate adaptation resources offered through the City of Kingston ICLEI membership.
- Adopt a local policy to consider climate change for all capital projects.
- Integrate impacts of climate change and appropriate measures into current effort to address stormwater and intermittent flooding conditions in the City.

## **NEXT STEPS**

The easy part, drafting this Plan has been done. The hard part, putting this plan into action is the challenge that lies ahead.

With release of this Draft Plan, the Climate Smart and Green Jobs Community Task Force is seeking additional stakeholder input on the initial climate action planning work that has been done over the past year.

Over the coming months the Task Force will be actively looking to engage the Common Council, City government staff and the community in the review, prioritization and implementation of the proposed goals and initiatives.

Community review of recommended goals and initiatives should be based on the City's priorities and constraints taking into consideration the triple bottom line of sustainability – people, planet and profits.

Reviewing and prioritizing initiatives for implementation will require consideration of what can be accomplished in the near-term with limited resources and what initiatives are more long-term efforts.

The Climate Smart and Green Jobs Community Task Force will also want to work with the community, the Common Council and the Mayor to have the Climate Action Plan formally adopted by the Common Council as City of Kingston policy and intent. Members of the Climate Smart and Green Jobs Community Task Force will also want to be actively engaged in the Comprehensive Master Plan and Zoning Update process. Members of the Task Force should work closely with the City Planning Department, the Comprehensive Plan Steering and Advisory Committees to integrate the goals and initiatives of the CAP into the Comprehensive Master Plan and new Zoning Code.

In addition it will important for the Task Force and City to aggressively seek funding to implement the goals and initiatives of the Plan.

While this Plan primarily addresses the reduction of energy use and greenhouse gas emissions, as the effects of climate change become more common and severe, local government adaptation policies will be fundamental in preserving the welfare of residents and businesses. Rising waters along the Hudson River and Rondout Creek, intensified and extreme weather which will result in amplified severity of flood events make it imperative for the City of Kingston to determine how it will adjust and cope with the impacts of climate change. A full analysis of the vulnerabilities of the City of Kingston to a changing climate and development and implementation of an adaptation plan to improve resiliency to climate change is a critical next step for the City of Kingston.





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## I. INTRODUCTION

Climate change is one of the most important social, economic and environmental issues facing society today.

Climate change is occurring; its impacts are well documented globally as well as regionally. While no single weather related incident can define the impacts of climate change we do know that “temperatures are increasing, precipitation patterns are changing, and sea level is rising.”<sup>i</sup> We also know that “these climatic changes are projected to occur at much faster than natural rates because of increased amounts of greenhouse gases in the atmosphere. Some types of extreme weather and climate events have already increased in frequency and intensity, and these changes are projected to continue.”<sup>ii</sup>

The changing climate along with the economic and environmental risks associated with our dependence on a finite supply of fossil fuel based sources of energy has fostered a heightened sense of urgency to advance policies and practices that will allow for a more sustainable, low emissions, carbon neutral future.

While a global issue, action at the local level is critical to addressing the challenges that lie ahead. Many communities in the U.S. and in New York are taking responsibility for addressing energy management and greenhouse emissions. Since many of the major sources of greenhouse gas emissions are directly or indirectly controlled through local policies, local governments have a strong role to play in reducing greenhouse gas emissions within their boundaries. Through proactive measures around land use planning, transportation, energy efficiency, green building, waste reduction, and more, local governments can dramatically reduce emissions in their communities. In addition, local governments are primarily responsible for the provision of emergency services and the mitigation of natural disaster impacts.

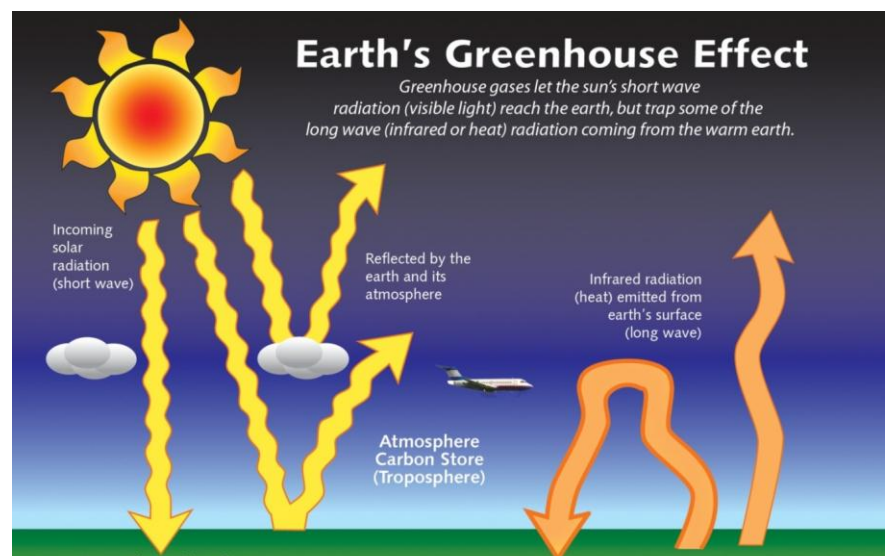


Figure 1: Earth's Greenhouse Effect, USEPA

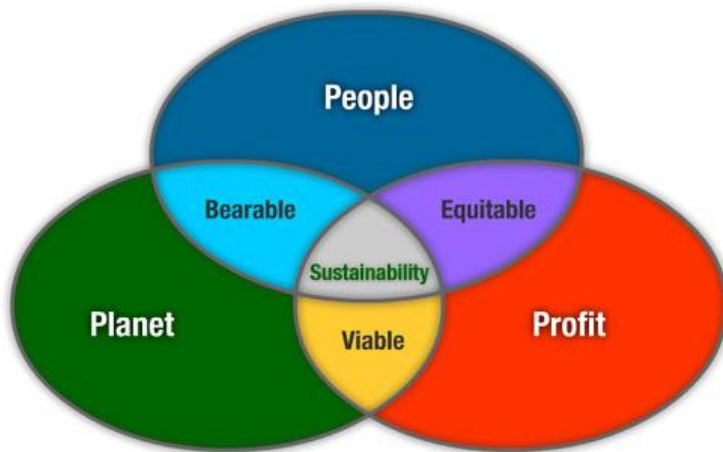
The City of Kingston recognizes that greenhouse gas (GHG) emissions from human activity are catalyzing profound changes in climate and weather, the consequences of which pose substantial risks to the future health, well-being, and prosperity of the community. In response, the City of Kingston has taken action through the completion of an energy assessment, a GHG emissions inventory and preparation of a Climate Action Plan.

The City of Kingston Climate Action Plan (CAP) includes recommendations for comprehensive policies and programs that will reduce greenhouse gas emissions, enhance operational and energy efficiencies, reduce energy costs, support local job growth, and adapt to a changing climate while improving quality of life, saving taxpayer dollars, and promoting social justice. While Climate Action Plans focus specifically on reducing GHG emissions, this plan more broadly addresses many important initiatives that fall under the broad umbrella of ‘sustainability.’

Sustainability is a principle for how to manage natural and human resources. This approach meets the needs of the present while providing for the future by protecting the natural systems on which we are dependent for clean air, clean water and healthy food. Sustainability requires a shift in thinking to consider, in all that we do, the triple bottom line: people, planet, and profits or the environment, economy and equity.

The USEPA defines sustainability as:

*Everything that we need for our survival and well-being depends, either directly or indirectly, on our natural environment. Sustainability creates and maintains the conditions under which humans and nature can exist in productive harmony, that permit fulfilling the social, economic and other requirements of present and future generations.* <sup>iii</sup>



By more broadly incorporating sustainability into its policies, plans and day-to-day operations, the City of Kingston can take actions to improve air and water quality, use resources more efficiently, and enrich the overall quality of life. The City of Kingston can continue to take a leadership role and become a ‘Model City’ of sustainability in the Hudson Valley and in the State of New York.

Figure 2: Sustainability, Grand Rapid Institute for Information Democracy

## A Vision for the City of Kingston:

*As a community working together to transform public policy and by taking individual action, the City of Kingston will become a 'Model City' of sustainability by:*

- *Creating a low carbon/low emissions future.*
- *Reducing overall community energy consumption, improving air quality and the quality of life through energy efficiency, conservation and renewable energy.*
- *Creating land use and transportation systems that encourage compact, higher density mixed use development and a shift to modes of transportation that are less dependent on fossil fuels.*
- *Being a leader by reducing energy use, energy costs and GHG emissions associated with the operation of government buildings, facilities and vehicles.*
- *Reducing or eliminating material and resource waste.*
- *Providing education, training and resources for city employees, businesses and residents.*
- *Preparing for and adapting to a changing climate.*

This Plan outlines proposed goals and a full range of potential initiatives that the City government and community can implement to achieve this vision.



Youth from Kingston, N.Y. participate in a bike to school event<sup>iv</sup> and smiling faces at the Kingston Farmers Market

## A. REGIONAL AND LOCAL CLIMATE CHANGE IMPACTS

Climate changes throughout New York and the northeast include:

- Rise in sea level threatening coastal infrastructure.
- Severe and more frequent flooding due to heavy downpours, more intense storms and sea level rise.
- Higher temperatures, more frequent and intense heat waves.
- Declining air quality and extreme heat likely to pose increasing human health risks, especially in urban areas.<sup>v</sup>
- Reductions in snow cover adversely affecting winter recreation and the industries that rely upon it.

In its November 2010 *Climate Action Plan Interim Report*, the New York State Climate Action Council indicated:

*Climate change has already put in motion certain environmental impacts in New York, and further changes are likely. According to the latest assessment from a team of scientists at the NASA Goddard Institute, Columbia University, Cornell University, and the City University of New York—the average air and water temperatures in New York and the region are projected to increase significantly over the coming decades and heat waves are expected to become more frequent and more intense. Summertime rain is expected to fall more often as heavy downpours, leading to more flooding; at the same time, the periods between these rainstorms are likely to be drier, leading to droughts. By the year 2100, sea levels along our coast and the Hudson River estuary are projected to rise between 12 and 55 inches, increasing storm-related coastal flooding.*<sup>vi</sup>

For more information on New York State Climate and Energy Policies please see Appendix I.

## B. LOCAL CLIMATE CHANGE POLICY

In October 2009, the City of Kingston's Common Council demonstrated its commitment to environmental and climate protection by adopting the 'Climate Smart and Green Jobs Community Pledge' and becoming a 'Climate Smart Community.' As a 'Climate Smart Community', the City of Kingston partners with the NYS Department of Environmental Conservation (NYSDEC), the New York State Energy Research and Development Authority (NYSERDA), the NYS Department of State, the Public Service Commission, the NYS Department of Transportation as well as 102 municipalities<sup>vii</sup> throughout New York State to address climate change at the local level.

The Pledge created the Kingston Climate Smart and Green Jobs Community Task Force. The mission of the Task Force is to advance the steps outlined in the Climate Smart and Green Jobs Community Pledge and to implement the goals and initiatives of a Climate Action Plan.

As a 'Climate Smart Community', the City of Kingston was successful in obtaining a grant to fund the development of greenhouse gas (GHG) emissions inventories for both the community and the local government and to create this Plan.

There are a number of other community initiatives in the City of Kingston that have begun in just the last five years which will help realize the vision of a 'Model City' of environmental and economic sustainability. The City of Kingston has adopted a 'Complete Streets Policy' through the 'Healthy Kingston for Kids'<sup>1</sup> initiative envisioning a vibrant city alive with pedestrians and bicyclists along with easy access to healthy, affordable, local food. The City employs two environmental educators that are working on greening the community through initiatives to reduce waste and improve recycling. The Kingston Land Trust has created community gardens and is promoting rail trails for the City. Hudson River Sloop Clearwater is working in Kingston to advance 'green infrastructure' and climate justice. Local groups focused around two of Kingston's major water bodies, the Hudson River and the Rondout Creek, are addressing inter-municipal water issues including waterfront development, the economy and the environment. The City of Kingston is also currently updating its Comprehensive Master Plan and Zoning Code.



Kingston's Climate Smart and Green Jobs Community Pledge outlines ten steps the Task Force and the City of Kingston will undertake to combat climate change:

1. Pledge to combat climate change by becoming a Climate Smart Community
2. Set Goals, Inventory Emissions, Move to Action
3. Decrease Energy Demand for Local Government Operations
4. Encourage Renewable Energy for Local Government Operations
5. Realize Benefits of Recycling and Other Climate Smart Solid Waste Management Practices
6. Promote Climate Protection Through Community Land Use Planning
7. Plan for Adaptation to Unavoidable Climate Change
8. Green Innovation Strategy
9. Inform and Inspire the Public
10. Commit to an Evolving Process

*The Climate Smart and Green Jobs Community Pledge in its entirety can be found in Appendix J.*

<sup>1</sup> This project is funded by the Robert Wood Johnson Foundation and facilitated by Cornell Cooperative Extension of Ulster County.

## C. ICLEI – LOCAL GOVERNMENTS FOR SUSTAINABILITY

The City of Kingston, along with more than 1,200 local governments, including over 600 in the United States, has joined *ICLEI – Local Governments for Sustainability*. ICLEI is an association for local governments to share knowledge and successful strategies toward increasing local sustainability.<sup>viii</sup> ICLEI members represent the most forward-thinking and adept local governments who are working to make their communities more livable, prosperous, equitable, and environmentally sound.

ICLEI provides a framework and methodology for local governments to identify and reduce greenhouse gas emissions, organized along Five Milestones:

1. Conduct an inventory and forecast of local greenhouse gas emissions;
2. Establish a greenhouse gas emissions reduction target;
3. Develop a climate action plan for achieving the emissions reduction target;
4. Implement the climate action plan; and,
5. Monitor and report on progress.

The City of Kingston has completed ICLEI's Climate Mitigation Milestones One, Two and Three. This Plan provides a foundation for the successful completion of Milestones Four and Five.



## D. ORGANIZATION OF THE CITY OF KINGSTON CLIMATE ACTION PLAN

Section I provides introductory and background information on climate change impacts and climate change policy.

Section II presents a summary of the findings of the community and local government energy assessments and GHG emissions inventories.

Section III offers a GHG emissions forecast and proposed energy and GHG reduction targets.

Section IV sets forth proposed goals and initiatives the community and City government can take to achieve energy and GHG reduction targets, according to six different subject areas:

- A. Energy and Renewables: Buildings and Facilities
- B. Land Use, Transportation and Vehicles
- C. Materials Management: Waste Reduction, Reuse, Recycling & Composting
- D. Sustainable Resource Management
- E. Outreach, Education & Training, and
- F. Climate Adaptation.

## E. IMPLEMENTATION OF THE CITY OF KINGSTON CLIMATE ACTION PLAN

The implementation of initiatives, policies, projects and programs is the most important part of this process. By laying the groundwork through the GHG emissions inventories and climate action planning process, the City of Kingston will have the ability to select and prioritize the best emissions reduction strategies and confidently take action. The City of Kingston will benefit by acting quickly to reduce GHG emissions, both through changes in local government operations and by inspiring action throughout the community.

The Climate Smart and Green Jobs Community Task Force is the group primarily responsible for advancing the implementation of this Plan. Implementation, however will take a concerted effort by members of the community, City government staff and elected officials.

### Prioritization

It is recommended that the Task Force, with community and government input, prioritize the goals and initiatives and continually re-evaluate and update this Plan. Evaluation of initiatives should include the potential to help achieve energy reduction and GHG emissions targets. To aid in quantifying the potential emission reductions from proposed projects the Task Force can use an Excel-based tool, called the Climate and Air Pollution Planning Assistant (CAPPA). Other potential benefits of climate and sustainability initiatives will also need to be considered.

Reviewing and prioritizing initiatives for implementation will require consideration of what can be accomplished in the near-term with limited resources and what initiatives are more long-term efforts.

*It is at the local level of government where most climate change impacts occur. Local jurisdictions are where streets and homes are flooded, where infrastructure is installed, where potable water is supplied, and where building permits are issued. When storms and droughts occur, citizens look to their local governments for answers and solutions, as well as for protection. When citizens desire more energy-efficient buildings and development patterns, local plans, incentives and regulations help make these desires a reality. As a result, "Main Street" is the nexus for climate change action.<sup>1</sup>*

### Plan Adoption

To advance implementation of the Climate Action Plan, the City of Kingston Common Council should adopt a resolution that supports and formally recognizes the goals and initiatives of the Plan as City of Kingston policy and intent. Council adoption and recognition of the Plan will not result in the blanket acceptance or approval of its goals and initiatives. Advancing many of the goals and initiatives will require further administrative and legislative action. Actions taken on specific initiatives will be based on prioritization of the initiatives and the human and financial resources available to implement such actions.

## Recognize Task Force

A Common Council resolution should also recognize the Climate Smart and Green Jobs Community Task Force as an official government entity with relevant staff, policy experts and community stakeholders appointed by the Mayor to implement the goals and initiatives of the Plan. In addition, it is recommended that the Climate Smart and Green Jobs Community Task Force be renamed the 'Energy and Sustainability Task Force.'

## Additional Cost Analysis

Additional cost analysis of some of the recommended initiatives will also be necessary to determine upfront costs, cost savings and return on investment. Some measures may require upfront costs, however long-term energy and monetary savings should be factored into overall decision making.

## Integration and Consistency

It will also be important to integrate the goals and initiatives recommended in this Plan into the City of Kingston Comprehensive Master Plan and Zoning Code updates. In addition any other pertinent municipal actions such as code changes, development approvals, purchases or City government policy should be reviewed in the context of consistency with the goals set forth in this Plan.

## Mid Hudson Regional Sustainability Plan

It is recommended that the City of Kingston actively participate in the development of the Mid Hudson Regional Sustainability Plan. This two-phased effort is part of New York's 'Cleaner Greener Communities Program' to encourage communities to adopt regional, sustainable growth strategies.

Phase 1, the development of the regional plan is a seven county effort being led by the Town of Greenburgh and Orange County and is just getting under way. Participation by the City of Kingston in this effort will be important because Phase 2 will have approximately \$90 million of funding, awarded on a competitive basis, for implementation of specific projects that provide the greatest opportunity to achieve carbon reductions, energy efficiency savings, and renewable energy deployment, consistent with the sustainability plans developed by each region.

By adopting the goals and initiatives of this Climate Action Plan the City positions itself for potential project implementation funding.

## Funding

The City will need to consider how it can establish stable, ongoing funding for the implementation of the goals and initiatives of the Climate Action Plan. The City should consider establishing a fund in which savings accrued from the implementation of energy efficiency and renewable energy projects be specifically allocated to further the goals and initiatives of the CAP. Active monitoring and evaluation of City government energy usage and cost is necessary to identify potential energy projects and measure cost savings.

The City should also aggressively pursue outside sources of funding such as government and corporate grants and private foundations. By adopting this Plan the City also positions itself for potential grant funding opportunities.

The City should also consider other potential sources of revenue to fund this important effort. It is recognized, however, that in the current economy it is unlikely that the City will allocate funding for a new initiative. It is important to note that many of the initiatives outlined in the Plan will pay for themselves in short time frames and will result in long-term savings and overall improved fiscal management.

## II. CITY OF KINGSTON ENERGY ASSESSMENT & GREENHOUSE GAS EMISSIONS INVENTORY SUMMARY

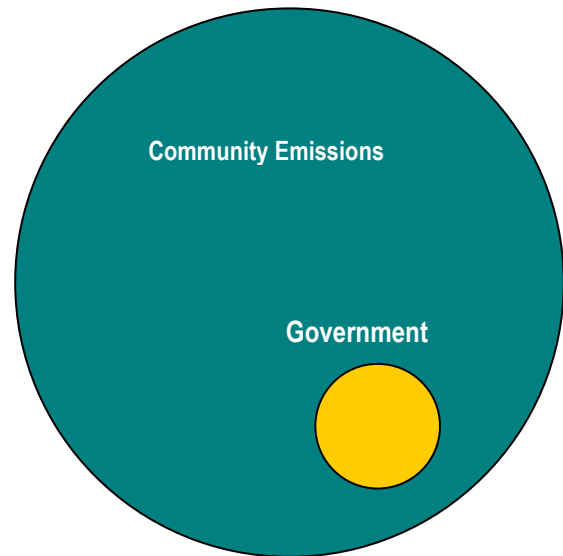
In 2011, the City of Kingston conducted its first comprehensive energy assessment and greenhouse gas emissions inventory for the City as a whole (community emissions inventory) and for the City of Kingston's government operations (government emissions inventory) for calendar year 2010. Presented below are summaries of the energy information and estimates of GHG emissions for both the community and City government operations. The City government inventory is a subset of the community inventory.

The detailed findings of the community emissions inventory and government emissions inventory can be found in Appendices A and B respectively.

These inventories are critical to clearly understanding the City's contribution to climate change and supporting the long-term efforts of the City to reduce GHG emissions. The GHG emissions inventory establishes a baseline against which the City of Kingston will be able to evaluate the success of local efforts, compare future performance and demonstrate progress in reducing GHG emission levels over time. This baseline information will help guide the City of Kingston efforts in becoming a model of sustainability.

The Climate Smart and Green Jobs Community Task Force will want to continue to update the energy and GHG inventory as additional data becomes available and use these studies to measure the City of Kingston's progress in reducing its contribution toward the global and local issue of a changing climate. By periodically updating inventories, creating new baselines, and adding new initiatives to the CAP, the City of Kingston will be able to track and report progress in protecting the climate and demonstrate reductions in emissions.

For a comprehensive description of what was involved in conducting the GHG emissions inventories, the protocols used, the inventory boundaries, methodology, data collection, quantification methods and the software used to estimate emissions please see Appendices C and D. All GHG emissions data was generated using the ICLEI CACP 2009 software. For an explanation of emissions types and scopes please see Appendix E.



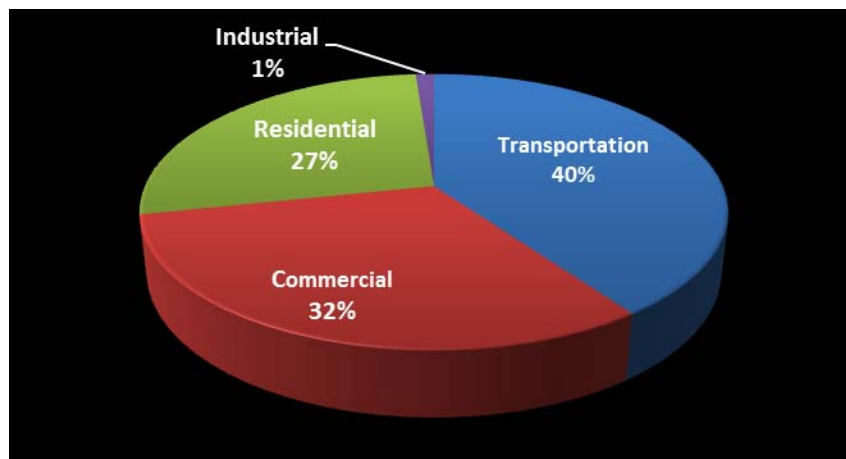
## A. COMMUNITY ENERGY CONSUMPTION SUMMARY

Using the ICLEI CACP 2009 software, aggregate community-wide energy data was used to estimate the total energy consumption for the residential, commercial, industrial and transportation sectors in the City of Kingston. The transportation sector in the City of Kingston consumes the largest percentage of the community's energy. The commercial sector is second, however the commercial and residential sectors combined account for 59% of the community's energy consumption.

**Table 1: Community Energy Consumption<sup>2</sup>**

City of Kingston Community-Wide Usage	2010 Community Total Energy Consumption (MMBTU)	% of Total Energy
Transportation	1,284,800	40
Commercial	1,012,178	32
Residential	867,671	27
Industrial	38,472	1
<b>Total</b>	<b>3,203,121</b>	

**Figure 3: Community Energy Consumption**



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<sup>2</sup> Energy consumption data generated by ICLEI CACP 2009 software

## B. COMMUNITY-WIDE GREENHOUSE GAS EMISSIONS SUMMARY

Community-wide, the City of Kingston generated an estimated 225,097 metric tons of CO<sub>2</sub>e<sup>3</sup> in 2010.

The transportation sector (gasoline and diesel use) accounted for more than 41% of the community's GHG emissions, with residential energy usage contributing 26%, commercial 18% and industrial less than 1%. Emissions from waste account for less than 1% of the total.<sup>4</sup>

The GHG emissions of 225,097 tonnes of CO<sub>2</sub>e is equal to the CO<sub>2</sub> emissions from the consumption of 25,235,090 gallons of gasoline, 523,481 barrels of oil, the electricity use of 28,067 homes for one year or the carbon sequestered by 47,995 acres of pine or fir forests.<sup>5</sup>

**Table 2: Community-Wide GHG Emissions City of Kingston**

City of Kingston Community GHG Emissions Summary by Sector	Total CO <sub>2</sub> e (tonnes)	% of Total
Transportation*	93,048	41
Commercial	71,281	32
Residential	58,247	26
Industrial	1,400	1
Waste	1,121	<0.5
<b>Total</b>	<b>225,097</b>	

\* Includes 352 tonnes of CO<sub>2</sub>e from Waste Transport

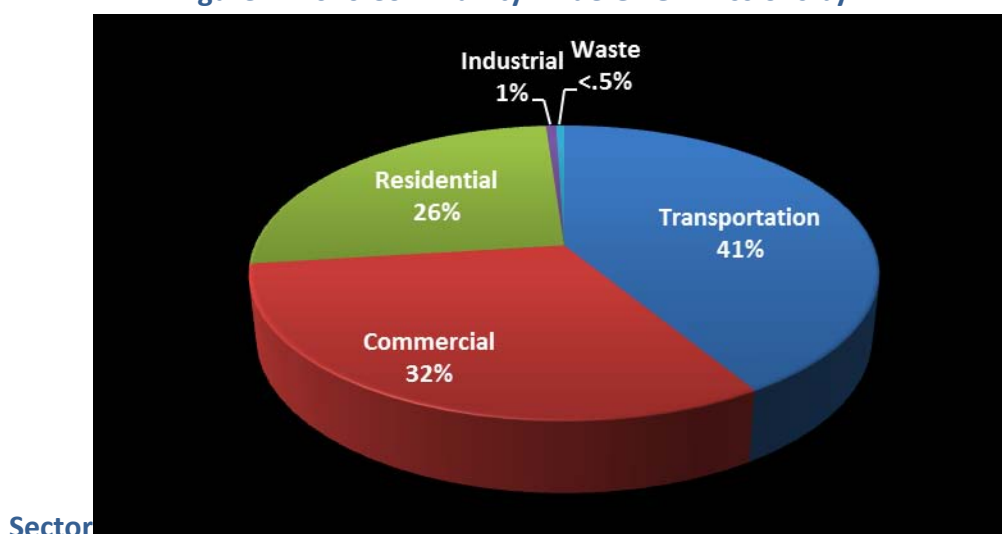
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<sup>3</sup> CO<sub>2</sub> equivalent (CO<sub>2</sub>e) - The universal unit for comparing emissions of different GHGs expressed in terms of the Global Warming Potential (GWP) of one unit of carbon dioxide. (Local Government Operating Protocol, May 2010). For more information, see Appendix E.

<sup>4</sup> Only waste collected by the City DPW is factored into these GHG emissions. Not all waste generated in the City was accounted. Also emissions from waste have technically not yet been created as landfill gas is created as waste decomposes over time.

<sup>5</sup> EPA GHG Equivalency Calculator <http://www.epa.gov/cleanenergy/energy-resources/calculator.html>

Figure 4: 2010 Community-Wide GHG Emissions by



For the complete **Community Energy and Greenhouse Gas Emissions Inventory Report** see Appendix A.

### C. GOVERNMENT OPERATIONS ENERGY SUMMARY

The City of Kingston government energy costs in 2010 were \$1,590,415<sup>6</sup> which is 4.6% of the 2010 budget of \$34,776,803. Taking into account the energy costs of the Kingston Water Department (KWD), (\$97,034), the Kingston Housing Authority (KHA),<sup>7</sup> (\$268,389), and Dietz Stadium (\$19,564) the overall 2010 total energy costs for City government related operations was \$1,975,402. Adding in the estimated employee commuting fuel costs of \$119,904, energy related expenses were \$2,095,306 in 2010.

Table 3 summarizes the energy usage and cost totals for City government operations. The most significant portion of the City's energy expenditures are from purchased electricity, with government operations using 6,461,721 kWh of electricity in 2010 at a cost of \$1,012,384, 64% of the overall energy bill. Natural gas costs accounted for approximately 9% of the overall energy expenditures. The cost of vehicle fuel was 26% of the total costs with equal portions of gas and diesel fuel.

<sup>6</sup> The energy cost figures in this report are as accurate as possible based on available data. The total energy costs may be greater. In 2010 the City of Kingston was transitioning utility accounts to have electricity and natural gas supplied by the Hess Corporation and delivered by Central Hudson Gas & Electric. In a few cases the cost of natural gas as supplied by Hess had to be estimated.

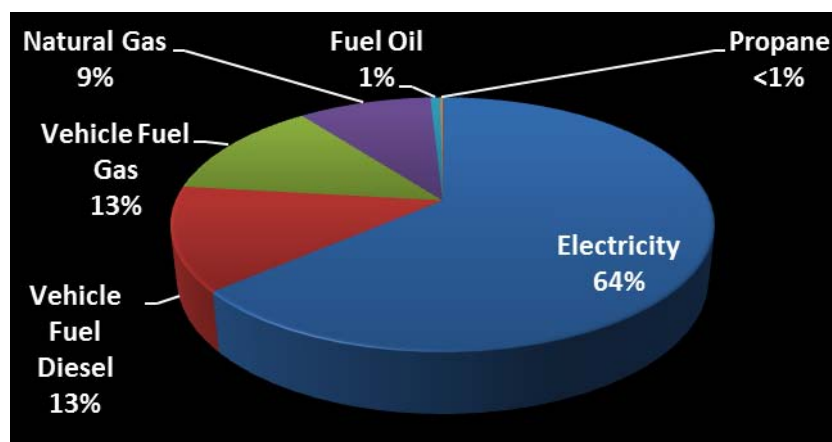
<sup>7</sup> Utility data for Stuyvesant Charter was inadvertently not accounted for. Therefore KHA energy usage and cost for 2010 will be slightly greater.

**Table 3: City of Kingston Energy Usage and Cost Summary**

City of Kingston Energy Source	2010 Total Usage	2010 Total Energy Cost	% of Total Energy Costs
Electricity (kWh)	6,461,721	\$1,012,384	64
Natural Gas (CCF)	113,267	\$151,058	9
Fuel Oil (Gal)	4,582	\$11,225	1
Propane (Gal)	1,044.1	\$2,748	<1
Vehicle Fuel Gas (Gal)	84,402.6	\$202,970	13
Vehicle Fuel Diesel (Gal)	83,513	\$210,026	13
<b>TOTAL City Government Costs</b>		<b>\$1,590,411</b>	

(Does not include KHA, KWD and Dietz and Employee Commute)

**Figure 5: City of Kingston Energy Cost Summary**



(Does not include KHA, KWD and Dietz and Employee Commute)

## D. GOVERNMENT OPERATIONS GREENHOUSE GAS EMISSIONS SUMMARY

In 2010 the City of Kingston government operations resulted in the release of an estimated 4,587 tonnes of CO<sub>2</sub>e.<sup>8</sup> This does not include the emissions from the Kingston Water Department (KWD), the Kingston Housing Authority (KHA), Dietz Stadium and employee commuting.<sup>9</sup>

Including the GHG emissions generated by employee commuting, the KHA, KWD and Dietz Stadium GHG emissions are estimated at 7,281 tonnes of CO<sub>2</sub>e.

<sup>8</sup> Due to rounding within CACP 2009, GHG totals had a variation of 2 to 4 tonnes of CO<sub>2</sub>e.

<sup>9</sup> Kingston Housing Authority, Kingston Water Department and Dietz Stadium are not a part of regular government operations but were included in government analysis because City has some operational control over these entities.

Electricity purchased for City government operations in 2010 created the majority of GHGs, 2,011 tonnes of CO<sub>2</sub>e, almost half of all the City government operation GHG emissions. Gasoline and diesel fuel usage combined accounted for more than a third of GHG emissions.

The Department of Public Works, as a whole, released an estimated 2,681 tonnes of CO<sub>2</sub>e, which includes the 694 tonnes of CO<sub>2</sub>e from outdoor public lighting and 1,329 tonnes of CO<sub>2</sub>e from wastewater treatment operations; 58% of the total 4,587 tonnes of CO<sub>2</sub>e. The wastewater treatment plant is the single largest producer of GHG emissions: 1,329 tonnes of CO<sub>2</sub>e, 29% of the total 4,587 tonnes of CO<sub>2</sub>e.

Due to the significant amount of gasoline used by the Kingston Police Department in 2010 it is second to DPW in GHG emissions. Operation of the Kingston Fire Department, the Parks and Recreation Department, Citibus, KWD and employee commuting each contributed similar amounts of GHG emissions.

While KHA facilities produced a significant percentage of GHG emissions, an estimated 1,982 tonnes of CO<sub>2</sub>e, the electric and natural gas used at KHA facilities was primarily for residential purposes.

City of Kingston government operations accounted for approximately 2.04% of the total community-wide GHG emissions in the City of Kingston. Including KHA, KWD and Dietz Stadium in the operations, GHG emissions are approximately 3.23% of the total.

While GHG emissions are discussed with and without the KWD, KHA, Dietz Stadium and employee commuting, the City of Kingston government has some degree of operational control over or ability to influence and affect each of these areas to reduce the overall total GHG emissions of 7,281 tonnes of CO<sub>2</sub>e.

City government buildings and facilities are the largest producers of GHG emissions for City operations.

**Table 4: Government GHG Emissions Summary<sup>10</sup>**

GHG Emissions Summary	(1) CO <sub>2</sub> e (tonnes)*	(2) CO <sub>2</sub> e (tonnes)**
Buildings & Facilities	4,467	2,264
Vehicles	1,750	1,629
Public Lighting	694	694
<b>TOTAL</b>	<b>6,911</b>	<b>4,587</b>
Employee Commute	370	
<b>TOTALS</b>	<b>7,281</b>	

\* Column 1 includes KHA, KWD and Dietz Stadium

\*\* Column 2 excludes KHA, KWD and Dietz Stadium. Includes City Hall and DPW, KPD, KFD, and Parks and Recreation.

<sup>10</sup> Rounding within the CACP 2009 software and Excel spreadsheets resulted in slight differences in these totals, up to 2 tonnes of CO<sub>2</sub>e.

The GHG emissions of 7,281 tonnes of CO<sub>2</sub>e, is equal to the CO<sub>2</sub> emissions from the consumption of 816,256 gallons of gasoline, 16,933 barrels of oil, the electricity use of 908 homes for one year or the carbon sequestered by 1,552 acres of pine or fir forests.<sup>11</sup>

**Table 5: City Government Operations GHGs as a % of Community-wide Emissions**

GHG Emissions Summary	CO <sub>2</sub> e (tones)	% of Community-wide GHG Emissions
GHG Emissions based on operations included in City budget	4,587	2.04
GHG Emissions based on City budget operations plus the KHA, KWD , & Dietz Stadium	6,911	3.07
GHG Emissions total including employee commuting	7,281	3.23
GHG Emissions Community wide	225,097	

For the complete **Local Government Energy and Greenhouse Gas Emissions Inventory Report** see Appendix B.



*In 2009, approximately 83 percent of the energy consumed in the United States was produced through the combustion of fossil fuels.<sup>2</sup>*

<sup>11</sup> EPA GHG Equivalency Calculator <http://www.epa.gov/cleanenergy/energy-resources/calculator.html>

## E. SUMMARY OF THE NUMBERS: CITY OF KINGSTON, NY

<b>2010 Population:</b>	<b>23,893</b>
<b>2020 Population Projection:</b>	<b>24,337</b>
<b>Total Housing Units :</b>	<b>11,147</b>
<b>2020 Household Projection:</b>	<b>11,680</b>
<b>Community Energy Use (MMBTU):</b>	<b>3,203,121</b>
<b>Per Capita:</b>	<b>134</b>
<b>Per Household<sup>12</sup>:</b>	<b>287*</b>
<b>Vehicle Miles Traveled (VMT):</b>	<b>158,782,140</b>
<b>2020 VMT Projection:</b>	<b>160,528,744</b>
<b>Solid Waste Total Collected<sup>13</sup> (Tons):</b>	<b>13,827.1</b>
<b>Garbage:</b>	<b>8,768.8</b>
<b>Garbage per capita:</b>	<b>2.01lbs/day</b>
<b>Total Recycling:</b>	<b>5,058.29</b>
<b>Recycling per capita:</b>	<b>1.16lbs/day</b>
<b>Community GHG Emissions (Tonnes of CO<sub>2</sub>e):</b>	<b>225,097</b>
<b>Transportation:</b>	<b>93,048 (41%)</b>
<b>Commercial:</b>	<b>71,281 (32%)</b>
<b>Residential:</b>	<b>58,247 (26%)</b>
<b>Industrial:</b>	<b>1,400 (1%)</b>
<b>Waste:</b>	<b>1,121 (&lt;1%)</b>
<b>Metric Tonnes CO<sub>2</sub>e Per Capita:</b>	<b>9.43</b>
<b>Tonnes CO<sub>2</sub>e Per Household<sup>14</sup>:</b>	<b>5.23</b>
<b>Local Government Energy Use (MMBTU):</b>	<b>86,603</b>
<b>Local Government Energy Costs:</b>	<b>\$1,590,412</b>
<b>Local Government Number of Employees:</b>	<b>406</b>
<b>Energy Use Per Employee:</b>	<b>213</b>
<b>Energy Cost per Employee :</b>	<b>\$3,917</b>
<b>Energy Cost per capita :</b>	<b>\$67</b>
<b>Local Government GHG Emissions (Tonnes of CO<sub>2</sub>e)<sup>15</sup>:</b>	<b>4,587</b>
<b>Buildings &amp; Facilities:</b>	<b>2,264 (49%)</b>
<b>Vehicles:</b>	<b>1,629 (36%)</b>
<b>Public Lighting:</b>	<b>694 (15%)</b>
<b>Per Employee:</b>	<b>11.29</b>
<b>Local Government GHG Emissions (Metric tonnes of CO<sub>2</sub>e)<sup>16</sup>:</b>	<b>7,281</b>

<sup>12</sup> Based only on residential energy consumption, energy use is 78 MMBTU per household.

<sup>13</sup> Includes only waste and recycling collected by City of Kingston Department of Public Works.

<sup>14</sup> Based on Residential GHG emissions of 58,247 tonnes of CO<sub>2</sub>e and 11,147 households.

<sup>15</sup> Does not include emissions from the Kingston Water Department, Housing Authority, Dietz Stadium and employee commuting.

<sup>16</sup> Includes emissions from the Kingston Water Department, Housing Authority, Dietz Stadium and employee commuting.

### III. GREENHOUSE GAS EMISSIONS FORECAST AND REDUCTION TARGET

#### A. COMMUNITY EMISSIONS FORECAST

The potential emissions growth were based on projected trends in population, housing units, commercial job rates and transportation (vehicles miles traveled) from the baseline year going forward. A variety of reports and projections were used to create the emissions forecast, as profiled below.<sup>17</sup> The anticipated growth rate for the City of Kingston by 2020 is estimated to be 2.48%.<sup>18</sup>

Kingston conducted an emissions forecast for the year 2020.

It is estimated that under a business-as-usual scenario, the City of Kingston's emissions will increase by approximately 2.48% percent by the year 2020, from 225,097 tonnes to 230,679.4 tonnes of CO<sub>2</sub>e, an increase of 5,582.4 tonnes of CO<sub>2</sub>e.

**Table 6: Community Growth Projections by Sector**

2010 Community Emissions Growth Forecast by Sector	2010	2020	Annual Growth Rate	Change from 2010 to 2020
Population	23,893	24,337	1.86	444
Housing (Units)	11,147	11,680	4.79	534
Commercial Job Growth	*	*	3.1	
Vehicle Miles Traveled	158,782,140	160,528,744	1.1	1,746,604
Waste Generation (Tons)	8,768.80	7,155.3	<18.4>	<1,613.5>

\*Data unavailable.

#### B. LOCAL GOVERNMENT EMISSIONS FORECAST

To estimate the growth in the government operations it was anticipated that over the next 10 years there will be slight growth in government operations in proportion with the growth in the community. As described in the community report it is anticipated that community GHG emissions will grow by approximately 2.48% by the year 2020.

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<sup>17</sup> Projected population growth rate for the City of Kingston for 2020 is based on the City population growth rate from 2000-2010 being 1.86%. Projected growth in housing units, based on US Census data in housing units from 2000 to 2010, 4.79% Total Unit Demand (Owner and Renter) . Projected annual percentage growth rate of 1.1% for vehicles miles traveled for the City of Kingston.

(480,889 VMTs 2010, 536,484 VMT 2020). Source: Ulster County Planning. Commercial job growth of 3.1% based on NYS Dept of Labor Long-Term Occupational Projections for the Hudson Valley Region <http://www.labor.ny.gov/stats/demand.asp> (Johnny Nelson, Labor Market Analyst - Hudson Valley Region, NYS Dept. of Labor as referred by Ulster County Planning)

<sup>18</sup> Based on growth projections for each individual sector, housing (4.79%), transportation (1.1%), waste (-18.39%) and commercial job growth (3.1%), it was determined to be a 2.48% increase in CO<sub>2</sub>e emission, from 225,097 tonnes in 2010 to 230,679.4 tonnes in 2020, an increase of 5,582.4 tonnes.

Under a business-as-usual scenario, the City of Kingston's local government emissions are projected to increase by approximately 2.48% by the year 2020, 114 tonnes of CO<sub>2</sub>e from 4,587 tonnes to 4,701 tonnes of CO<sub>2</sub>e. The GHG emissions total that includes the KHA, KWD, Dietz Stadium and employee community is projected to increase 181 tonnes from 7,281 to 7,462 tonnes of CO<sub>2</sub>e in 2020 (in proportion to community growth.)

## C. PROPOSED REDUCTION TARGET

In selecting target reductions it is important to strike a balance between scientific necessity, ambition, and what is realistically achievable. By establishing a challenging yet feasible target, the City of Kingston can demonstrate its goal to do its part towards addressing GHG emissions. Energy and GHG reduction targets can be achieved through prioritizing and implementation of the recommendations of this Climate Action Plan (CAP).

It is recommended that the City of Kingston set an energy reduction goal of 20% by 2020 and GHG emissions target reduction goal of 20% by 2020 or '20 by 20' for both the community and local government operations.

The recommended target was established by surveying GHG emissions reduction targets of other New York cities and towns and other similarly-sized cities across the US as well as New York State GHG emissions reduction target of 40% by 2030 target (and ultimately 80% by 2050, '80 by 50').

The City of Kingston 20% target by 2020 is equal to 2.5% per year over the next 8 years. A local 2.5% annual reduction in GHG emissions is consistent with the state target of 80% reductions by 2050.

## IV. CLIMATE ACTION

This section outlines the proposed climate and sustainability goals and initiatives that could be implemented to meet the energy and GHG emissions reduction targets of '20 by 20.' Initiatives include efforts to promote energy efficiency, renewable energy, vehicle fuel efficiency, alternative transportation, vehicle trip reduction, land use and transit planning, waste reduction and more. Through these and other efforts, the City of Kingston can save money, increase economic vitality, and improve quality of life for its citizens.

Proposed goals and initiatives are presented according to six different subject areas:

- A. Energy and Renewables: Buildings and Facilities
- B. Land Use, Transportation and Vehicles
- C. Materials Management: Waste Reduction, Reuse, Recycling & Composting
- D. Sustainable Resource Management
- E. Outreach, Education & Training, and
- F. Climate Adaptation.

A brief introduction, findings, proposed goals and recommended initiatives are presented for each of the six subject areas.

Some, but not all, of the recommended initiatives are discussed in the text of each section however a summary table of recommended initiatives is provided at the end of each section. The summary of recommended initiatives identifies measures as either those to be implemented community-wide or those pertaining to municipal government operations, or both. Many community initiatives will require action and support from City government.

## A. ENERGY AND RENEWABLES: BUILDINGS AND FACILITIES

Buildings and facilities contribute to greenhouse gas emissions in two major ways. First, buildings and facilities consume electricity for lighting, cooling, computers, printers, copiers and moving water and wastewater. Facility operations also require the use of fuels such as oil and natural gas, primarily for space heating.

Secondly, fire suppression, air conditioning and refrigeration equipment in buildings can emit hydrofluorocarbons (HFCs) and other greenhouse gases when these systems leak refrigerants or fire suppressants.



Buildings and facilities account for a significant portion of energy use. According to the U.S. Department of Energy, households and commercial buildings consume more energy than the transportation or industry sectors, accounting for nearly 40 percent of total U.S. energy use.<sup>ix</sup>

Total building energy consumption in 2008 was about 50% higher than consumption in 1980. Space heating equipment and water heaters were the dominant sources of consumption, using almost half of all energy in the buildings sector.<sup>x</sup>

This section summarizes the community and local government energy and GHG emissions from buildings and facilities in the City of Kingston. More specific energy information was available for City government buildings and facilities whereas aggregate energy data was used to estimate GHG emissions for building and facilities in the community. Also presented are recommended initiatives that both the local government and the community can take to improve energy efficiency in buildings and facilities to achieve energy and GHG reduction goals.

Data on refrigerants used in fire suppression, air conditioning, and refrigeration equipment as well as in vehicles was either unavailable at the time of this analysis or beyond the scope but should be part of a future GHG evaluation.

### FINDINGS

#### COMMUNITY ENERGY AND GHG EMISSIONS

In the City of Kingston, the commercial and residential sectors combined, primarily the electricity and fossil fuels consumed in buildings and facilities, account for 59% of the community's energy consumption, 32% and 27% respectively. The commercial sector consumed the greatest portion of electricity usage at 63%, the residential sector 35%, and the industrial sector used the least, 3%.

The USDOE reports that electricity is the largest energy source for buildings, and the overall electricity consumption by buildings continues to increase. Natural gas is the second largest energy source and

petroleum (predominantly heating oil) a distant third. Buildings' demand for electricity was the principal force behind the 58% growth in net electricity generation in the U.S. from 1985 to 2006.<sup>xi</sup>

According to the USEPA energy used by commercial and industrial buildings in the United States is responsible for nearly 50% of emissions of greenhouse gases (GHGs) that contribute to global climate change.<sup>xii</sup>

*Over the past 30 years, the share of electricity used by appliances and electronics in U.S. homes has nearly doubled from 17% to 31%.<sup>3</sup>*

The City of Kingston's residential sector generated an estimated 58,247 tonnes of CO<sub>2</sub>e or 26% of community-wide GHG emissions in 2010. The City of Kingston's commercial sector generated an estimated 71,281 tonnes of CO<sub>2</sub>e or 32% of community-wide GHG emissions in 2010. Combined, local commercial and residential energy use resulted in well over half of the community's greenhouse gas emissions, 32% and 26% respectively.

In 2010 electricity usage in the City of Kingston contributed 25% of community-wide GHG emissions, 55,204 tonnes of CO<sub>2</sub>e and natural gas usage another 22%, 49,651 tonnes of CO<sub>2</sub>e. Fuel oil usage accounted for approximately 8% of the community-wide GHG emissions with commercially used residual fuel oil<sup>19</sup> accounting for 2% of Kingston community-wide GHG emissions. Propane, kerosene and waste-transported related emissions each accounted for 1% or less of the community-wide GHG emissions.

Commercial electricity usage accounted for 34,249 tonnes of CO<sub>2</sub>e or 62% of all GHG emissions from purchased electricity.

Additional information on residential and commercial energy usage and GHG emissions can be found in Sections IV and V. of ***The Community Energy and GHG Emissions Inventory Report*** in Appendix A.

## GOVERNMENT OPERATIONS ENERGY & GHG EMISSIONS

The City of Kingston owns a number of buildings used to provide services typical of municipal governments. The City buildings vary widely in the type of structures, age of construction and use of the building. Building construction age ranges from 1877 to 2001.

### ENERGY USAGE

In 2010 the City of Kingston government operations used approximately 4% of the community's total electricity, 1% of the natural gas, and less than half a percent of propane and fuel oil. Government operations

*The burning of coal and natural gas to supply buildings with electricity, coupled with direct burning of natural gas, makes buildings responsible for the largest share of U.S. carbon dioxide emissions, according to the USDOE. With the increase in buildings' electricity consumption, that proportion has risen from about one-third of the total in 1980 to almost 40% in 2005.<sup>4</sup>*

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<sup>19</sup> A general classification for the heavier oils, known as No. 5 and No. 6 fuel oils, that remain after the distillate fuel oils and lighter hydrocarbons are distilled away in refinery operations. (Local Government Operating Protocol, May 2010).

consumed 6% of the total diesel fuel but only 1% of the gasoline.

Including the energy costs associated with KHA, KWD and Dietz Stadium, in 2010 the City of Kingston government used more than 5% of the total electricity in the community, 4.3% of the natural gas, 1% of propane and less than half a percent of the fuel oil.

Excluding the energy costs associated with KHA, KWD and Dietz Stadium in 2010, the City government spent close to \$653,000 on energy related expenses for building and facility operations, approximately 41% of the total City government energy expenditures of \$1,590,415. The primary energy cost to operate buildings and facilities was electricity, \$487,764, or 75% of the total of \$652,793.

Of all government operated facilities the wastewater treatment plant was the largest consumer of energy, primarily electricity. The total energy costs associated with the operation of the wastewater treatment plant (WWTP) and sewers in 2010 were \$335,992. The WWTP total energy costs account for more than 21% of the City government's total energy costs (\$335,992 of \$1,590,415), second only to the operation of street lights and traffic signals.



The total energy costs to operate the buildings and facilities at the WWTP were \$303,143, close to half (47%) of the total buildings and facilities energy costs for the City government (\$652,793).

In 2010 the wastewater treatment facility (buildings, pumps and CSO stations) was the largest single user of the City of Kingston's government operations electricity consuming 2,525,109 kWh. The cost for the main plant and the annex was \$225,958 and including pumps and CSO stations the total electricity costs for wastewater and sewer was \$268,206. The electricity costs at the plant alone accounted for approximately 17% of the City's total energy costs, and approximately 26% of the government's overall electricity bill of \$1,012,384. The plant's electricity usage accounted for almost 40%<sup>20</sup> of the government operations electricity, the largest percentage of the governments total electricity usage.

*The process of generating electricity is the single largest source of CO<sub>2</sub> emissions in the United States, representing 41 percent of all CO<sub>2</sub> emissions.<sup>5</sup>*

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<sup>20</sup> (2,525,109 kWh of 6,461,721 kWh) Percentage based on City operations electricity usage, does not includes KHA, KWH and Dietz Stadium.

The buildings that are the top five largest consumers of electricity in the City of Kingston are identified in Table 7.

**Table 7: Five Largest Consumers of Electricity - City of Kingston Government Buildings\***

Buildings	Area (sq ft)	2010 Electric Usage (kWh)	2010 Cost (\$)
WWTP 91 E Strand St Bldg 17	**	2,233,440	\$223,018
Police and Court 1 Garraghan Drive	25,907	481,360	\$46,702
City Hall 420 Broadway	22,500	315,360	\$36,405
Water Treatment 1442 Sawkill	**	154,560	\$18,191
DPW Garage 478 Hasbrouck Ave	**	110,400	\$13,452

\* Does not include KHA facilities.

\*\* Data unavailable

The Andy Murphy Neighborhood Center, a Parks and Recreation Department operated facility was the largest consumer of natural gas in 2010. City Hall was second and Building 13 at the wastewater treatment facility plant, third.

**Table 8: Five Largest Consumers of Natural Gas - City of Kingston Government Buildings\***

Buildings	Area (sq ft)	2010 Natural Gas Usage (CCF)	2010 Natural Gas Usage (Therms)	2010 Cost (\$)
Andy Murphy Neighborhood Center	30,831	18,708	19,157	\$23,320
City Hall	22,500	14,009	14,345	\$18,458
WWTP 85 E Strand St Bldg 13	**	11,436	11,710	\$15,116
Police and Court	25,907	8,926	9,140	\$10,970
Rondout Neighborhood Center	**	8,826	9,038	\$11,002

\* Does not include KHA facilities.

\*\* Data unavailable

The Kingston Housing Authority (KHA) manages 481 affordable housing units in 6 facilities in and around Kingston. The Kingston Housing Authority is an independent authority however since the Executive Director of the KHA is appointed by the Mayor it was determined that the City has some level of operational control of the Housing Authority and therefore was included in the inventory.

KHA energy-related expenditures in 2010 were estimated at approximately \$268,389 with electricity usage accounting for the majority of the energy expenditures, 58%. <sup>21</sup>

KHA buildings and facilities used a significant amount of natural gas relative to the total amount of natural gas used by all other City government buildings and facilities. KHA facilities used 283,795 CCF at a cost of \$106,177. Considering that the use of natural gas at KHA facilities is primarily for 'residential'

<sup>21</sup> Utility data for Stuyvesant Charter was inadvertently not accounted for. Therefore KHA energy usage and cost for 2010 will be slightly greater.

heating it is important to look at natural gas usage excluding KHA facilities. By comparison KWD facilities used 6,266 CCF of natural gas, Dietz Stadium used 3,004 CCF and all other City government facilities used 113,267 CCF of natural gas.

Not including the natural gas usage by KHA facilities, Kingston Parks and Recreation, as a department, was the most significant user of natural gas in 2010, with wastewater facilities second. The primary consumer of natural gas at the wastewater facility is the sludge pelletizer.

## GHG Emissions

City government buildings and facilities, including wastewater treatment, accounted for approximately half<sup>22</sup> of government operations GHG emissions in 2010. The wastewater treatment facility as a whole (buildings, pumps, CSO stations, process emissions) was the largest single source of government GHG emissions, 1,202 tonnes of CO<sub>2</sub>e.

The GHG emissions from all City buildings and facilities in 2010 (including wastewater, water and solid waste facilities, and housing authority facilities) were estimated to be approximately 4,469 tonnes of CO<sub>2</sub>e.<sup>23</sup> Water delivery facilities contributed 204 tonnes of CO<sub>2</sub>e and the solid waste transfer station 8 tonnes of CO<sub>2</sub>e.

Excluding KWD, KHA, and Dietz Stadium the GHG emissions from City operated facilities are estimated at 2,264 tonnes of CO<sub>2</sub>e.

**Table 9: Top Five Contributors to Greenhouse Gas Emissions from Buildings and Facilities\***

Buildings and Facilities	CO <sub>2</sub> e (tonnes)
WWTP 91 E Strand St	1,033
Police and Court	198
City Hall	174
Andy Murphy Neighborhood Center	124
DPW Garage 478 Hasbrouck Ave	79

\*KHA, KWD and Dietz Stadium are not included in the ranking.

The total greenhouse gas emissions for the Kingston Housing Authority in 2010 were an estimated 1,982 tonnes of CO<sub>2</sub>e. The majority of GHG emissions from KHA are from the use of natural gas, 1,541 tonnes of CO<sub>2</sub>e, 78% of the total CO<sub>2</sub>e emitted by KHA.

While KHA facilities produced a significant percentage of GHG emissions, an estimated 1,982 tonnes of CO<sub>2</sub>e, again it is important to note that the electricity and natural gas used at KHA facilities is primarily for residential purposes. Therefore it is important that City operations GHG emissions be examined separately.

<sup>22</sup> 2,263 tonnes of CO<sub>2</sub>e of 4,587. Does not include KHA, KWD and Dietz Stadium.

<sup>23</sup> Includes KHA, KWD and Dietz Stadium.

Detailed discussions of the energy usage and GHG emissions of wastewater treatment facilities can be found in Appendix J. Additional information on buildings and facilities energy use and GHG emissions can be found in Section IV. of Appendix B ***The Local Government Energy and GHG Inventory Report.***

## Outdoor Public Lighting

In 2010, the City spent \$524,620 on outdoor public lighting. The electricity costs associated with outdoor public lighting accounted for the largest single portion of the City's total energy bill, approximately 33%. The electricity consumed by outdoor public lighting in 2010 accounted for 35% <sup>24</sup> of the City governments total electricity usage and 52% <sup>25</sup> of the City's electric bill.<sup>26</sup>

Most of the usage and cost of outdoor public lighting in 2010 was attributed to street lights, which is 30% of the City's total electricity usage at a cost of \$481,008, which was almost 48% of the City's 2010 total electric bill of \$1,012,384.<sup>27</sup> The cost/kWh for street lighting was \$0.248/kWh. This includes demand and other charges but is still a very high cost per kW. By comparison, on average, the City paid an average of \$0.115/kWh for electricity in 2010 (non-street lighting costs).

Overall in 2010 outdoor public lighting accounted for approximately 15% of the City operations GHG emissions.<sup>28</sup>

Street lighting accounted for 87% of the GHGs emitted by outdoor public lighting.<sup>29</sup>

Street lighting was 13% of total government operations GHG emissions in 2010.<sup>30</sup>

More information on the City outdoor public lighting including a detailed account of City street lamps can be found in Appendix L.

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<sup>24</sup> (2,228,944 kWh of 6,461,721 kWh)

<sup>25</sup> (\$524,620 of \$1,012,384)

<sup>26</sup> Percentage based on City operations alone, does not include KHA, KWD and Dietz Stadium.

<sup>27</sup> Usage and costs numbers do not include KHA, KWD and Dietz Stadium.

<sup>28</sup> 694 tonnes of CO<sub>2</sub>e of 4,587 total tonnes of CO<sub>2</sub>e. Does not include KHA, KWD, Dietz Stadium and employee commuting. Including GHG emissions from KHA, KWD, Dietz Stadium and employee commuting, outdoor public lighting is 10% of overall total (694 tonnes of CO<sub>2</sub>e of 7,281 total tonnes of CO<sub>2</sub>e).

<sup>29</sup> 603 tonnes of CO<sub>2</sub>e of 694 tonnes of CO<sub>2</sub>e

<sup>30</sup> 603 tonnes of CO<sub>2</sub>e of 4,587 total tonnes of CO<sub>2</sub>e. Does not include KHA, KWD, Dietz Stadium and employee commuting. Including GHG emissions from KHA, KWD, Dietz Stadium and employee commuting, outdoor public lighting is 8% of overall total (603 tonnes of CO<sub>2</sub>e of 7,281 tonnes of CO<sub>2</sub>e).

## PROPOSED GOALS

- Reduce energy consumption, improve energy efficiency and reduce energy related costs.
- Support and promote the use of renewable forms of energy.
- Improve awareness of opportunities for energy efficiency and GHG emissions reductions.

### By 2020:

- Reduce overall energy consumption and GHG emissions in the City and in municipal government operations by at least 20%.
- City of Kingston government will get at least 20% percent of its energy from renewable sources.

## RECOMMENDATIONS

### COMMUNITY RECOMMENDATIONS

Reducing energy use and cutting greenhouse gas emissions in the community will require advancing measures that cut energy consumption in the commercial and residential sectors with a particular focus on measures that can decrease building electricity use and fuel used for space heating.

It is recommended that the City government take a lead role in working with local businesses, not-for-profits, community groups, the general public and any other interested stakeholders to promote and advance energy efficiency improvements for commercial and residential facilities city-wide.

When updating land use policies, zoning and building codes it will be important to include provisions that address energy use, energy efficiency and GHG emissions reduction goals. Reducing the energy used in buildings can be addressed through policies that promote energy efficiency and sustainable or 'green' building design and operations that will reduce overall building fossil fuel consumption, reduce GHG emissions and create healthier places in which to live and work.

Some of the specific initiatives that the City can take are discussed below. A more complete list of proposed initiatives can be found in the 'Summary of Recommendations' at the end of the section.

#### A. Local Financing Mechanism for Energy Retrofits

It is strongly recommended that the City create a local financing program based around Property Assessed Clean Energy (PACE) that can offer local property owners the ability to secure low cost loans to make energy improvements which could then be recovered through an increase in the property taxes.

PACE allows property owners to finance energy efficiency measures and renewable energy projects for their homes and commercial buildings. Interested owners opt-in to receive financing that is paid back with an assessment on their property taxes for up to 20 years. PACE spreads the cost of energy improvements such as weather sealing, insulation upgrades, more efficient heating and cooling systems, solar installations and the like, over the expected life of the measures and allows the repayment obligation to transfer automatically, like other property assessments, to the next owner if the property is

sold. PACE programs are designed so that annual energy cost savings will exceed annual assessment charges.<sup>xiii</sup> In other words, particularly with rising energy prices, the money saved on energy expenses will exceed the additional payments on the assessment. Please see [www.pacenow.org](http://www.pacenow.org) for more information.

It is strongly recommended that the City examine other municipalities that have established such programs particularly the Town of Bedford, Westchester County. Bedford has adopted PACE enabling legislation that will allow homeowners to apply for loans for energy upgrades and improvements with a 15 to 20 year repayment period that would be paid back as a special assessment on the tax bill. If the property is sold, the loan can be transferred to the next owner. The program is voluntary and those that participate should see a greater savings on their energy costs than the investment that they had made on the improvements.

The Bedford program established an Energy Improvement Corporation to implement the PACE program for Bedford and any other municipalities that adopt PACE enabling special assessment districts: See [www.energyimprovementcorp.org](http://www.energyimprovementcorp.org).

### **PACE Programs**

**City of Ann Arbor** In the fall of 2011 the Ann Arbor City Council passed a resolution of intent to establish a PACE program, stating that financing energy projects serves a valid public purpose by reducing energy costs and greenhouse gas emissions, as well as stimulating the economy and improving property values. Through the city's PACE program, qualifying property owners will be able to borrow money for energy efficiency projects ranging from \$10,000 to \$350,000 and then pay back the loans through special assessments added onto their tax bills for up to 10 years.

**Babylon, NY:** Begun in 2008, the Long Island Green Homes program uses funds from the town's solid-waste reserve fund to provide financing for efficiency or renewable energy projects (based on a town council decision that the carbon content of greenhouse gases constitutes a solid waste problem). After the homeowner completes an audit, the town pays contractors directly; property owners pay back the cost via a trash bill surcharge with 3% interest.

**Boulder County, CO:** The ClimateSmart Loan Program provides financing to residential and commercial property owners for efficiency or renewable projects. The program was established with \$40 million in funding available, financed by tax-exempt bonds issued by the county. The program has been operational since early 2009 for the residential sector; the commercial portion began in 2010. While the residential program has been suspended pending resolution of the Fannie Mae / Freddie Mac issue, the commercial program is still active.

<http://www.annarbor.com/news/student-rental-houses-could-benefit-from-energy-efficiency-upgrades-under-ann-arbors-new-pace-progra/>

Property Assessed Clean Energy Financing, Alliance to Save Energy  
<http://ase.org/resources/property-assessed-clean-energy-financing-pace>

## B. Local Energy Conservation Code

It is recommended that the City of Kingston ensure that all local codes and local code requirements are, at a minimum consistent, and comply with the 2010 Energy Conservation Construction Code of New York State (ECCCNYS).

Buildings that comply with energy codes are more energy-efficient and use less energy in their lifetimes. However potential energy savings can only be realized when projects actually comply with the code.

The City may also want to consider higher energy efficiency performance standards. Specific model energy codes which have been developed for local government adoption include ASHRAE Standard 189.1, International Green Construction Code and Leadership in Energy and Environmental Design (LEED).

*Strong building energy codes are one of the most affordable and effective mechanisms for advancing energy efficiency in buildings, yet compliance with energy codes is often poor. By simply enforcing existing energy codes, local governments can achieve dramatic energy reductions at a relatively modest cost. Each dollar spent on energy code compliance yields \$6 in energy savings.<sup>6</sup>*

## C. Energy Code Training

It is strongly recommended that the City actively provide regular training for local code enforcement to ensure that City of Kingston residential and commercial buildings comply with the 2010 Energy Conservation Code of New York State (ECCNYS).

NYSERDA offers free or low-cost 'Energy Code' training and support programs including on-line courses, in-person training, compliance tools and a resource library.

For more information:

<https://nyserdacodetraining.com/>

## D. Green Building Standards

Building energy efficiency and renewable energy requirements can be adopted as part of local Green Building standards. Green building standards should address more than energy encompassing other initiatives outlined in this Plan. A local 'green' code can be part of a more comprehensive approach to sustainable development.

'ENERGY STAR®' rating for residential development or another best practice residential green building standard should be adopted through local legislation and be incorporated into the updated Comprehensive Master Plan and Zoning Code. Local residential multiple dwelling developments should be required to follow practices established by the Leadership in Energy and Environmental Design (LEED) - Neighborhood Development rating system, but not necessarily requiring certification, unless the City deems such certification to be important.

To develop a local green building code that is appropriate for the City of Kingston a review and analysis of relevant green codes will be necessary. The US Department of Energy provides a summary of **Green Building Codes and Programs** at:

<http://www.energycodes.gov/GreenBuildings/sources/programs.stm>

### Why Build Green?

According to the United States Green Building Council:

*“Buildings in the United States are responsible for 39% of CO<sub>2</sub> emissions, 40% of energy consumption, 13% of water consumption and 15% of GDP per year, making green building a source of significant economic and environmental opportunity. Greater building efficiency can meet 85% of future U.S. demand for energy, and a national commitment to green building has the potential to generate 2.5 million American jobs.”<sup>xiv</sup>*



## Relevant Green Codes

[ASHRAE 189](#): Standard for the Design of High-Performance, Green Buildings Except Low-Rise Residential Buildings, published in January 2010 and is applicable to new commercial buildings and major renovation projects.

[IgCC](#): The International Green Construction Code (IgCC) is currently under development. The IgCC will be applicable to all new construction and renovation to existing buildings other than residential structures.

[ICC-700-2008 National Green Building Standard](#): The ICC-700-2008 National Green Building Standard defines green building for single and multi-family homes, residential remodeling projects, and site development.

[LEED](#): The LEED certification system provides third-party verification addressing energy savings, water efficiency, CO<sub>2</sub> emissions reduction, improved indoor environmental quality, and stewardship of resources.

[ENERGY STAR](#): The U.S. EPA outlines criteria for ENERGY STAR certification of homes and commercial buildings. ENERGY STAR homes are typically 15% more energy efficient than average minimum energy codes. New York State allows local jurisdictions to adopt ENERGY STAR as their minimum residential energy code and many, such as Brookhaven, have done so.

[EarthCraft House](#): EarthCraft House is a points-based program that includes ENERGY STAR certification in its baseline.

[Collaborative for High Performance Schools](#): This standard mandates energy efficiency 25 % above ASHRAE 90.1-2004. Originally a California standard, it is being revised for regional factors and adopted by states and school districts across the country.

### **A Simplified Sustainable Development Checklist**

- ☐ use previously disturbed sites, protecting and restoring habitat
- ☐ repair and reuse existing buildings
- ☐ use products made from secondary or high recycled content
- ☐ use durable products and materials – choose materials that will last
- ☐ use sustainable materials that are from rapidly renewable resources
- ☐ use materials with low embodied energy – products not heavily processed or manufactured, which tend to require more energy
- ☐ buy locally produced building materials
- ☐ use salvaged building materials when possible – lumber, bricks
- ☐ eliminate or minimize use of pressure treated lumber
- ☐ maximize use of renewable sources of energy – solar, wind, geothermal
- ☐ maximize use of natural light
- ☐ seek to avoid using potable water for landscaping or irrigation
- ☐ use waterless or water saving fixtures
- ☐ use ‘green’ infrastructure to manage stormwater - rain gardens, grassy swales
- ☐ use innovative wastewater technologies
- ☐ provide storage, collection and delivery of recyclables to a recyclables processor

## **E. Commercial Energy Policy**

Due to the fact that commercial buildings use significant amounts of energy which results in substantial GHG emissions, *ICLEI-Local Governments for Sustainability USA* and the *Institute for Market Transformation* have developed a toolkit that presents local policy makers with 11 proven and complementary policy options that will reduce energy use in this sector.

The tool kit includes policy recommendations for energy audits and retro-commissioning, benchmarking and disclosure, compliance and enforcement, factoring energy efficiency into commercial appraisals, working with landlords and tenants on ‘split incentives’, sub metering, recognition and more.

Specific information regarding the City’s commercial building stock, particularly the total square footage of commercial space was unavailable for the development of this Plan. An assessment of the City’s commercial building stock is needed to better understand the square footage of commercial space in the City as well as a breakdown of size and type of commercial space.

It is recommended that the City conduct a commercial building assessment and use the toolkit referred to above to create a Commercial Energy Policy for the City of Kingston. This policy should also consider the LEED rating system or similar ‘green’ building standards for new or renovated commercial space.

## **F. City Lighting Ordinance**

It is recommended that the City adopt a lighting ordinance using the model developed by The International Dark Sky Association (IDA) and the Illuminating Engineering Society of North America (IES). While lighting ordinances are ordinarily thought of as addressing light pollution it is important to

consider the energy impacts of lighting distribution. That is the wasted light; light trespass, glare and sky glow result in wasted energy.

The Model Lighting Ordinance developed by IDA and the IES provides guidance on how to drastically reduce light pollution and glare and lower excessive light levels. The recommended practices of the IES can be met using readily available reasonably priced lighting equipment.

The stringency of lighting restrictions can be adopted according to the sensitivity of the area as well as accommodating community intent. The impact of the model ordinance can be fine-tuned without having to be customized. The model ordinance can be found on the IDA website at:

[http://www.darksky.org/index.php?option=com\\_content&view=article&id=622](http://www.darksky.org/index.php?option=com_content&view=article&id=622)

### G. Energy Awareness Program

A local community energy awareness or energy challenge program is a useful tool to engage the community in energy issues and provide information to businesses and residents about energy audits, energy conservation measures, energy efficiency program incentives and the opportunity to change energy habits.

It is recommended that the City of Kingston strongly consider an energy challenge or energy awareness program that is consistent with the goals of this Plan. It is recommended that the City of Kingston and the Climate Smart and Green Jobs Community Task Force work with the Mid-Hudson Energy Smart Communities Program, the Rural Ulster Preservation Company, Cornell Cooperative Extension of Ulster County, Sustainable Hudson Valley, Central Hudson's Energy Efficiency program and others to determine the potential to successfully engage the community in an energy challenge program in the City of Kingston.

#### **Energy Efficiency Savings from Central Hudson Gas & Electric**

Central Hudson offers a variety of energy efficiency rebates and incentives for homes and businesses.

For example, Central Hudson offers a rebate of up to \$600 for having your home professionally sealed by a Building Performance Institute (BPI) certified Trade Ally after a blower door test. The blower door test is one of several special diagnostic tools BPI certified Trade Allies use to pinpoint and seal hidden air leaks. Sealing your home's envelope (outer walls, ceiling, windows, doors, and floors) is often the most cost effective way to improve energy efficiency and comfort. A skilled Trade Ally can save you up to 20% on heating and cooling costs (or up to 10% on your total annual energy bill) by sealing and insulating, according to estimates from Energy Star.

For more information on Central Hudson's energy efficiency rebates visit:

<http://www.savingscentral.com/>

## Home Energy Audit

Most New Yorkers qualify for a free or reduced-cost comprehensive home energy assessment, also referred to as an energy audit. Visit: <http://nyserdagreeny.org/home-performance>

### Energy Assistance for Low and Moderate Income Households

To reduce the energy burden on households that are particularly susceptible to high and fluctuating energy costs, the following programs provide cost-effective home improvements:

- Assisted Home Performance with ENERGY STAR
- Assisted New York ENERGY STAR Homes
- EmPower New York<sup>SM</sup>
- Low-Income Home Energy Assistance Program (HEAP)
- Weatherization Assistance Program (WAP)

<http://www.nyserda.ny.gov/en/Page-Sections/Residential/Programs/Low-Income-Assistance.aspx>

## Weatherization Assistance Services

Ulster County Community Action Committee, Inc.

70 Lindsley Ave

Kingston, NY 12401

**Contact:** Anthony Pampinella

**Phone:** (845)338-8750

**Email:** [uccawx@hotmail.com](mailto:uccawx@hotmail.com)

**Service Profile:** Weatherization assistance providers can assist eligible homeowners and owners of rental properties with measures to improve energy efficiency including:

- an energy audit of the home to identify specific needs;
- weatherstripping and caulking around doors and windows;
- cleaning, testing, repairs, or replacement of heating systems;
- replacement or repair of storm windows;
- replacement or repair of broken windows and/or outside doors;
- addition of insulation to walls or ceilings;
- mitigation of health and safety concerns, in particular assure that all dwelling units receive smoke detectors and carbon monoxide detectors.

Weatherization Services may also include other energy-related improvements such as: water heater repair/replacement, roof repair/replacement, chimney repairs, lighting fixture replacement, venting systems, heating distribution system replacement, refrigerator replacement, installation of GFCI outlets, and electrical service upgrade.

Weatherization services are available to income-eligible (60% of State median income) individuals who may be either home owners or renters living in a mobile home, an apartment, or a single-family home.

[http://www.dhcr.state.ny.us/Apps/profiles/profile\\_detail.asp?applid=3242](http://www.dhcr.state.ny.us/Apps/profiles/profile_detail.asp?applid=3242)

## On-Bill Financing of Energy Improvements

It is recommended that the Climate Smart and Green Jobs Community Task Force work with the Mid-Hudson Energy Smart Communities Program and the Green Jobs Green NY Program and others to actively promote the use of 'on-bill financing' for residential energy efficiency home improvements.

The On-Bill Recovery Loan Program allows residents to finance energy efficiency improvements to their home through a charge on their utility bill. The repayment amount will be based on projected savings on their energy bills. The payments appear as a separate line item on the utility bill and are financed at a special low interest rate (currently 2.99%) that may be tax deductible. The program is transferable if the property is sold. Customers of Central Hudson Gas and Electric are eligible for the On-Bill Recovery Loan Program.<sup>xv</sup>

For more information on the On-Bill Recovery Loan Program please see:

<http://www.nyserda.ny.gov/About/Statewide-Initiatives/On-Bill-Recovery-Loan-Program.aspx>

## H. Renewable Energy Opportunities

City policies and plans can promote the local use of renewable forms of energy in both new development as well as redevelopment within the City. The update to the Comprehensive Master Plan and Zoning Code presents an ideal opportunity for the City to advance renewable energy as well as other sustainable energy practices.

As the Comprehensive Master Plan and Zoning Code are updated the City should ensure that the local zoning and building codes accommodate and encourage renewable forms of energy production throughout the City.



This 216-panel photovoltaic system was installed in 2011 on Building 21, Tech City, Kingston NY. It is a 50KW system that is expected to produce about 60,000 kWh annually for the Tech City tenant 'Farm-To-Table'. Since the commissioning of the solar system in September 2011 it has produced 6% more power than anticipated. The solar array is providing approximately 20% of Farm-to-Table's electricity.

SolarTech Renewables, a local manufacturer of solar panels based in Tech City, produced and installed the panels.

## MUNICIPAL GOVERNMENT RECOMMENDATIONS

Government buildings and facilities present the greatest opportunity to reduce energy usage, cost and cut GHG emissions. Buildings and facilities accounted for 41% of the City government energy costs and 49% of the GHG emissions. Second to buildings and facilities are vehicles.

To make significant strides in reducing energy costs and GHG emissions it will be important for the City government to make a concerted effort to measure and manage its energy use and energy costs.

Energy efficiency improvements should be a regular part of building management and operations. Significant energy savings can be realized through improvements to buildings and facilities particularly at the wastewater treatment facilities as well as indoor and outdoor lighting. While energy efficiency retrofits and improvements should be the initial step, the use of energy efficient equipment and the installation of renewable sources of energy at municipal facilities will help the City government become more energy independent, reduce overall energy costs and reduce GHG emissions.

Some of the potential priority initiatives are discussed in detail below. A more complete list of recommended initiatives that can be taken by the City government can be found in the 'Summary of Recommendations' at the end of this section.

### A. City of Kingston Office of Energy & Sustainability

It is recommended that the City create a City of Kingston Office of Energy and Sustainability to oversee energy planning and management for the City, monitor government energy usage and cost, account for greenhouse gas emissions and measure progress in achieving energy efficiency and sustainability goals.

Energy planning and management should incorporate a wide range of measures to reduce the wasteful use of energy and encourage an atmosphere of energy independence. Two distinct areas will be addressed to improve overall energy efficiency in City government operations: building management and operation and fleet management.

A growing number of cities have demonstrated their leadership to create more energy efficient and sustainable government operations and community practices through the development of a local government program. Such a local government program can establish the City of Kingston as one of those leaders.

An Office of Energy and Sustainability would work with the Common Council, the Mayor and department heads to establish energy and resource efficiency goals. The primary goals will be to reduce and minimize government operated facility and vehicle operating energy costs through energy efficiency and renewable energy. Through existing and new programs and projects the Office would work to achieve



those goals. The Office would also work with local businesses, not-for-profits and community organizations to promote and advance energy and sustainability goals.

The Office would:

- Maintain an energy database for all city facilities to provide a baseline of energy use, costs and savings.
- Manage projects including energy purchases, energy efficiency improvements, renewable energy at City-owned facilities.
- Manage projects for energy use, energy efficiency for City-owned vehicles.
- Maintain an Energy and Sustainability web site.
- Develop and distribute information resources.
- Work with municipal departments to design and implement projects to reduce energy use and costs.
- Advise the Common Council, Mayor, City staff and the general public on energy and sustainability matters related to policies, planning and programming.
- Manage energy and environmental purchasing to allow for intelligent purchases of energy for city facilities and transportation.
- Work with the Economic Development Office to create 'green' jobs and stimulate a 'green' economy in the City.
- Create and manage a municipal energy fund to finance energy projects.
- Annually report energy use and energy budget and budget recommendations.

#### Funding an Office of Energy and Sustainability

The initial funding of an Office of Energy and Sustainability can be achieved in part through energy improvements. Continued efforts can be made to build stable financing for energy and sustainability projects, with an emphasis on approaches that can result in self-financing through innovative mechanisms as well as using grants, rebates and incentives.

There are a number of models that can be examined to determine how the City can sustain financing for energy efficiency and energy improvements. Some cities, such as the City of Ann Arbor, created an Energy Fund by re-investing the funds saved through energy efficiency measures in other energy saving projects. The city initially used its bonding authority to fund energy efficiency measures. The bond payments were made with the energy cost savings. Once paid off, instead of eliminating the bond payments from the annual budget the city chose to create an Energy Fund at 50% of the annual bond payments.

The City should also consider other potential sources of revenue to fund this important effort. It is recognized, however, that in the current economy it is unlikely that the City will allocate funding for a new initiative. However, it should also be recognized that many of the initiatives outlined in the Plan will pay for themselves in short timeframes and will result in long-term savings and overall improved fiscal management.

It is recommended that the City of Kingston Climate Smart and Green Jobs Community Task Force explore other models and all practical financing mechanisms to fund City energy and sustainability projects and programs.

## B. Municipal Energy Conservation Policy

It is recommended that the City establish a municipal government Energy Conservation Policy that:

- Sets goals for energy efficiency and renewable energy for municipally owned and operated buildings, facilities and vehicles.
- Reduces overall energy consumption in municipal government operations and overall energy use in the City by at least 20% by 2020.
- Establishes energy conservation policies/measures (decrease plug-loads, programmable thermostats for maximum energy conservation, etc).
- Requires minimum fuel efficiency of fleet vehicles, and consideration of alternative fuel vehicles as part of vehicle purchasing.
- Reduces overall vehicle fuel usage by at least 20% by 2020.
- Sets goals of 20% of City government vehicle fleet to be hybrid and alternative fuel vehicles by 2020.

## C. Government Facility Energy Improvement Plan

It is recommended that the City create a Facility Energy Improvement Plan to:

- Conduct energy audits and retrofits, commissioning and retro-commissioning of HVAC systems, lighting control upgrades, etc.
- Explore opportunities for lighting upgrades, specifically the use of LEDs at municipal facilities.
- Explore opportunities for lighting controls at municipal facilities such as City Hall.
- Establish energy conservation policies/measures (i.e. decrease plug-loads, programmable thermostats for maximum energy conservation, etc).
- Identify opportunities for solar and other renewable installations.



The Plan should outline programs and projects that will reduce and minimize facility and vehicle operating energy costs through energy efficiency and renewable energy.

Potential projects to be included in the Government Facility Energy Improvement Plan:

### Upgrade City Streetlights and Traffic Signals

#### Lamp Upgrades

Upgrading outdoor lighting, particularly street lighting, presents a tremendous opportunity for energy and monetary savings. There are approximately 700 Mercury Vapor street lamps (the most inefficient lamp besides incandescent), in the City of Kingston. The majority of these lamps are owned and maintained by Central Hudson.

If an older light such as an incandescent or Mercury Vapor lamp needs to be replaced, Central Hudson replaces it with an equivalently sized high pressure sodium light. Central Hudson does not increase the wattage of a street light without a written request from the City.<sup>31</sup>

Upgrading the 700 Mercury Vapor street lamps to high pressure sodium will result in an approximate annual savings of \$46.00 per lamp per year or \$30,176.

Central Hudson is supposed to be upgrading at least 5% of the street lamps annually, however in recent years this is not being done. In an analysis of the mercury vapor lamps, only 16 had been replaced between November 2009 and August 2011 (20 months). Central Hudson is not changing out 5% of company owned lights per year as at least 33 should have been replaced in 2010. The City must more diligently work with Central Hudson on a regular basis to ensure that at a minimum they are upgrading the 5% annually. It is recommended that the City urge Central Hudson to approve going above and beyond the 5%, particularly in light of the fact that they have not been meeting the 5% in recent years.

Additional information and a more detailed discussion of street lights including a detailed breakdown of these lamps can be found in Appendix L. ***City of Kingston Public Lighting.***

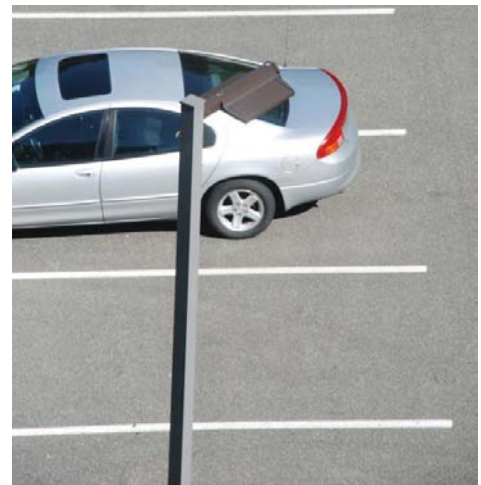
### LEDs

LEDs (Light Emitting Diodes) street lighting, area lighting and traffic signals can significantly reduce lighting energy costs as well as reduce maintenance lighting costs. In general LED lighting costs about 70% less per year to operate than traditional lights such as high-pressure sodium vapor lamps, Mercury Vapor or metal halide lights.

LED Lighting Fixtures were installed at all three driveway and parking area facilities at Kingston, Benedictine, and Margaretville Hospitals. The energy savings is estimated to be over \$17,000 a year in energy and labor costs, a 70% annual savings for the hospitals.

The City of Ann Arbor is saving \$49,000 annually by replacing incandescent traffic signals and pedestrian crossing signals with LEDs. Ann Arbor is anticipating cutting its street lighting bill in half by utilizing LED street lighting.

By upgrading 25 Mercury Vapor lamps to LEDs, there is an estimated annual energy savings of \$7,500. With regard to lamps owned and maintained by Central Hudson, the challenge will be to work with Central Hudson to determine annual kWh and



Overhead LED Fixture Benedictine Hospital, Kingston

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<sup>31</sup> Email from Sam Rosenberry, Central Hudson August 1, 2011.

annual charges for LED fixtures. Conversion savings will depend on the lamps involved. At a minimum the City can examine upgrading City owned and operated lamps. While there are upfront costs associated with relamping and reballasting City owned fixtures payback time will be fairly quick, probably three years or less.

#### Traffic Signals and LEDs

All municipalities will eventually have to switch to LED traffic signal bulbs. The Energy Policy Act of 2005 requires all traffic signal fixtures to meet ENERGY STAR (2003) power requirements, effectively requiring the use of LED lamps in traffic signal heads.<sup>32</sup>

### D. WWTP Energy Efficiency Improvement Plan

While street lighting was the largest single electricity cost to the City, as is discussed above, the largest electricity consumer in the City is the Kingston Wastewater Treatment Plant (WWTP). It is recommended that the City develop an energy efficiency improvement plan for the WWTP to explore and continually upgrade energy efficiency measures and renewable energy opportunities at the plant. The plan can include:

#### Upgrading Aeration, Installation of Turbo Blowers

One of the largest, if not the largest, consumer of energy at the WWTP is the aeration blowers. Typically aeration costs range from 45-75% of the energy cost of a WWTP. Turbo blower manufacturers claim to offer significant energy savings (20-40%) over conventional blower equipment.

The City of Louisville, Colorado purchased high speed turbo blowers for its wastewater treatment facility. According to their Wastewater Facility Superintendent "The wastewater treatment facility is saving 25-30% in energy and that will pay off the equipment within 5-6 years."

The City of Kingston WWTP has 4 aeration blowers that are 25 to 35 years old.

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<sup>32</sup> Energy Efficient Traffic Signal & Streetlights, Municipal Implementation Tool #20 December 2010, p.3

It is recommended that as part of an overall energy improvement plan for the WWTP, the City should assess the potential to upgrade the blowers with high speed turbo blowers or other energy efficient aeration equipment. A more complete assessment of the current age and condition of the aeration system as well as the cost of new blowers and potential funding sources would be necessary. Potential funding sources include NYSERDA and the New York State Environmental Facilities Corporation [www.nysefc.org](http://www.nysefc.org).

#### Wastewater Treatment Plant Hourly Pricing and Energy Manager

It is strongly recommended that the City develop an Energy Management Program for the WWTP utilizing the Central Hudson's Energy Manager Program.

Recently the City was notified that the WWTP will be subject to hourly pricing due to the fact that the plant has billed demands of greater than 300 kW. While electricity costs have the potential to increase as a result of hourly pricing the goal is to realize the benefits of reducing the system peak demand and shifting loads to off-peak, less expensive time periods. The City will have access to this hourly usage data through Central Hudson's Energy Manager Program. Before hourly billing begins on October 1, 2012, the City will have access to more than a years' worth of data through Energy Manager to make informed energy management decision-making prior to being subject to hourly pricing.

Identifying when during the day or week those 300 kW spikes occur, or whether there is fairly constant demand at that 300 kW level will be very important to determine. The City will want to determine what, if any additional costs are being incurred due to these spikes in usage.

Monitoring of energy usage and pricing information will help WWTP operators and other City officials make informed process decisions at the plant.

Developing an Energy Management Program for the WWTP setting specific energy reduction goals would be an important step for the City and could result in significant electricity cost savings at the WWTP.

#### Energy Use: Process-by-Process Basis

It is recommended that as part of an overall energy efficiency improvement plan that an assessment be conducted to better understand the electricity used by different processes at the plant.

This can be done by monitoring power at the plant for a specific period of time or through the use of submetering. An examination of performance and energy use on a process-by-process basis can help identify energy savings measures at the WWTP.

The energy improvements made at the WWTP as part of a NYSERDA 2007 Flex Tech study and energy performance contract with Wendel Duchscherer, Architects and Engineers can be found in Appendix K.

Through a NYSERDA FlexTech Grant, Malcolm Pirnie is currently conducting a Gas Generation and Heat Recovery Study for the WWTP.

## E. Municipal Green Building Policy

Green Building Codes for the community are discussed above. Many federal, state and local governments have adopted green building standards for government buildings and facilities.

It is recommended that the City of Kingston:

- Establish a policy requiring any new municipal facility or major renovation to a municipal facility achieve a LEED Silver or 'ENERGY STAR' rating or a similar sustainable building design standard.
- Set standards to operate and maintain its existing buildings and facilities in a more 'green' and sustainable fashion.



Guidance for sustainable building operation and maintenance can be found in the US Green Building Council LEED for Existing Buildings: Operations & Maintenance rating system: <http://www.usgbc.org/DisplayPage.aspx?CMSPageID=221>

'Green' or sustainable buildings are proven to have reduced energy expenditures and overall lower operating costs and reduce the overall impact on the environment as well as provide healthy indoor environments in which to work.

*Many federal agencies, states, and local jurisdictions have mandated or encouraged LEED certification for municipal buildings.<sup>xvi</sup>*

## **Communities in New York are Adopting Green Building Standards and Policies**

### **City of Syracuse, NY**

In 2007, Syracuse became one of the first cities in New York State to adopt green building standards for all new construction and major renovations of City-owned municipal buildings. The law requires that all major renovations and new construction of public buildings meet a LEED Silver standard. If there is no appropriate Silver standard, then the City Engineer can set an alternate green building standard. The ordinance does not apply to privately owned city buildings.

### **Town of Brookhaven, NY**

The town has adopted LEED standards for all new town buildings with a goal of "Gold" but at least basic LEED. The resolution requires the same LEED standards for 75 percent renovated town buildings. Additionally, in 2009, the town amended its definition of "Rubbish" to include the carbon component of energy waste.

### **Town of Red Hook, NY**

In 2009, the town adopted NY ENERGY STAR standards for any newly constructed one to four family dwelling, not more than three stories in height.

### **Town of Huntington, NY**

The town requires LEED certification for commercial buildings (2008) and also provides an incentive of increased building height from four (4) to six (6) stories in the light industry district for achieving LEED Silver standard (2006). Also, all new one-family dwellings must comply with the Long Island Power Authority (LIPA) New York ENERGY STAR Labeled Homes Program requirements. (2007)

### **Town of Malta, NY**

Applications for planned development districts, special use permits, and site plan approval of major subdivisions must contain a review of possible LEED certification. (2007)

<http://www.dec.ny.gov/energy/64095.html>

## F. Municipal Energy Efficient Procurement Policy

The City can save energy and save money by purchasing and using products that meet energy efficiency criteria. Purchasing efficient products can reduce energy cost without compromising quality and create a range of environmental and economic benefits.

According to the Lawrence Berkeley National Laboratory:

*Energy-efficient products require less energy to operate than conventional products, purchasing these products can reduce facility energy loads and achieve energy bill savings on the order of 5–10 percent (Lawrence Berkeley National Laboratory LBNL, 2002).* <sup>xvii</sup>

It is recommended that the City establish an Energy-Efficient Product Procurement Policy and program requiring the purchase of energy efficient and 'environmentally preferable' IT and office equipment including computers/servers, monitors, printers and copiers.

The City policy should, at a minimum, specify the purchase of ENERGY STAR products.

Additionally the City should educate purchasing agents, department heads, City officials and other key stakeholders about ENERGY STAR purchasing requirements, savings benefits, and available mechanisms for making these purchases.



ENERGY STAR is a partnership between the EPA and industry to label products such as office equipment and light fixtures and bulbs that meet certain energy efficient requirements. ENERGY STAR requirements are the standard for products meeting energy efficiency criteria.

According to EPA more than 2 million ENERGY STAR certified products have been purchased since 1992, saving the energy equivalent of the generation capacity of 70 power plants, reducing GHG emissions the equivalent of removing 25 million cars from the road.

There is guidance and tools available through the ENERGY STAR program and from EPA on creating energy efficient product procurement programs. ENERGY STAR offers an MS Excel calculator to estimate how much money and energy can be saved by purchasing ENERGY STAR products.

An 'Energy-Efficient Product Procurement Policy' can be part of a broader 'Environmentally Preferable Purchasing Program' that would address environmental attributes or impacts of many products such as toxic-free cleaners or VOC-free paints.

## ENERGY STAR COMPUTERS

Currently the City of Kingston has a total of 182 computers, 174 personal computer and 8 servers. Approximately 50 personal computers and 4 of the servers are used by the Kingston Police Department. The Kingston Water Department has two (2) servers.

Currently none of the City computers are ENERGY STAR, however about a third of them do have power management systems. The servers are particularly large consumers of electricity.

Using the ENERGY STAR calculator, replacing 50 of the City's current desktop computers with ENERGY STAR certified equipment will save approximately 33%. Each year approximately 6,664 kWh of electricity and \$800 will be saved or \$3,200 over a 4 year life of the equipment. By choosing ENERGY STAR equipment, GHG emissions will be reduced by approximately 10,262 pounds of carbon dioxide annually. This is equivalent to the emissions reduction of not driving a car for 333 days.

Using the CAPPA calculator, replacing 50 computers with ENERGY STAR certified equipment would result in annual electricity savings of up to \$1,206 and would result in the reduction of 3.5 metric tons of CO<sub>2</sub>e.

## G. Energy Efficiency Programs and Incentives

It is recommended that the City:

- Monitor and take advantage of energy programs and incentives available through the New York State Energy Research and Development Authority and through Central Hudson Gas and Electric. NYSEDA programs are summarized below.  
Track NYSEDA funding opportunities. This can be done by joining the NYSEDA Funding Opportunities List Serve to receive Program Opportunity Notices (PONs) and other funding information. To sign up visit <http://www.nyserda.ny.gov/Funding-Opportunities/Funding-Opportunity-Email-List.aspx>

## **NYSERDA Programs**

**Existing Facilities Program** - offers incentives to encourage applicants to implement cost-effective energy efficiency projects. Pre-qualified incentives are offered for small-sized energy projects and equipment replacement projects. <http://www.nyserda.ny.gov/existing-facilities>

**FlexTech Program** - FlexTech provides objective, customized information to help customers make informed energy decisions. Program participants receive analysis targeting their particular energy and business needs. Studies generally are cost-shared 50%. <http://www.nyserda.ny.gov/flextech>

**Industrial and Process Efficiency Program** - The IPE Program offers incentives to manufacturers and data centers to offset the cost of projects focused on increasing productivity, increasing process efficiency, reducing waste, and reducing electricity. <http://www.nyserda.ny.gov/ipe>

**New Construction Program** - provides technical and financial assistance when incorporating energy efficiency measures into the design, construction, and operation of new and substantially renovated buildings. <http://www.nyserda.ny.gov/new-construction>

## **H. Renewable Energy Opportunities**

One way to protect against volatility in energy cost is to supplement municipal facilities with on-site energy generation using renewable sources. A local government is well suited to reap the long-term benefits of renewable energy generation projects. Renewable energy resources can help the City better control energy costs. There are a number of opportunities within the City of Kingston for renewable energy generation.

It is strongly recommended that the City of Kingston develop a clean energy program examining the potential for using renewable forms of energy such as solar and geothermal. As deemed appropriate the City should actively and aggressively pursue installation of clean renewable energy systems. It will be important, however, to decrease energy usage through implementation of energy conservation and efficiency improvements prior to renewable energy installations.

### **Solar Energy**

The location and orientation of several government building structures and facilities are well-suited for solar energy generation which can help offset some of the City's electricity costs. Potential sites include the wastewater treatment plant, the Police Station on Garraghan Drive, the DPW Garage at 478 Hasbrouck Avenue and the Rondout Neighborhood



**Solar Thermal Hot Water System**

28 solar panels are used to preheat water at Benedictine Hospital in Kingston. A project of The Solar Energy Consortium (TSEC) was funded by a federal grant.

Center at 103 Broadway. Solar installations at these facilities may be possible with no up-front costs to the City using as a combination of financing mechanisms such as NYSERDA funds and private investor financing, such as power purchase agreements, which can take advantage of tax incentives.

It is recommended that the City of Kingston also explore the potential to take advantage of the new remote net metering law in New York, which allows non-residential customers to generate solar power in one location and use it in another. In other words the City can generate electricity with solar panels at one location and obtain credit for the electricity used at another location.

Additional sites and expansion of renewable energy opportunities should be part of a regular assessment of the City's energy planning and management.

### Geothermal

In March 2011 the City of Kingston Common Council passed a resolution authorizing the Mayor to sign a 'Letter of Intent' to commence discussions for the purposes of considering a Geothermal Power Purchase Agreement to govern the construction, installation and operations of a municipally based Geo-utility.

In May 2011 a 'Letter of Intent' was signed by the Mayor of the City of Kingston with GeoUtilities. GeoUtilities has contracted with Hardin Geothermal to examine the potential for a municipal geothermal utility starting in the Midtown area of Kingston.

*A GeoUtility system, through public/private partnerships between Hardin Geothermal, LLC (HG) and municipalities, brings geothermal water supply to each consumer without requiring substantial personal investment. The local labor force is provided skilled jobs and superior technical competence through GeoUtility-sponsored education and training. Money spent on coal, oil and gas that currently leaves the community will be redirected to local infrastructure, job creation, and community development.*<sup>xviii</sup>

Energy usage baseline data was supplied to Hardin

### Geothermal

Geothermal heating and cooling systems use electrically powered water-source heat pumps that use the earth's high thermal capacity and constant 50-55 degree temperature as a sustainable energy resource. The heat pumps provide heating and cooling from water circulating through pipes buried beneath the earth's surface. This process is 40-70% more energy efficient than conventional forced-air systems, which use lower capacity outside air (sometimes subject to extreme temperatures) as a resource for cooling and heating.

Your facility will be equipped with a water source heat pump, which uses geothermal tempered water to supply or remove heat from a space. The system water is returned to the ground heat exchanger to pick up or release the heat back into the earth. During the summer, the system reverses itself to cool the building by pulling heat from the building and placing it into the ground.

<http://hardingeo.com/how-geothermal-works/>

Geothermal for City Hall, the Water Department Administrative office and maintenance garage, the Central Fire Station and a couple of the City DPW buildings that are all located close by City Hall in Midtown. Hardin may also be looking at including Kingston Hospital in the project.

For more information on the GeoUtility system being considered please see: <http://hardingeo.com/geoutilities/>

It is recommended that the City actively pursue this opportunity to create a geothermal municipal utility as well as examine the potential for using geothermal energy at other individual City buildings and facilities. As with solar, every effort should be made to implement energy efficiency improvements prior to investing in renewable forms or energy.

## I. Green Power Options

It is also recommended that as part of a clean energy program the City explore Green Power Options available through Hess and Central Hudson or other Energy Service Companies as well as the potential purchase of Renewable Energy Certificates (RECs).

The City should also consider becoming a ‘Green Power Partner,’ a voluntary program that encourages organizations to buy green power as a way to reduce the environmental impacts associated with purchased electricity use. <http://www.epa.gov/greenpower/>

## Monitor and Evaluate

It is recommended that the City of Kingston:

- Establish a protocol and systems to annually update, review, monitor and measure energy use, energy costs and GHG emissions. As energy costs continue to rise, the benchmarking, tracking and management of energy usage and costs in City facilities is imperative.
- Use *ENERGY STAR Portfolio Manager* or a similar tool to track energy usage in all City facilities. *ENERGY STAR Portfolio Manager* is a free web-based program that can be used to monitor energy use, set goals and measure progress for energy efficiency improvement projects over time, identify under-performing buildings to target for energy efficiency improvements, and track energy and cost savings over time.
- Work with utility providers (Central Hudson and Hess Corp) to simplify billing records and access to utility usage data. Currently energy usage data is available through both utility providers’ web sites, however simplifying this access by uniformly renaming accounts will allow for easier access and management.

## Technical Assistance Programs

It is strongly recommended that the Task Force and local officials access and take advantage of the network of technical experts that are available for assistance with renewable energy and energy efficiency policies and programs. Some of the programs are identified below.

### **Technical Assistance Programs**

The U.S. Department of Energy's (DOE) Technical Assistance Program (TAP) supports the Energy Efficiency and Conservation Block Grant Program (EECBG) and the State Energy Program (SEP) by providing state, local, and tribal officials the tools and resources needed to implement successful and sustainable clean energy programs. For More Information: [www.wip.energy.gov/solutioncenter](http://www.wip.energy.gov/solutioncenter)

The U.S. Department of Energy (DOE) [Technical Assistance Program](#) Blog provides a platform for state, local, and tribal government officials that receive funding from the DOE State Energy Program and Energy Efficiency and Conservation Block Grants to connect with technical and programmatic experts and share best practices about their renewable energy and energy efficiency programs.

For More Information: <http://www.eereblogs.energy.gov/tap/>

The U.S. Department of Energy (DOE) Weatherization and Intergovernmental Program (WIP) provides technical assistance to states, local governments, community action agencies, utilities, Indian tribes, and U.S. territories for their energy programs.

For More Information: <http://www1.eere.energy.gov/wip/assistance.html>

## **Monitor GHG Emissions and other Criteria Air Pollutants**

The City of Kingston is a member of ICLEI-Local Governments for Sustainability until August 2012. It is recommended that the City maintain this membership and actively use the tools and other resources.



The Clean Air Climate Protection Software 2009 can be used to account for greenhouse gas emissions.

Although not a focus of this report, CACP 2009 also provides emissions data on criteria air pollutants. Emissions data is available on the following air pollutants: nitrogen oxide (NO<sub>x</sub>), Sulfur oxide (SO<sub>x</sub>), carbon monoxide (CO), volatile organic compounds (VOC), particulate matter 10 (PM<sub>10</sub>), and particulate matter 2.5 (PM<sub>2.5</sub>).

It is recommended that as a follow-up to this analysis the Task Force use CACP 2009 to analyze and report the criteria air pollutants for the City of Kingston and how to improve overall air quality through energy efficiency improvements and a clean energy program.

## SUMMARY OF RECOMMENDATIONS: ENERGY & RENEWABLES-BUILDINGS & FACILITIES

Sector	Goal	Action/Initiative	Community	Municipal Government
Energy & Renewables Buildings & Facilities				
	Reduce overall energy consumption and GHG emissions in the City and in municipal government operations by 20%.	Create a local financing mechanism for energy retrofits such as a Property Assessed Clean Energy (PACE) program.	X	
		Adopt Local Energy Conservation Code.	X	
		Provide training for local code enforcement on 2010 Energy Conservation Construction Code of New York State (ECCCNYS). <a href="https://nyserdacodetraining.com/">https://nyserdacodetraining.com/</a>	X	
		Create and adopt a local 'Green Building' Standards.	X	
		Explore potential for a 'Commercial Energy Policy.'	X	
		Establish a City Lighting Ordinance.	X	
		Establish and implement 'Municipal Energy Conservation Policy.'		X
		Create and implement 'Government Facility Energy Improvement Plan.'		X
		Examine the potential to remove or 'disconnect' street lights.		X
		Upgrade City Street lights and traffic signals with energy efficient lighting such as LEDs.		X
		Develop and implement an 'Energy Efficiency Improvement Plan for City Wastewater Treatment Plant.'		X
		Use Central Hudson's <b>Energy Manager</b> Program to track and manage energy use at WWTP.		X
		Explore expanded use of Hess Demand Response Program.		X
		Create and implement 'Municipal Green Building Policy.'		X
		Create and implement 'Municipal Energy Efficient Procurement Policy.'		X
		Track and take advantage of federal, state and utility energy efficiency programs and Incentives.		X
		Conduct energy audits at all Kingston Housing Authority facilities.	X	X

	City government will get 20% of energy from renewable sources by 2020.	Explore opportunities for the on-site generation of energy using of renewable, particularly solar and geothermal, at municipal facilities.		X
		Install solar electricity systems at appropriate municipal facilities.		X
		Continue exploration of community scale municipal renewable facilities - such as municipal geothermal utility.		X
		Explore Green Power Options available through Hess and Central Hudson or other Energy Service Companies.		X
		Explore the purchase of Renewable energy certificates (RECs), also known as 'green tags,' 'green certificates,' and 'renewable energy credits,' that can be used to meet renewable energy targets.		X
		Consider becoming a 'Green Power Community' by participating in EPA Green Power Partnership.		X
		As part of Comprehensive Plan Update and Zoning Update remove barriers to and provide incentives to use of renewable forms of energy in the City of Kingston.	X	
		Promote NYSERDA, Central Hudson and other programs available for advancing renewable energy at residential and commercial level.	X	
	Improve awareness of opportunities for energy efficiency and GHG emissions reductions.	Actively promote the use of NY On-Bill Recovery Loan Program.	X	
		Consider a Community Energy Awareness or Energy Challenge Program.	X	
		Create and maintain 'Sustainable Kingston' Program.		
		Create and Maintain 'Sustainable Kingston' web site.	X	
		Create and distribute outreach material of energy efficiency, renewable energy programs, including County weatherization programs.	X	
		Partner with Business Alliance of Kingston.	X	
		Work with local foundations to	X	X

		develop and implement energy and other sustainability initiatives.		
		Identify and describe training efforts to educate City staff on energy conservation and efficiency.		X
		Promote NYSERDA, Central Hudson and other programs available for advancing energy efficiency at residential and commercial level.	X	
		Targeted campaigns to promote the use of energy efficient 'IT' and other equipment.	X	X
		CFL Giveaway and Collection.	X	
	Monitor and evaluate.	Create, fund and sustain City Office of Energy & Sustainability.		X
		Establish protocol and systems to annually update, review, monitor and measure energy use and GHG emissions.		X
		Work with utility providers (Central Hudson and Hess Corp) to simplify billing records and access to utility usage data.		X
		Require use of Portfolio Manager for municipal buildings.		X
		Use CACP 2009 to identify and report Criteria Air Pollutants.		X
		Annually report energy use and energy budget.		X

## B. LAND USE, TRANSPORTATION AND VEHICLES

Land use patterns and transportation systems are interconnected and have a direct impact on energy use and greenhouse gas emissions.

This section summarizes the energy use and transportation related GHG emissions associated with vehicle miles traveled and vehicle fuel usage in the community and by local government operations. This section also presents the recommended initiatives to mitigate the impacts related to transportation related GHG emissions, including vehicle usage, land use planning and transportation systems. Rising fuel costs have necessitated advancing alternatives to the single occupancy vehicle. More specific information was available on vehicles used by government operations than in the community; therefore more specific fleet management recommendations can be made. Hence vehicle findings and recommendations are discussed separately from land use and transportation.

*“...it is increasingly clear that the extreme segregation of land uses leads to greater VMT, and by extension, higher levels of greenhouse gas emissions.”<sup>7</sup>*

### Transportation Emissions

*Transportation emissions depend on:*

1. *The availability of alternative transportation choices (choices other than the automobile),*
2. *The fuel efficiency of the vehicles in use, and*
3. *Land-use patterns.*

TRAVELMATTERS.ORG, a project of [The Center for Neighborhood Technology](http://www.travelmatters.org/about/transit-climate)  
<http://www.travelmatters.org/about/transit-climate>

## FINDINGS

### COMMUNITY TRANSPORTATION - ENERGY USE AND GHG EMISSIONS

The transportation sector in the City of Kingston consumes 40% of the community's energy. While buildings in the commercial and the residential sectors combined account for more energy use, transportation, as a single sector consumes the largest percentage of the community's energy.

In the U.S., 28% of the energy goes to transporting people and goods from one place to another, with automobiles being the most common mode of transportation. Personal vehicles (cars and light trucks) consume 60% of the total energy used for transportation.<sup>xix</sup>



NY Thruway

In 2010, there were 158,782,140 vehicle miles traveled in the City of Kingston using an estimated 10,121,527 gallons of fuel. Most fuel is estimated to be gasoline, 8,613,576 gallons, or 85%, with 1,507,951 gallons being diesel fuel.

It is estimated that 93%, or 147,684,000 vehicle miles traveled in the City of Kingston in 2010 were by gasoline vehicles. The majority of the miles traveled by gas vehicles are by passenger vehicles, 65%, using 57% of the gas. The remaining miles are traveled by gasoline light trucks.

The other 7% of the vehicles miles traveled are done so by diesel vehicles. Most of these miles are by heavy duty diesel vehicles, 77%, which use 91% of the diesel fuel. Light trucks account for 19% of the diesel vehicles and passenger cars 4%.



Flatbush Ave, Kingston

City operations gasoline usage accounted for approximately 1% of the total gas used in the community, with City use of diesel fuel accounting for about 6% of the City's total diesel usage.

The transportation sector accounts for the largest percentage of community-wide GHG emissions in the City of Kingston, 93,048 tonnes of CO<sub>2</sub>e, which is 41% of the community's total emissions. By comparison the transportation sector in New York State accounted for 34% of New York's gross GHG emissions in 2008.<sup>xx</sup>

Additional information on community wide energy usage and GHG emissions from the transportation sector can

be found in Section VI. of **Appendix A. Community Energy and Greenhouse Gas Emissions Inventory Report.**

## PROPOSED GOALS

- Capitalize on existing compact development and promote various modes of transportation and efficiency in providing public services and infrastructure.
- Reduce travel demand specifically that of single-occupancy private vehicles, reducing vehicles miles traveled in the City of Kingston.
- Improve existing sidewalk network to promote safe walking.
- Promote consistency and coordination between land use and transportation policies, improvements strategies and decision-making.
- Protect and enhance the environment, promote energy conservation, improve the quality of life.

### By 2020

- 20% reduction of single occupancy vehicle use and VMTs.
- 20% increase in use of transit.
- 20% reduction in single occupancy vehicle commuting by City employees.
- Local sidewalks are all in good repair.

- Bike infrastructure is in place including designated bike lanes in appropriate places and bike racks at all public facilities implemented as a result of the City of Kingston Bicycling Master Plan.
- A network of trails, bike paths, and complete streets exist in the City of Kingston connecting rail trails from the Wallkill Valley, Rondout Valley, Catskill Mountains and Kingston Point to a Midtown Hub along the Broadway Corridor.

## RECOMMENDATIONS

### COMMUNITY RECOMMENDATIONS

To maximize quality of life benefits as well as GHG emissions reductions, land use planning policies and decisions must support low-emissions compact development that allows for various modes of transportation reducing vehicle miles traveled in the City.

By capitalizing on the existing compactness of the City, planning policies and decisions going forward should support a diverse, compact, transit-oriented, bikeable and walkable community; promote infill development; prohibit new development in floodplains and preserve and protect open space, biodiversity, and water supplies. This includes enhanced green space, maintaining or establishing healthy community forests and encouraging tree planting especially along waterways and streets to increase shading and to absorb carbon dioxide. Also important will be supporting local food production, 'green' building measures, and 'green' infrastructure.

This should be done in a way that recognizes the continued importance of integrating housing, work places, shops, entertainment, schools, parks, and civic facilities, supports and encourages non-motorized opportunities and linkages along with efficient modes of public transportation readily available and accessible to all.

While encouraging low-emissions development that is resilient to changes in the climate, growth must also demonstrate efficiency in providing public services and infrastructure and help meet the demand for affordable housing.

Considering that the transportation and building sectors are the primary consumers of energy and account for the majority of greenhouse gas emissions, the recommended initiatives regarding land use and transportation identified in this section should be used in concert with the recommended initiatives for buildings and facilities in Section IV.A. Implementation of the energy efficiency and renewable energy recommendations used in tandem with recommendations for improvements in land use and transportation systems can

*Based on current GHG emission reporting guidelines, the transportation sector directly accounted for about 28 percent of total U.S. GHG emissions in 2006, making it the second largest source of GHG emissions, behind only electricity generation (34 percent). Nearly 97 percent of transportation GHG emissions came through direct combustion of fossil fuels, with the remainder due to carbon dioxide (CO<sub>2</sub>) from electricity (for rail) and hydrofluorocarbons (HFCs) emitted from vehicle air conditioners and refrigerated transport. Transportation is the largest end-use sector emitting CO<sub>2</sub>, the most prevalent greenhouse gas.<sup>8</sup>*

result in significant reductions in overall energy use and GHG emissions. A comprehensive approach to planning and designing the built environment is imperative to addressing energy and GHG emissions reductions.

This approach to creating a sustainable, livable community has many benefits some of which include less of a reliance on fossil fuels, lower energy costs, reduced greenhouse gas emissions, better local air quality and an overall improved quality of life.

Some of the potential priority initiatives are discussed in detail below. A more complete list of recommended initiatives can be found in the ‘Summary of Recommendations’ at the end of this section.

### **New Urbanism**

*Alternately termed Neo-traditional Planning or Traditional Neighborhood Development (TND), is a community design reform movement evolving in response to the prevalence and consequences of urban and suburban sprawl. The primary design characteristics of New Urbanism include the following:*

- 1) Pedestrian-centered neighborhoods with primary social and economic facilities within a five-minute walk;*
- 2) Community orientation around public transit systems; and*
- 3) Mixed land uses within neighborhoods.*

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

## **A. Comprehensive Master Plan and Zoning Code Update**

Goals, objectives, and strategies for the future development that are established in a Comprehensive Master Plan should seek to minimize the impacts of land use through more efficient use of energy and natural resources and by promoting compatibility with local climate and environmental systems. It is strongly recommended that the local land use planning principles and policies adopted as part of the Comprehensive Master Planning process and Zoning Code update integrate the goals and initiatives of this Plan.

When updating land use policies, building codes or any other community plans, such as a recreation or open space plan, it is recommended that provisions be included to address the energy used in transportation and land use and the associated GHG emissions.

In its ***Policy Guide on Planning & Climate Change*** the American Planning Association found that:

*Land use patterns play a significant role in reducing VMT and thus in reducing energy consumption and its associated GHG emissions. VMT can be reduced by promoting strategies such as compact development, high density development arranged to encourage pedestrians, bicycle and transit use, transit oriented development, and mixed use development.*<sup>9</sup>

## B. Transit Oriented Design and Infill Development

It is recommended that the concept and practice of transit oriented design (TOD) be integrated in the Comprehensive Plan and Zoning Code update as a way to reduce VMT and GHG emissions.

High density neighborhoods with good bus transit, mixed residential and commercial uses and pedestrian-friendly design have much lower rates of car use than typical low-density suburban developments. TOD attempts to create such neighborhoods in planning of new or existing transit systems. An essential component of reducing transportation-related greenhouse gas emissions in Kingston and in the region is to direct new development to locations that are close to transit and have retail and other services within walking distance. Encourage the development of housing (including affordable housing) retail services, and employment centers in areas of Kingston best served by transit. In addition to reducing commuter VMTs by adding housing near transit, the community can do more to reduce the number and length of shopping trips that require driving. Locating compact residential development and neighborhood-serving retail development along the same transit corridors represents an integrated strategy for reducing VMT and increasing other mobility options.



“Walkability,” “bikeability” and ridership of public transit are fundamentally tied to density and a mix of land uses near transit hubs and jobs and along transit corridors.

Exploring transit oriented design will need to be considered along with the expansion and enhancement of additional modes of transportation.

*Through sustainability, smart growth and New Urbanism, planners have recognized the many advantages of a more compact urban form. Compact development can be served with many modes of transportation, offers a wider variety of housing choices than the suburban model, and is more efficient to provide with public services and infrastructure. Whether “compact” meant replicating or*

*rediscovering small-town America, developing nodes of transit oriented development, creating public amenities to support and attract dense downtown development, or establishing communities designed around form-based codes, planners realized that this form of development had the potential to reduce pollution and congestion, enhance social interaction, improve the efficiency and effectiveness of public service delivery, and create vitality in once-abandoned urban areas.<sup>xxi</sup>*

## Infill Development

An important component of creating a compact, mixed used community that supports a variety of modes of transportation will be for the City to actively promote and advance ‘infill development.’

Developing vacant or under-used parcels in built-up areas of the City where infrastructure is already in place should be a priority of the updated Comprehensive Master Plan. If it has not been done already, the City will want to have

a clear understanding of the number of undeveloped and underdeveloped vacant parcels within the City.

*Infill development results in a more efficient use of land and existing infrastructure such as streets and public utilities. Ideally, it achieves compact land use patterns and densities high enough to support improved transportation choices and public services, as well as a wider variety of commercial services, cultural events, and other amenities. Maximizing use of existing public facilities should lower the per capita costs of providing and maintaining services.*

Municipal Research and Services Center of Washington  
<http://www.mrsc.org/subjects/planning/lu/infill.aspx>

## C. Complete Streets

Addressing climate change in Kingston can be accomplished through the aggressive implementation of the Complete Streets policy adopted by the Kingston Common Council in 2010. Complete Streets “are comprehensive, integrated roads that provide for safe and convenient travel along and across the street network by all users: walkers, bicyclists, drivers of various types of vehicles and riders of public transportation, of all ages and abilities, including children and youth, older adults, and persons with disabilities.”



Walking brings health and environmental benefits, reduces traffic congestion, and brings customers to business along the walking routes. Planning that prioritizes pedestrian needs will require a different design from that which prioritizes vehicles. People are more likely to walk in interesting and safe environments that include attractive sidewalks, barriers between pedestrians and other traffic and traffic calming measures.

The Complete Streets approach will help achieve healthy and sustainable transportation systems. Complete Streets is complementary to and helps fulfill some of objectives of the

Climate Smart and Green Jobs Community Pledge.

### **Expansion of Transit System in the City of Kingston**

Travel modes expected to be an increasingly important part of Kingston's mobility management system include:

- A network of short-route local transit buses, i.e., employer-based and commercial shuttles and on-demand vehicles.
- A larger network of car share pods conveniently located adjacent to transit networks and in neighborhoods underserved by transportation alternatives.
- An increased role for rideshare/carpool programs.
- An expanded bicycle and pedestrian infrastructure including bicycle share programs.
- An increased role for taxis.
- A ferry system that is fully integrated into existing transit services.
- Neighborhood electric vehicles.

#### **D. Safe Routes to School**

It is recommended that the City of Kingston continue to working with Cornell Cooperative Extension of Ulster County and the Safe Routes Committee to support, promote and implement the 'Safe Routes to Schools and Parks' initiative to make the Kingston City School District a safe walkable and bikeable community.

Promoting walking and bicycling will result in a decrease in the use of fossil fuels in transportation and reduce GHG emissions resulting in an overall improvement in the quality of life.

A priority objective of the Comprehensive Master Plan update should be to make bicycling and walking to school and other local destinations, safer and more appealing transportation choices thus encouraging a healthy and active lifestyle from an early age.

An expanded outreach program should be developed with the City's Complete Streets Advisory Council, the Safe Routes to School Initiative and other interested organizations to promote increased bicycling and walking.

Implementing the Complete Streets policy and providing the infrastructure necessary for safe walking can be realized through the development of a Pedestrian Master Plan.

#### **E. Bike Infrastructure, Create Bicycle Friendly Zones**

Bicycles are the most efficient mode of transportation. They produce no air pollution and place minimal burden on natural resources. Bicycles are especially appropriate in reducing the number of short trips—up to five miles or so—which constitute more than half of all driving. But bicycles can also serve longer trips, on their own or in combination with bus and rail. Combining bicycles with transit can extend the use of both, allowing transit to be used when the destination is too far from a transit stop for walking.

Dedicated bike paths and bicycle lanes on roadways reduce the danger motor vehicles pose to bicyclists. They also make bicycling faster and more pleasant. Well-maintained surfaces, good lighting, a feeling of security, and strategic locations constitute the elements of a good bicycle route network. Adding crossing signals specifically for bicycles at major roads also helps to ensure efficient flow on the bike path network while providing greater safety for bicyclists at dangerous road interfaces.



Recommended improvements include new and expanded bike paths, bicycle storage facilities and safe sidewalks and crossings to encourage more bicycling and walking in and around the City of Kingston. These can all be part of a City of Kingston Bicycle Master Plan.

#### F. Rail Trail Network

It is recommended that as part of the Comprehensive Master Plan and Zoning Update and Complete Streets solutions, the City continue to work with the Kingston Land Trust to create a network of trails, bike paths, and complete streets connecting rail trails from the Wallkill Valley, Rondout Valley, Catskill Mountains and Kingston Point to a Midtown Hub along the Broadway Corridor.<sup>xxii</sup>

Rail trails support a healthier climate and environment by making active transportation a viable alternative to the automobile. They contribute to healthier, more vibrant community interaction, connecting people to the places they live, work and play.



Kingston Land Trust and Parks & Trails NY

To better understand and help quantify GHG emissions associated with land management it is also recommended that the Task Force use: *Opportunities to Reduce Greenhouse Gas Emissions through Materials and Land Management*, USEPA 2009.<sup>xxiii</sup>

[http://www.epa.gov/oswer/docs/ghg\\_land\\_and\\_materials\\_management.pdf](http://www.epa.gov/oswer/docs/ghg_land_and_materials_management.pdf)

Additional ‘**Resources for Land Use Planning and Climate Action**’ can be found in Appendix G.

## SUMMARY OF RECOMMENDATIONS: LAND USE & TRANSPORTATION

<u>Sector</u>				
<b>Transportation and Land Use</b>	<b><u>Goal</u></b>	<b><u>Action/Initiative</u></b>	<b><u>Community</u></b>	<b><u>Municipal Government</u></b>
	Capitalize on existing compact development and promote various modes of transportation and efficiency in providing public services and infrastructure.	Promote a compact, transit-oriented, bikeable and walkable community.	X	
		Promote infill development.		
		Allow for sufficient residential density to support multiple modes of transportation.	X	
		Create public amenities to support and attract dense downtown development.	X	
		Consider proximity of land uses that encourage walking and bicycling.	X	
		Set standards to improve efficiency of providing public services and infrastructure, such as streets and utilities.	X	
		Consider Form-based Codes.	X	
	Reduce automobile use and vehicle miles traveled by maximizing efficiency of the transportation network.	Promote development patterns that reduce VMT through complementary land use, proximity and street network connectivity along with greater energy efficiency in building type.	X	
		Direct new development to locations that are close to transit and have retail and other services within walking distance.	X	
		Promote mixed use and development around transit hubs and corridors –Transit Oriented Development.	X	
		Provide transportation alternatives that more closely reflect the interdependence of land use and transportation.		
		Inventory and evaluate how well the streets and transportation network of the City of Kingston are serving each category of users.	X	
		Work with Kingston Land Trust and Rail Trail Committee to create rail trails that will connect a Midtown Hub to rail trails that come to the City's border.	X	
		Develop a Bicycling Master Plan.	X	
		Create new and expanded pathways and bikeways in the City of Kingston that make it a more livable city.	X	
		Expand bike parking and create a bicycle sharing program.	X	
		Work with the Kingston City School District to become a partner in Clean School Bus USA to reduce children's exposure to diesel	X	

		exhaust and the amount of air pollution created by diesel school buses.		
		Work with the Kingston School District to increase School Bus ridership and minimize frequency of bus stops.	X	
		Provide training opportunities on practice and implementation of Complete Streets Policy.	X	X
		Develop an outreach program with the City's Complete Streets Advisory Council, the Safe Routes to School Initiative and other interested organizations to promote increased bicycling and walking.	X	
	Reduce travel demand specifically that of single-occupancy private vehicles, reducing vehicles miles traveled in the City of Kingston.	Establish as a goal a 20% reduction of single occupancy vehicle use and VMTs.	X	X
		Explore options and incentive alternatives to single occupancy vehicles.	X	X
		Expand promotion of Citibus, UCAT and other transit options.	X	X
		Actively promote biking, walking, or taking the bus.	X	X
		Promote ridesharing, car and van pooling by offering free or discounted parking within City.	X	X
		Provide incentives to City employees who use alternative transportation commute options- such as transit and vanpool subsidies.		X
		Offer flex or alternative work schedules to City employees, where possible.		X
		Providing a tax benefit or financial incentive through parking policies and fees that offer incentives to use transit.	X	X
		Establish a tele-commuting policy for City employees, where appropriate.		X
		As part of Comprehensive Master Plan and Zoning Update promote mixed use development with densities that promote walking, biking and mass transit with reduced parking options.	X	
		Work with local business associations and local business leaders to promote transit, ridesharing, and carpooling.	X	
		Initiate and promote car-sharing (i.e. Zip Car).	X	
	Reduce use of automobile through expansion of transit options currently	Consider a network of short-route local transit buses, employer-based and commercial shuttles and on-demand vehicles, an increased role for taxis, a ferry	X	

	not available to City residents.	system that is fully integrated into existing transit services.		
		Work with the Citibus, Ulster County Area Transit, Ulster County Transportation Council (UCTC), Ulster County Planning and others to provide consistent development of a comprehensive and coordinated transit plan for the City and County.	X	
	Improve existing sidewalk network to promote safe walking to school, work public facilities, transit and local businesses.	Working with Cornell Cooperative Extension and the Safe Routes Committee support, promote and implement the 'Safe Routes to Schools and Parks' initiative to make the Kingston City School District a safe walkable and bikeable community.	X	
		Develop a Pedestrian Master Plan.	X	
		Integrate safe sidewalks and crossings.	X	
		Create a Traffic Calming Program.	X	
	Reduce overall costs of transportation.	Promote and expand accessibility to transit.	X	
		Create a City where people can live and work thereby reducing commuting and associated costs.	X	
	Advance 'green' streets as part of Complete Streets Policy.	Explore non-toxic paving options, porous pavement and other 'green infrastructure' techniques such as rain gardens for any new transportation infrastructure or improvements to existing roadways and other transportation systems.	X	X
		Consider energy and greenhouse gas impacts of changes to the transportation infrastructure and its impacts on the flow of vehicles, such as installation of traffic lights, stop signs and traffic signals (vehicle idling time).	X	X
	Promote consistency and coordination between land use and transportation policies, improvements strategies and decision-making.	Local planning and development should be consistent with the 'Year 2035 Ulster County Long Range Transportation Plan (LRTP) - Provide transportation alternatives that more closely reflect the interdependence of land use and transportation.	X	
		Use the authority of the City's planning board to assure that new development projects reflect the community's desires for a low carbon/low emissions future.		X
		Review each development/transportation plan and project as an opportunity to improve safety, access and mobility for all		X

		travelers and promote alternatives to the automobile as integral elements of the local transportation system.		
	Protect and enhance the environment, promote energy conservation, improve the quality of life.	Prohibit new development in floodplains and preserve and protect open space, biodiversity, and water supplies.	X	X
		Provide resources to complete and adopt 'Natural Resource Inventory '.		X
		Adopt Conservation Development Guidelines developed by Kingston CAC.		X
		Establish protocol and systems to annually update, review, monitor and measure energy use and GHG emissions from the transportation sector.	X	X
		Gather fuel usage data to determine GHG emissions from railroad (CSX and Catskill Mountain Rail)	X	
		Gather fuel usage data to determine GHG emissions from motor craft on the City of Kingston's waterfront (the Rondout).	X	

## VEHICLES ENERGY USE & GHG EMISSIONS

### FINDINGS

In 2010, the City of Kingston government operated a vehicle fleet of 165 vehicles. These 165 vehicles used 84,402.6 gallons of gas at a cost of \$202,970 and 83,512.6 gallons of diesel fuel at a cost of \$210,026 for a total fuel cost of \$412,996. Vehicle fuel costs accounted for more than a quarter of the City energy costs in 2010 with gas costs and diesel fuel costs each being approximately 13% of the City's energy bill.

A total of 167,915.2 gallons of fuel was used in 2010 to travel an estimated 1,874,932 miles resulting in an average fuel efficiency of the City's fleet of just over 11 miles per gallon (mpg).

Approximately half, 79 of 165, of the vehicles in the City's fleet are heavy duty trucks.

The City of Kingston DPW operates the largest percentage of vehicles, 42%, and therefore uses the largest percentage of diesel fuel, 49%, with Citibus accounting for 42% of diesel fuel usage and cost.<sup>33</sup> The Kingston Police Department uses the majority of gasoline, 62% of that used by the City in 2010. The majority of vehicle miles traveled are by Citibus (39%) and the Kingston Police Department (34%).

To collect waste and recyclables, in 2010 the City DPW operated ten (10) refuse packers with model years ranging from 1987 to 2008. These 10 heavy duty diesel vehicles used an estimated 20,723 gallons of diesel fuel at a cost of \$51,834. These vehicles traveled an estimated 64,603 miles, an average of 6,460 per vehicle and were used an estimated 5,832 hours. Additional information about the City's refuse packers can be found in Appendix N.

Including the Kingston Housing Authority and Water Department vehicles, there are a total of 184 vehicles. In 2010 the 184 City vehicles along with off-road equipment<sup>34</sup> used 96,964.1 gallons of gasoline at a cost of \$233,202 and 84,210 gallons of diesel fuel at a cost of \$211,731 for a total vehicle fuel cost of \$444,983. It is estimated that the 184 vehicles traveled approximately 1,999,466 miles in 2010.

Commuting by City of Kingston government employees used an estimated 41,219 gallons of gas at a cost of \$119,904.

### VEHICLE GHG EMISSIONS

In 2010, the fuel used by the City governments 165 vehicles resulted in the release of 1,629 tonnes of CO<sub>2</sub>e.

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<sup>33</sup> Percentages exclude vehicle usage and cost by KHA and KWD.

<sup>34</sup> Based on the same gas key being used for vehicles and equipment it was not possible to specifically separate fuel used for vehicles versus off-road equipment.

More than a third of the emissions are from DPW vehicles with Kingston Police Department and Citibus responsible for 29% and 22% respectively as depicted in Table 10.<sup>35</sup>

The diesel fuel used by refuse packers used to collect waste and recycling in 2010 emitted 212 tonnes of CO<sub>2</sub>e. GHG emissions from refuse packers in 2010 were almost 37% of the total GHGs emitted from all DPW vehicles.

Including KHA and KWD, the 184 vehicles resulted in the release of 1,750 tonnes of CO<sub>2</sub>e.



**Table 10: City of Kingston Government Vehicle GHG Emissions Summary**

Vehicle GHG Emissions Summary	CO <sub>2</sub> e (tonnes)	Cost (\$)	% of Total CO <sub>2</sub> e
DPW	579	\$145,471	36
KPD	467	\$125,801	29
Citibus	355	\$87,195	22
KFD	135	\$29,836	8
Parks & Rec	70	\$18,294	4
City Hall	23	\$6,400	1
<b>TOTAL</b>	<b>1,629</b>	<b>\$412,997</b>	
KHA	23	\$6,189	
KWD	98	\$25,798	
<b>TOTALS</b>	<b>1,750</b>	<b>\$444,984</b>	

Employee commuting resulted in the release of an additional 370 tonnes of CO<sub>2</sub>e.

Additional information on the fuel used and vehicle miles traveled for government operations can be found in Section V. of Appendix B. **Local Government Operations Energy and Greenhouse Gas Emissions Inventory Report.**

## PROPOSED GOALS

- Improve overall government fleet fuel efficiency and reduce vehicle miles traveled.
- Promote and further the use of alternative fueled vehicles and alternative fueled transit technology.
- Reduce transportation related emissions.

<sup>35</sup> Percentages exclude vehicle usage and cost by KHA and KWD.

**By 2020:**

- Electric vehicle infrastructure is in place at several locations City-wide, including municipal government facilities.
- City government has doubled the fuel efficiency of its fleet.
- Fuel usage (gas and diesel) has been reduced by 20%.
- 20% of City government vehicle fleet is hybrid and alternative fuel vehicles.
- Alternative-fueled transit vehicles and refuse packers are part of the City hybrid and alternative fuel fleet.
- An active and successful car-share program exists in the City of Kingston.

**RECOMMENDATIONS**COMMUNITY RECOMMENDATION

As discussed above, land use policies and decisions will have a significant impact on vehicle use. A reduction in vehicle use, particularly gas and diesel powered vehicles, is the primary goal. However an important aspect of reducing energy use and GHG emissions from the transportation sector is the type of vehicle used. Rising fuel costs have spurred renewed interest in vehicle fuel efficiency and in alternative fueled and hybrid vehicles.

**A. Electric Vehicles (EV) and EV Charging Stations**

It is recommended that as part of a Complete Streets program and Comprehensive Master Plan Update the City explore the feasibility of planning, permitting, zoning, and providing infrastructure necessary to accommodate electric vehicles (EV). To encourage EV use the City can provide charging stations in strategic locations in the community, including parking spaces that are reserved for EVs and have a charging connection. The availability of EV charging stations promotes the idea of switching to EVs. EV charging stations must be present before consumers purchase EVs.



### **Albany's Electric Vehicle Program**

In April 2011 the City of Albany announced its program to conduct a feasibility study related to accommodating the electric vehicle (EV) and its associated charging equipment. Based on the results of the feasibility study, the City will install EV charging stations throughout the city that will enable residents as well as City government employees to charge electric vehicles at any time.

This is a joint initiative between New York State Energy Research & Development Authority (NYSERDA), the Department of Transportation (NYSDOT) and the New York State Department of Environmental Conservation (DEC), DeNooyer Chevrolet, National Grid, the University of Albany, and VHB Engineering, Surveying and Landscape Architecture, P.C.

The first electric vehicle (EV) charging station in Upstate NY has been installed at the downtown Holiday Inn Express in Albany. Two vehicles can use the station at a time. The station is available to the public for a small reservation fee which will be donated to a non-profit organization.

<http://www.albany2030.org/participate/event/electric-vehicle-announcement-mayors-office-energy-sustainability>  
<http://www.albanysustainability.org/newsarchive.asp>

Kingston City government should also consider charging stations as part of municipal facilities.

While EVs have no tailpipe emissions, the electricity needed to run the power plant will produce emissions. The emissions associated with the electricity production will depend on the power plant fuel source for the electricity.

*Many EV critics point out that charging thousands of EVs from aging coal plants will increase greenhouse gases such as CO<sub>2</sub> significantly. Although half the country uses coal-fired plants, EVs recharging from these facilities are predicted to produce less CO<sub>2</sub> than internal combustion engine vehicles. According to the World Resources Institute, EVs recharging from coal-fired plants will reduce CO<sub>2</sub> emissions in the country from 17 to 22 percent.<sup>xxiv</sup>*

### MUNICIPAL RECOMMENDATIONS

More specific information was available on vehicles used by government operations than in the community; therefore more specific fleet management recommendations can be made. In its vehicle fleet, the City government has a number of opportunities to improve overall fuel efficiency and reduce vehicle miles traveled.

## A. City Vehicle Fleet Management

It is recommended that the City develop a comprehensive and consistent City government vehicle fleet management program to better track fuel usage, miles traveled and fuel efficiency of the City's fleet. Each City department should be using a consistent system to track data. As part of this program vehicle refrigerant use should be tracked, monitored and evaluated.

## B. 'Green' the City's Vehicle Fleet

### City Government Fuel Efficiency Standards

As part of a comprehensive effort to reduce energy use, in the long run save taxpayer dollars and GHG emissions in the City of Kingston, the City government can again demonstrate its leadership by more actively managing its own vehicle fleet to incorporate the use of more fuel efficient vehicles.

Currently the most fuel efficient vehicles in the City's fleet are:

1. 2008 Ford Focus 24 mpg City, Water Department
2. 2003 Dodge Neon 22 mpg City, Building Safety



The Ford Crown Victoria used for various cities services averages approximately 16 mpg.

The average fuel efficiency of the City's fleet in 2010 was estimated at 11.2mpg.

Developing a plan to analyze and upgrade the City's fleet to address fuel efficiency will result in economic and environmental benefits to the City. The City can plan to track miles traveled, review annual fuel use data and vehicle purchases.

According to the U.S Department of Energy, upgrading a vehicle that gets 20 MPG to one that gets 30 MPG, amounts to a \$913 per year savings(assumes 15,000 miles of driving annually and a fuel cost of \$3.65).

It is recommended that the City of Kingston:

- Establish a goal of doubling the fuel efficiency of its fleet from the current 11.2 mpg to at least 24 mpg.
- Track fuel efficiency by department.
- Reduce the amount of vehicle fuel used 20% by 2020.
- Adopt a policy requiring minimum fuel efficiency for all new City vehicle purchases. Consider using the State adopted specification of purchasing or leasing vehicles which have a fuel economy in the top 30% of their vehicle class as listed under EPA size class on the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy and the U.S.

Environmental Protection Agency maintained web site at  
<http://www.fueleconomy.gov/feg/byEPAclass.htm>.<sup>xxv</sup>

Part of the effort to improve the overall fuel efficiency of the City fleet should include the use of smaller more fuel efficient vehicles for appropriate City tasks.

### Alternative Fueled & Hybrid Vehicles

There are no alternative fuel or hybrid vehicles in the City's fleet.

As part of a comprehensive effort to reduce energy use and GHG emissions in the City of Kingston, the City government can promote the use of alternative fuel or hybrid vehicles and create policies and plans that will provide incentives for the use of alternative fueled vehicles community-wide.

In addition to fuel efficient vehicles, when purchasing a new vehicle for City government operations, the City should examine alternative fuels or hybrid vehicles, including but not limited to compressed natural gas, E85, and electric vehicles. Part of this analysis should include ensuring that the proper infrastructure is in place to service such vehicles.

Fuel costs of operating traditional gasoline vehicles used by the City such as the Ford Crown Victoria or Ford 150 pickup truck should be factored into the overall costs of purchasing and operating alternative fueled and hybrid vehicles. Alternative fuels should include the potential to use electric vehicles as well as the need for infrastructure for the use of these vehicles.

It is recommended that the City of Kingston:

- Investigate the use of hybrids and alternative fuel vehicles as their use can result in long-term monetary savings and environmental benefits.
- Set policies and goals for vehicle replacement that will result in the use of hybrids and alternative fuel vehicles.
- Replace 20% of the City's fleet with alternative fueled or hybrid vehicles by 2020.

### Citibus & Refuse Packers

It is also recommended that when replacing buses and refuse packers the City look at alternatives vehicles. Strong consideration should be given to diesel electric hybrid and/or alternative fueled technology such as compressed natural gas refuse packers.



### **Ulster County Area Transit Diesel-Electric Hybrid Buses**

As of 2010, Ulster County Area Transit (UCAT) has five diesel-electric hybrid buses in its fleet. The hybrid buses were anticipated to reduce UCAT's fuel costs by about 40%.

According to UCAT's Director of Transportation the hybrids are more efficient in city stop and go driving where the electric drive has a chance to work. In addition, the amount of particulates emitted into the atmosphere has declined by 70% from traditional diesels from the early 90's. Air quality is a large consideration when UCAT purchases buses for its fleet.\*



*\* June 30 2011 email from Bob Di Bella, Director of Transportation, Ulster County Area Transit*

### **Car Sharing**

A number of larger cities such as Philadelphia and Chicago have implemented vehicle sharing programs. Both cities saw opportunities to cut costs, reduce traffic and make the cities more livable.

In Philadelphia, the City teamed up with PhillyCarShare (PCS), a local nonprofit that provides rental cars by the hour. Per-hour vehicle costs were far lower than the maintenance costs of little-used city vehicles. PCS is a local organization that is committed to reducing automobile dependence in the Philadelphia region. There were additional environmental benefits as 40% of the PCS fleet comprised fuel-efficient hybrid vehicles.

After switching to PCS, Philadelphia City government saw immediate significant savings. Over 5% of its vehicles were eliminated from the City fleet, resulting in a one-time budget injection from the sale of the vehicles at auction. Reductions in maintenance, fuel, parking, and acquisition costs resulted in a projected savings of \$1.7 million annually.

The car share company was also able to document each trip taken, allowing city officials to analyze transit patterns and think of ways to improve cost effectiveness. Frivolous vehicle use was reduced as individual employees had to sign for the vehicle.

Chicago has partnered with Zipcar Inc. In addition to its own fleet, Chicago also has the ability to pick from Zipcar's shared pool of cars, which are located at stations across the city.

Washington, D.C., Wilmington, Del., and Santa Cruz County, California use 'FastFleet' for car sharing service.

The City of Albany is currently examining the potential use of a car-sharing program.

### Idle-Reduction and Clean Diesel Technology

Various City of Kingston department officials have indicated that vehicles must remain idling while in use because equipment, such as on-board computers, need a continuous power supply.

Currently it is estimated that police patrol vehicles are getting less than 7mpg. One of the reasons is due to idling time. Idling an internal combustion engine can burn a half gallon to one gallon of fuel per hour, depending on engine size and air conditioner (AC) use.

In 2010 the City paid an average of \$2.44/gal for regular gasoline. If at least one City vehicle is idling during an 8-hour period, burning 4-8 gallons of gas, it is wasting \$10 - \$20 of fuel in that 8-hour period or \$3,650 to \$7,300 per year due to idling alone.

To reduce idling, save money, fuel and reduce emissions, the City should examine and use idle-reduction technologies or auxiliary power systems for non-emergency vehicles and explore their potential use in emergency vehicles as appropriate.

Auxiliary power systems can consist of batteries or fuel cells that can provide heating, cooling, and electronic device power without running the vehicle's engine.

The City of Kingston government should also ensure that delivery and service vehicles in the City are not left idling so as to be in compliance with New York State Environmental Conservation Law (ECL) which prohibits heavy duty vehicles, including diesel trucks and buses, from idling for more than five minutes at a time.<sup>xxvi</sup>

It is also recommended that the City of Kingston work with local hospitals and emergency services organizations to reduce vehicle idling in the City.

### **Dallas Police Department Saves Money with Anti-Idling Technology**

In Dallas, Texas, the police department is reducing engine idling — and saving money — by using Energy Xtreme's Independence Package.<sup>TM</sup> The Independence Package, a power management system that allows a car's electrical system to operate while the gasoline engine is turned off, is a power cell that requires no fuel and no maintenance and has no moving parts. "The Independence Package allows us to have our electrical systems running at the scene of a crime without having to leave the vehicle running," said Lt. Dale Barnard of the Dallas Police Department (DPD). "That's good for several reasons: We don't run the risk of running out of gas, we don't run the risk of the car being stolen and we aren't pumping unnecessary emissions into the air."

According to a Reuters press release, the DPD used the Independence Package for an average of 4.85 hours per day over a 30-day period. Assuming 300 work days per year, a gas price of \$3.26 per gallon, and 0.75 gallon of gas burned per hour while the vehicle idles, the department saves \$11.86 per day in fuel costs and \$3,131 per year per vehicle.

[http://www1.eere.energy.gov/vehiclesandfuels/pdfs/idling\\_news/sep09\\_network\\_news.pdf](http://www1.eere.energy.gov/vehiclesandfuels/pdfs/idling_news/sep09_network_news.pdf)

Clean diesel technologies should also be investigated to reduce diesel emissions and their impact on human health. New purchases should include clean diesel equipment to help cut air pollution. City policy should reflect that any city contractors, owners, and operators of diesel equipment should be using clean diesel equipment. In addition to replacing old equipment the City of Kingston should also examine the potential to retrofit existing diesel engines with new technologies that pollute less.

### **Biodiesel**

Biodiesel is a form of diesel fuel manufactured from vegetable oils, animal fats, or recycled restaurant greases. It is safe, biodegradable, and produces fewer air pollutants than petroleum-based diesel. Biodiesel can be used in its pure form (B100) or blended with petroleum diesel. Common blends include B2 (2% biodiesel), B5, and B20. B2 and B5 can be used safely in most diesel engines.<sup>xxvii</sup>

Biodiesel has a variety of advantage and disadvantages. Its use can result in the overall reduction of greenhouse gases except for nitrogen oxides.

It is recommended that the City of Kingston DPW examine the potential to use bio-diesel, particularly in generators. NYSERDA has supported recent efforts to promote the use of biodiesel-blended fuel in diesel generators.

## SUMMARY OF RECOMMENDATIONS: VEHICLES

<u>Sector</u>	<u>Goal</u>	<u>Action/Initiative</u>	<u>Community</u>	<u>Municipal Government</u>
<b>Vehicles</b>				
	Improve overall government fleet fuel efficiency and reduce vehicle miles traveled.	Develop & implement a vehicle fleet management program to better track miles traveled and fuel usage.		X
		Develop City policy requiring minimum fuel efficiency of fleet vehicles, and consideration of alternative fuel vehicles as part of vehicle purchasing.		X
		Develop 'Greening of Fleet' - Seek to replace 20% of City's gasoline & diesel vehicles with alternative fuel and hybrid vehicles by 2020.		X
		Use smaller more fuel efficient vehicles for appropriate tasks.		X
		Adopt anti-idling policy for City fleet to reduce idling time of non-emergency City vehicles.		X
		Explore anti-idling equipment for installation in police, fire and other emergency vehicles.		X
		Explore the feasibility of using bicycles for police patrol.		X
		Improve fuel efficiency of Citibus fleet by reducing sudden acceleration, reduce idling, tires, etc.		X
	Promote and further the use of alternative fueled vehicles.	As part of Complete Streets program and Comprehensive Master Plan Update, explore feasibility of planning, permitting, zoning, and providing infrastructure necessary to accommodate electric vehicles.	X	
		Install electric vehicle charging stations at strategic locations throughout the city.	X	X
		Actively promote the use of alternative fueled vehicles.	X	X
		Provide parking and other incentives for alternative fueled and zero or low emissions vehicles.	X	X
	Promote and further the use of alternative fueled transit technology.	Explore the use of hybrid or other alternative fueled (propane, compressed natural gas) buses for Citibus.		X
		Work with school district and school transportation contractors to use hybrid or other alternative fueled (propane,	X	

		compressed natural gas) buses.		
	Reduce transportation related emissions.	Adopt local anti-idling ordinance.	X	
		Work with local institutions and businesses such as Health Alliance of the Hudson Valley to reduce vehicle idling.	X	
		Work with delivery services to reduce vehicle idling.	X	X
		Work with City of Kingston School District to reduce school bus idling by creating idle-free zones around schools.	X	
		Investigate clean diesel technologies to reduce diesel emissions and their impact on human health.	X	X
		Replace old equipment with clean diesel equipment.		X
		Retrofit existing equipment to reduce diesel emissions.	X	X
		Examine and consider the use of bio-diesel in City equipment.	X	
		Require any contractors with the City to use clean diesel equipment.	X	
	Monitor and evaluate.	Establish systems and protocols to measure improvements in fuel reductions, costs savings and lower GHG.		X

## C. MATERIALS MANAGEMENT: WASTE REDUCTION, REUSE, RECYCLING & COMPOSTING

Waste contributes to the production of greenhouse gas emissions in a number of ways. The most prominent source of greenhouse gas emissions from solid waste disposal facilities is fugitive methane (CH<sub>4</sub>) released by the decomposition of organic materials over time in landfills. Methane has a 'global warming potential' 21 times more potent than CO<sub>2</sub>, which means it can trap heat in the atmosphere 21 times more effectively than CO<sub>2</sub>.

Emissions from the waste sector are an estimate of methane generation from the anaerobic decomposition of organic wastes (such as paper, food scraps, plant debris, wood, etc.) that are deposited in a landfill. The scale of these emissions depends upon the size and type of the landfill and the presence of a landfill gas collection system. The incineration of waste as well as the combustion of fuel in collection and transportation of waste also contributes greenhouse gas emissions.

According to the USEPA, landfills accounted for approximately 17% of total U.S. anthropogenic methane (CH<sub>4</sub>) emissions in 2009, the third largest contribution of any CH<sub>4</sub> source in the United States.<sup>xxviii</sup>

The evaluation and reporting of GHG emissions, primarily methane, from landfills is usually done by a local government if they own and operate a landfill within their community. In other words, communities that transport waste out of their jurisdiction do not usually evaluate the GHG emissions that are created in a landfill elsewhere. The City of Kingston does not own or operate its own landfill. The waste the City collects is transported to the Ulster County Resource Recovery Agency (UCRRA) and then trucked to a landfill in western New York.

However, due to the potential for the decomposition of waste in landfills to emit methane (CH<sub>4</sub>) and due to the fact that the City of Kingston has a variety of active programs to reduce waste, mainly through recycling and composting, it was determined that it was important to begin to get an idea of the emissions associated with both the generation and transportation of waste materials in the City of Kingston. The City of Kingston efforts to evaluate the waste related GHG emissions demonstrates its commitment to finding measures that will reduce waste and waste related GHG emissions.

This section summarizes the community and local government GHG emissions from the waste collected by the City. Recommended initiatives that both the local government and the community can take to achieve GHG reduction goals through improved materials management are discussed and summarized at the end of the section.

More detail is presented on waste related emissions in Section VII of the **Community Energy and Greenhouse Gas Emissions Inventory Report** (Appendix A), in Section VI.E. of the **Local Government Operations Energy and Greenhouse Gas Emissions Inventory Report** (Appendix B) and in Appendix N. **City of Kingston Solid Waste Refuse Packers**.

*Materials management can play a significant role in combating climate change; landfill gas is 1.8 percent of the state's GHG inventory, while EPA estimates that 42 percent of national GHG emissions are influenced by the lifecycle impacts of the products and packaging that become waste.*<sup>xxix</sup>

## WASTE MANAGEMENT IN THE CITY OF KINGSTON

The City of Kingston Department of Public Works (DPW) provides solid waste collection to all City residents and to some businesses and institutions. The DPW also is responsible for the curbside collection of recyclable commingled containers and mixed paper. Scrap metal, yard waste, and brush are also collected separately at curbside.

The City of Kingston DPW delivers collected solid waste and regulated recyclables to the Ulster County Resource Recovery Agency (UCRRA) on Route 32 in the Town of Ulster. Municipal solid waste (MSW) is transferred to long-haul trucks and shipped to the Seneca Meadows Landfill in western New York. Source separated recyclables are delivered to the UCRRA Material Recovery Facility where it is sorted, and baled and shipped to recycling markets.

The City of Kingston operates a municipal transfer station on Route 32 where residents and businesses can deliver a variety of waste and recyclable material including tires and electronics. Periodic programs are offered to collect household hazardous waste, some of which may be recycled.

The City's operation of the transfer station and the fuel used by DPW refuse packers to collect and transport 'waste' and recyclable materials contribute to the overall GHG emissions associated with materials management. The energy usage, costs and associated GHG emissions of the transfer station and DPW refuse packers are discussed in Section VI.E. of the ***Local Government Operations Energy and Greenhouse Gas Emissions Inventory Report*** (Appendix B) and in Appendix N. Energy and GHG emissions analysis for the UCRRA facility for Kingston managed materials was beyond the scope of this project.



The City of Kingston DPW does not provide solid waste disposal and recycling services to all generators in the City. A variety of private haulers provide collection service to non-profits, multi-family residents, institutions and businesses. Diversion to private haulers has been a trend over the last 20 years with a consequent increase in vehicle miles traveled to transport waste. Private haulers are not obligated to deliver their waste and recycling to UCRRA so the final destination and travel distances are not known.

The waste, recycling and waste transportation numbers presented in the greenhouse gas inventory reports and in this Plan only account for the waste collected by the Kingston DPW. Therefore the waste generation and transportation data used and the GHG emissions reported provide a partial picture of the waste-related GHG emissions for the City of Kingston. Large waste generators in the City that use private haulers such as the Kingston Hospital and Kingston School District should be part of a future comprehensive waste assessment and GHG emissions inventory update.

It is important to note that over the next couple of years the transportation and management of the City's solid waste may change. The current solid waste management contract that the City has with

UCRRA is set to expire in less than a year, March 1, 2013. In addition, the contract that UCCRA has with Seneca Meadows Landfill expires at the end of 2014.<sup>36</sup>

## FINDINGS

In 2010 the City of Kingston DPW collected 13,827.1 tons of material: 8,768.8 tons of 'waste', 1,538.49 tons of curbside recycling and 3,519 tons of 'other' recyclables.

All 8,768.8 tons of trash generated by the City of Kingston was sent to Seneca Meadows Landfill.

In 2011, UCCRA reported collecting a total of 210,263.55 tons of material for Ulster County: 154,394.43 tons of 'waste' and 55,869.12 tons of total recycling.

The 'waste' collected by the City DPW is 5.7% of the total 'waste' collected by the County. The curbside recycling collected by the City DPW is 2.8% of the amount of recyclables collected by the County.

**Table 11: City of Kingston 2010 Recycling Collection**

Curbside Recycled Materials	Tons
Mixed Paper (Office-Computer)/Mixed News (Mag/Mail/Phone)	903.5
Cardboard	206.57
Commingled Plastic #'s 1,2,4,5,7 & Metal (Aluminum/Tin)	428.42
<b>TOTAL CURBSIDE</b>	<b>1,538.49</b>
Other Recycled Materials (non-curbside)	Tons
Scrap Metal	80
Organic Wood Waste	1,400
Sewage Sludge (beneficial re-use) (wet tons)	2,004.8
Electronics	35
<b>TOTAL OTHER (non-curbside)</b>	<b>3,519.8</b>
<b>TOTAL RECYCLED</b>	<b>5058.29</b>

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<sup>36</sup> Phone Interview with Tim Rose, Executive Director UCCRA October 27 2011

### **City of Kingston 'Waste' & Recycling Per Capita**

The total materials collected by the City in 2010 were 13,826.9 tons which equals 1,157 lbs/person/year or 3.17lbs per day.

The total 'waste' collected by the City in 2010 was 8,768.8 tons which equals 734lbs/person/year or 2.01lbs per day.

The total 'recycling' collected by the City in 2010 was 5,058.29 tons which equals 423.4bs/person/year or 1.16lbs per day.

### **Ulster County 'Waste' & Recycling Per Capita**

The total materials collected by the County in 2011 were 210,263.55 tons which equals 2,304 lbs/person/year or 6.31lbs per day.

The total 'waste' collected by County in 2011 was 154,394.43 tons which equals 1,692lbs/person/year or 4.64lbs per day.

The total 'recycling' collected by County in 2011 was 55,869.12 tons which equals 612lbs/person/year or 1.67lbs per day.

Based on 2010 census data –City population of 23,893 and County population of 182,493

According to the USEPA:

*On average, (in 2010) we recycled and composted 1.51 pounds out of our individual waste generation of 4.43 pounds per person per day.*

Municipal Solid Waste Generation, Recycling, and Disposal in the United States: Facts and Figures for 2010  
[http://www.epa.gov/osw/nonhaz/municipal/pubs/msw\\_2010\\_factsheet.pdf](http://www.epa.gov/osw/nonhaz/municipal/pubs/msw_2010_factsheet.pdf)

## **WASTE RELATED GHG EMISSIONS**

The GHG emissions summarized below in Table 12 present emissions from both local government management of solid waste as well as the fugitive landfill emissions released beyond the City borders.

The total GHG emissions associated with the collection, management, transport and disposal of solid waste is 1,693 tonnes of CO<sub>2</sub>e, less than 1% percent of total 2010 community-wide emissions.

The emissions from local government solid waste management are 220 tonnes of CO<sub>2</sub>e.

The fugitive methane landfill emissions and the emissions associated with transport of the waste from Kingston to western New York are 1,473 tonnes of CO<sub>2</sub>e. The transportation of waste from the UCRRRA

facility to the Seneca Meadows Landfill in western NY resulted in 352 tonnes of CO<sub>2</sub>e, less than 0.5% of the total community GHG emissions.

The waste collected by the City of Kingston DPW in 2010 will generate 53,362 kg of CH<sub>4</sub> as it decomposes in the Seneca Meadows Landfill, which is equivalent to 1,121 tonnes of CO<sub>2</sub>e. As previously noted methane has 21 times the global warming potential as that of CO<sub>2</sub>. Therefore efforts to reduce 'waste' will also help reduce methane emissions and overall GHG emissions. This underscores the importance of waste diversion, re-use and recycling. It is important to note that the methane emissions released by the decomposition of 'waste' from a landfill is over time. In other words the landfill methane emissions are not released in the baseline year of 2010 as are other GHG emissions analyzed in the report that were primarily a result of the burning of fossil fuels.

Again it is also important to note that this is a partial picture of waste-generated GHG emissions and these numbers do not reflect the waste generated and transported by private haulers in the City of Kingston. Therefore it is understood that the City of Kingston as a community generates more 'waste' than what is collected by the City DPW. Hence the GHG emissions will be greater than what is presented here and will be a more significant percentage of the total GHG emission generated in the community.

**Table 12: City of Kingston Solid Waste GHG Emissions<sup>37</sup>**

Solid Waste GHG Emissions	CO <sub>2</sub> (tonnes)	N <sub>2</sub> O (kg)	CH <sub>4</sub> (kg)	CO <sub>2</sub> e (tonnes)	Energy (MMBtu)	% of Waste CO <sub>2</sub> e	% of Total CO <sub>2</sub> e
Landfill Scope 3	0	0	53,362	1,121		66	0.60
Transportation Scope 3	352	1	1	352	7,983	21	0.19
Solid Waste Transfer Station Scope 2	8	0	0	8	85	.5	<0.1
Refuse Packers Scope 1	212	0	0	212	4,298	12.5	0.11
<b>TOTALS</b>	<b>572</b>	<b>1</b>	<b>53,363</b>	<b>1,693</b>	<b>12,366</b>		<b>0.90</b>
<b>TOTAL Community GHG Emissions</b>	<b>184,838</b>	<b>6,259</b>	<b>67,690</b>	<b>188,200</b>	<b>3,211,118</b>		

## RECYCLABLES AND GHG EMISSIONS

Following prevention and reuse, recycling is the third best way to reduce GHG emissions associated with waste.

There are significant GHG emissions associated with the energy intensity of extraction, manufacture and transportation of virgin materials used in new products. These GHG emissions can be avoided by recycling.

According to the USEPA:

*Manufacturing goods from recycled materials typically requires less energy than producing goods from virgin materials. When people reuse things or when products are made with less material, less energy is needed to extract, transport, and process raw materials and to manufacture products. The payoff?*

<sup>37</sup> Reflect solid waste collected by City of Kingston DPW, not all waste generated in the City of Kingston.

*When energy demand decreases, fewer fossil fuels are burned and less carbon dioxide is emitted to the atmosphere.<sup>xxx</sup>*

According to the Aluminum Association it takes 95% more energy to make aluminum from virgin ore than from recycled aluminum.

*Recycling just one aluminum can saves enough energy to power a television set for the three hours that it took to watch the Super Bowl.<sup>xxxi</sup>*

Metals and paper recycling offer the most significant potential for reducing GHG emissions as the mining and extracting of virgin metals for production is very energy intensive. The virgin paper production process is also very energy intensive and therefore reducing the demand for pulp will have climate benefits as will reducing the demand for trees which can continue to act as carbon storage or sinks.<sup>xxxii</sup>

While recycling helps avoid the energy use and GHG emissions associated with the use of virgin materials, there are impacts associated with the transportation of recyclables, which in part makes waste reduction and re-use more important in the waste hierarchy. Recyclable materials collected in the City of Kingston are shipped to numerous markets in several different locations many of which are intermediary markets and not ultimate locations. Therefore it was not feasible to collect the fuel usage, miles and associated GHG emissions from the transportation of recyclable materials. However, based on UCCRA's description of the movement of recyclables from the City to UCCRA to vendors and to potential final destinations, it seems clear that the transportation of recyclable materials has a fairly significant carbon footprint. This should be further analyzed by the County and the City.

As with waste the amounts of recyclable materials examined in this report is only what is collected by the City DPW. The amount of recyclables generated in the City of Kingston will be greater than what is reported.

## PROPOSED GOALS

- Reduce the overall waste generated in the City of Kingston.
- Reduce the overall waste generated in City government operations.
- Promote waste reduction, re-use, recycling and composting.
- Reduce greenhouse gas emissions associated with the transportation and disposal of waste.

### By 2020:

- Reduce the overall waste generated in the City of Kingston by 20%.
- Increase the overall recycling rates in the City of Kingston by 20%.
- Achieve an annual 10% reduction in overall annual waste generated in local government operations as measured against a base year of Fiscal Year 2013. (10% waste reduction per year beginning in FY 2013) Long-term Goal: Zero-waste.
- Achieve an annual 10 % reduction in annual paper use (copy and janitorial) as measured against a base year of FY 2013. (10% paper use reduction per year beginning in FY 2013).

## RECOMMENDATIONS

### COMMUNITY RECOMMENDATIONS

Targeting waste prevention, that is, reducing the amount of waste created, transported and placed in the landfill will have the greatest impact in reducing methane and other GHG emissions associated with solid waste management.

The foremost method of reducing GHG emissions associated with waste is not to produce the waste in the first place.

In an analysis of the climate impacts of waste management activities, it was found in *Beyond Waste: A Sustainable Materials Management Plan for New York*, released by the NYSDEC in 2010, that the existing materials management hierarchy, of waste prevention, reuse and recycling will have the best result of reducing the GHG emissions impacts related to waste.

In its 'Beyond Waste' plan, New York State fosters a shift in thinking about waste. The plan outlines the changes that need to occur to move away from the "end-of the-pipe" waste management techniques to looking "upstream" and more comprehensively at how materials that would otherwise become waste can be more sustainably managed. This shift is central to reducing demand for energy, reducing dependence on disposal, minimizing emissions of greenhouse gases and creating green jobs.<sup>xxxiii</sup>

To make significant strides in reducing energy costs and GHG emissions associated with the generation and transportation of waste it will be important for the City of Kingston to continue to advance policies and programs in both the community and within its own operations that minimize the amount of waste materials going to landfills.

*Waste reduction, reuse, recycling and composting provide significant benefits in combating climate change by eliminating or diverting the materials that may generate methane in a landfill and by providing valuable materials for industrial feedstocks that will help manufacturers reduce demand for energy and reduce pollution in the production process.*<sup>xxxiv</sup>

#### A. Materials Management Plan for the City of Kingston

It is recommended that the City of Kingston, working with UCCRA, private haulers and local businesses and institutions prepare a comprehensive Materials Management Plan.

A City of Kingston Materials Management Plan should:

- Adopt the goals, timelines and approach of *Beyond Waste: A Sustainable Materials Management Plan for New York*, <http://www.dec.ny.gov/chemical/41831.html>.
- Reduce consumption and waste; increase reuse, recycling and composting; and decrease use of landfills.
- Measure and analyze waste generation, collection and transportation from all sectors: City operations, residential (single and multi-family), commercial, institutional and industrial.
- Encompass the reporting and tracking of waste collected by private haulers.

- Examine waste records and conduct a series of waste audits.
- Better promote waste reduction in the City of Kingston.
- Analyze the transportation of waste as well as life cycle costs associated with materials.
- Partner with local business to advance waste reduction, reuse, recycling and composting.
- Measure greenhouse gas emissions from waste generation and transportation.
- Examine applications of Extender Producer Responsibility.

To better understand and help quantify GHG emissions associated with waste prevention, waste reduction and recycling it is recommended that the Task Force refer to *NYS Beyond Waste: A Sustainable Material Management Plan for New York*,<sup>38</sup> 2010 and *Opportunities to Reduce Greenhouse Gas Emission through Materials and Land Management Practices*, USEPA, September 2009.<sup>39</sup>

Waste prevention and recycling will:

- Reduce the amount of waste going to landfills and therefore reduce the production of methane from landfills.
- Reduce the amount of waste going to incinerators thereby reducing emissions from these facilities.
- Reduce the amount of paper used, thereby reducing the demand for paper products made from trees. More trees means more carbon stored or 'sequestered.'  
Recycling paper and use of recycled paper products will also help reduce the demand for paper products made from trees.
- Reduce the emissions associated with the extraction, transportation and use of raw materials for new products.

*NYS Beyond Waste: A Sustainable Material Management Plan for New York*

## B. 'Pay-As-You-Throw' Program (PAYT)

It is recommended that the City of Kingston consider establishing a Pay-As-You Throw (PAYT) Program. PAYT programs create direct financial incentives to produce less garbage as you pay only for what you dispose of.

Under a PAYT program the City would charge residents for each bag of waste they generate. The City can build in the cost of each bag to cover recycling pick-up as well. The fewer bags of trash a resident puts at the curb, the less they pay, the more they save. PAYT programs are seen as an incentive to create less waste and are viewed as more equitable than paying a flat fee for waste hauling.

<sup>38</sup> [http://www.dec.ny.gov/docs/materials\\_minerals\\_pdf/frptbeyondwaste.pdf](http://www.dec.ny.gov/docs/materials_minerals_pdf/frptbeyondwaste.pdf)

<sup>39</sup> [http://www.epa.gov/oswer/docs/ghg\\_land\\_and\\_materials\\_management.pdf](http://www.epa.gov/oswer/docs/ghg_land_and_materials_management.pdf)

The City should use EPA's *Saving Money and Reducing Trash Benefit Evaluation Tool* to help determine if a PAYT Program unit-based pricing for materials management is the right method for Kingston.

EPA has found that:

*PAYT is an effective tool for communities struggling to cope with soaring municipal solid waste management expenses. Well-designed programs generate the revenues communities need to cover their solid waste costs, including the costs of such complementary programs as recycling and composting. Residents benefit, too, because they have the opportunity to take control of their trash bills.*

*Communities with programs in place have reported significant increases in recycling and reductions in waste, due primarily to the waste reduction incentive created by PAYT.*<sup>xxxv</sup>

### C. Material Management and Green Building Code

As part of a 'Green' building code the City is encouraged to establish waste reduction and recycling standards for local building and development. Green Codes, such as the U.S. Green Building Council Leadership in Energy and Environmental Design 'Materials and Resources' Rating System can serve as guidance.

### D. Throw-Away Bags

The City of Kingston may also want to consider a ban or fee related to the use of plastic and paper bags at local establishments.

*Every year Americans come home from shopping with 1 billion one-use shopping bags, creating 300,000 tons of landfill waste. Only about one percent of bags are actually recycled.*<sup>xxxvi</sup>

*They (plastic bags) are typically made of polyethylene and can take up to 1,000 years to biodegrade in landfills that emit harmful greenhouse gases.*<sup>xxxvii</sup>

An outreach and education program should be instituted to promote and advance the use of non-throwaway re-useable bags not only for grocery shopping but for all retail related shopping. As part of an outreach program the City should assure that local businesses are complying with the New York State's Plastic Bag Reduction, Reuse and Recycling Act.<sup>xxxviii</sup>

<http://www.dec.ny.gov/chemical/50034.html>

### E. Promote Waste Reduction, Reuse, Recycling and Composting Programs

The importance of outreach and educational campaigns for the promotion of waste reduction, reuse, recycling and composting programs cannot be overemphasized. Regular communication with the public improves participation and the quality of the materials collected. A commitment to waste reduction and recycling from local government will help increase citizen participation in these programs.

The following waste reduction, reuse and recycling goals have been identified for the City of Kingston for 2012:

- Increase community awareness and understanding of recycling rules and regulations.
- Roll out new single stream totes to the entire Kingston population.
- Move Kingston to volume based waste collection after successful implementation of trial in 2012.
- Increase home and commercial composting, and the development of an online composting registry to track and quantify the amount of food waste being diverted city-wide.
- Increase recycling rates city-wide.
- Develop rewards program for recycling participants.

These goals should be incorporated into an overall comprehensive Material Management Plan for the City of Kingston.

### EXISTING PROGRAMS

The City of Kingston, through the work of its two environmental educators, actively work to promote and advance waste reduction and recycling in the City of Kingston through a variety of programs and activities designed to reduce waste going to landfills.

These programs include:

#### Single Stream Recycling

In 2011 the City of Kingston environmental education staff working with the City of Kingston DPW, NYSEDA and the NYSDEC began the implementation of a grant funded 'single stream' recycling program to create a more efficient and productive recycling system in the City of Kingston while reducing 'waste' generated.

'Single stream' recycling simply means all recyclables go in one bin - no more need to separate bottles, cans and paper, etc - just mix them all together. This program will allow the City of Kingston to increase recycling rates, track participation rates, and reduce operating expenses for the DPW.

#### Recycling Education

The City of Kingston offers a series of public recycling programs throughout the year to educate both the general public as well as school children. Each school year, City of Kingston staff works in local elementary schools to provide informative and age appropriate recycling programs.

#### Composting Education

A series of composting education workshops were held in 2011, with additional programs planned for 2012, funded through a grant from the ALCOA Foundation. These workshops allow Kingston residents to reduce their trash output through food and yard waste diversion.

It is recommended that the City provide additional resources to actively support the expansion and growth of these programs. Some of the initiatives to expand waste reduction and recycling are discussed below.

### Promote Backyard Composting

Promote backyard composting of yard and food waste by homeowners, city-wide gardeners, and restaurants. Work with local community garden programs to get the word out.

### Grow, Expand and Promote Recycling

It is recommended that the City of Kingston advance recycling and increase recycling rates in the City of Kingston by:



- Increasing recycling education and outreach through a dedicated fund from enforcement actions.
- Providing a consistent look or branding for the program, with signage and messaging that should be the same everywhere.
- Developing a plan to assist event organizers to provide recycling at City events.
- Being persistent with the message. Keep the message 'out there.'
- Using the media to promote the program.
- Developing or use existing educational materials to provide to the various sectors in the City. (All publications, if printed, should be on 100% post-consumer recycled content paper.)
- Tapping into the use of 'Social Marketing' to promote the program.
- Continuing to be present at special events throughout the year or host specific events such as NY Recycles Day (Nov 15).
- Developing a waste reduction, re-use, recycling and composting page on the 'Sustainable Kingston' web site.
- Developing additional recycling/re-use facilities at the Kingston Transfer Station.
- Providing permanent outdoor recycling/trash bins for public areas/parks in the City.
- Developing additional composting opportunities at the Kingston Transfer Station to allow for the acceptance of household organics; work with UCRRA and other businesses to promote composting.

## F. Curbside Food Waste Collection

The City already separately collects organic materials such as yards waste. As an extension of this it is recommended that the City explore the feasibility of curbside collection of food waste for composting. A curbside program can be initiated with restaurants and grocery stores participating on a voluntary basis.

## G. Recycling Enforcement Program

Since recycling is mandated by law it is recommended that the City of Kingston create, fund and sustain a recycling enforcement program for residential and commercial properties in the City. Enforcement should involve a multi-step process beginning with warnings and violation notices and ultimately to fines for non-compliance with recycling laws. Financial incentives such as fines have shown to improve recycling rates. The can be part of the City's overall effort to improve the quality of life in Kingston. The City should work with UCRRA as a partner in this program.

An enforcement program should be part of a larger effort that includes education as well as looking at rewards for improved recycling participation.

## MUNICIPAL GOVERNMENT RECOMMENDATIONS

### A. Waste Reduction and Recycling Policy, Plan and Program

The amount and type of solid waste generated as well as the amount and type of materials recycled by City government operations is currently unknown.

### Municipal Waste Reduction, Reuse and Recycling Program

It is recommended that the City of Kingston:

- Adopt a written Municipal policy establishing waste reduction and recycling goals that work towards 'zero-waste.'
- Establish procedures to track total municipal government waste generated, recycled and disposed of by type (regular trash, C&D waste, tires, electronic equipment, other) by volume/weight.
- Develop a baseline for municipal government waste generated, recycled and disposed of by March 2013 (Base year will be data collected and reported for 2013).
- Set up procedures to conduct periodic waste composition analyses (waste audits) to determine the greatest potential for reduction, set material-specific waste reduction goals and increase capture rates of recyclable materials.
- Provide stepped waste reduction and recycling goals for a comprehensive list of materials



**What is In Your Garbage?**

including paper, commingled plastic, glass and metal containers, scrap metal, bulk clean C&D debris, batteries (including vehicle batteries), car and truck tires, electronics, motor oil, food waste, yard waste, etc. that leads towards a 'zero-waste' goal.

- Develop department waste reduction and recycling plans setting reduction, re-use and recycling efforts for waste directly generated by government activities from administrative offices, garages, parks, maintenance centers, etc.
- Establish a Paper Reduction, Recycling and Procurement Policy.
- Create an environmental preferable or 'green' procurement policy that promotes waste reduction, reuse and the purchase of recycled materials.
- Provide training for City staff on re-use, waste reduction and recycling programs.

### Office Paper Reduction, Recycling and Procurement

It is recommended that the City adopt a government 'Paper Use Reduction Policy.'

This policy can:

- Develop a baseline for the amount of photocopy, printer paper, janitorial paper (paper towels, toilet paper) purchased for FY 2013 (base year).
- Set an annual paper use reduction goal (copy and janitorial) as measured against a base year of FY 2013.
- Ensure all City government printers and photocopiers are set to duplex as the default.
- Require that all new printers and copiers purchased have the capability for two-sided copying.
- Explore the use of paperless management systems as well as other paper use reduction measures to reduce the use of paper throughout government operations.
- Maximize the use of post-consumer recycled paper, seeking to purchase and use 100% post consumer recycled paper and paper from sustainable sources for all municipal government business.



*If the United States cut office paper use by just 10% it would prevent the emission of 1.6 million tons of greenhouse gases -- the equivalent of taking 280,000 cars off the road.<sup>xxxix</sup>*

### Environmentally Preferable Product or 'Green' Procurement Policy

Reducing waste starts with the product procurement. Using resources such as the Responsible Purchasing Network, the City should develop, adopt and implement an Environmentally Preferable Product or 'Green' Procurement Policy.

This policy should support the use of 'green' and local products and services; prohibit hazardous products when more environmentally friendly options exist; and allow for extended producer responsibility (EPR).

The life-cycle of a product should be taken into account when purchases are made. It should be understood what went into making a product (i.e. energy, resources, etc), what is the life of the product and how will it be disposed of.

#### New York City Environmentally Preferable Purchasing Laws

The 2005 EPP Laws (Local Laws 118, 119, 120, and 121) required the creation of standards for goods and equipment purchased by the City according to a list of environmental priorities including energy and water efficiency, hazardous materials and recycled content. These laws apply to:

- Products purchased or leased directly by the City;
- Building construction and renovation of spaces over 15,000 square feet (or if in leased space, where an agency leases at least 50,000 square feet and the construction work is a capital project) that is not covered by the City's Green Buildings Law (LL 86 of 2005); and
- Any other contracts at the discretion of the Director of Citywide Environmental Purchasing.

In addition, Local Law 123 created a green cleaning pilot program.

#### Electronics

When procuring desktops, laptops and monitors it is recommended that the City use the *Electronic Product Environmental Assessment Tool* (EPEAT) which is an easy-to-use, on-line tool providing assistance in comparing and selecting computer desktops, laptops and monitors based on their environmental attributes.

It is also recommended that the City join the State Electronics Challenge which can provide assistance in purchasing 'greener' electronic products, reduce the impacts of electronic products during use, and manage obsolete electronics in an environmentally safe way.

It would also be prudent for the City to inventory and track these assets so to ensure the appropriate purchase, use, recycling, reuse and proper disposal of all its electronics.

Appropriate City staff should be properly trained and familiar with the new *NYS Electronic Equipment Recycling and Reuse Act*<sup>xi</sup> <http://www.dec.ny.gov/chemical/65583.html> and the *Guidance for Municipal Electronic Waste Collection Sites*<sup>xli</sup> <http://www.dec.ny.gov/chemical/66879.html>.

## SUMMARY OF RECOMMENDATIONS: MATERIALS MANAGEMENT

<u>Sector</u>	<u>Goal</u>	<u>Action/Initiative</u>	<u>Community</u>	<u>Municipal Government</u>
<b>Materials Management- Waste Reduction, Reuse, Recycling &amp; Composting</b>				
	Reduce the overall waste generated in the City of Kingston by 20%.	Develop Materials Management Plan for City of Kingston.	X	
		Develop reporting/tracking system for private haulers in the City of Kingston, in concert with UCRRA.	X	
		Establish a 'Pay-As-You-Throw' Program.	X	
		Consider a local ban or fee on throw-away plastic and paper bags and polystyrene take-out food containers.	X	
		Establish waste reduction and recycling standards for local building and development.	X	
		Develop a recycling marketing campaign to promote waste reduction, reuse, recycling and composting programs.	X	
		Consider feasibility of instituting a curbside food waste collection.	X	
		Encourage zero waste planning of events.	X	
		Promote the use of compostable service ware and utensils in schools, restaurants, City offices and events.	X	
		Encourage and promote use of tap water, reduce bottled water use.	X	
		Install drinking fountains in public areas of the City.	X	
	Promote waste reduction, re-use and composting and increase the overall recycling rates in the City of Kingston by 20%.	Explore opportunities to expand curbside recycling.	X	
		Partner with local business to advance recycling and composting.	X	
		Explore the feasibility of curbside collection of food waste for composting.	X	
		Develop additional composting in municipal parks.	X	
		Promote backyard composting.	X	
		Provide compost bins to residents.	X	
		As part of local Green Building Code		

		Policy establish waste reduction and recycling standards for local building and development.	X	
		Work with School District to reduce waste, initiate/expand recycling and composting.	X	
		Create, fund and sustain a recycling enforcement program for residential and commercial properties in the City.	X	
		Provide permanent outdoor recycling/trash bins for public areas/parks in the City.	X	
		Provide temporary recycling bins at all public events in the City (i.e. clear stream bins).	X	
		Distribute updated waste reduction, recycling and composting information to all residents and properties serviced by the City.	X	
		Develop a recycling marketing campaign – bus and bus stop signage, billboards, news and other print media. Utilize social marketing/media tools like Facebook, YouTube and Twitter for promotion, contests, success stories, etc.	X	
		Promote, publicize, celebrate success.	X	X
	Achieve an annual 10% reduction in overall annual waste generated in local government operations as measured against a base year of FY 2013. (10% waste reduction per year beginning in Fiscal Year 2013). * Long-Term Goal: Zero- Waste *(This goal shall apply to all city buildings and facilities, including public use facilities, e.g. recreation centers and parks, etc.). This will either be based on pounds per full time employee per year	Develop a City Government Waste Reduction Policy.		X
		Establish procedures to conduct periodic waste composition analyses (waste audits) to track total municipal government waste generated, recycled and disposed of by type.		X
		Develop a baseline for municipal government waste generated, recycled and disposed of by December 2012.		X
		Develop City department waste reduction and recycling plans.		X
		Identify opportunities for re-using or recycling special wastes such as electronic waste, scrap metal, construction material, waste tires, batteries, toner cartridges, fluorescent tubes and waste oil.		X
		Conduct periodic waste composition analyses (waste audits).		X

	(lbs/fte/yr) or a combined estimate of pounds per full time employee and user per year (lbs/fte + user/year).	Consider establishing a re-use center at City Hall for items such as office supplies and furniture.		X
		Explore the feasibility of composting food waste at select municipal facilities.		X
		Set a 'zero-waste' goal for all City meetings (in-house and public) and City government functions.		X
		Use compostable service ware and utensils at City sponsored events and reusable service ware and utensils in day to day operations.		X
		Establish a 'Bottled Water Policy' to reduce or eliminate the use of 'Bottled Water' at municipal facilities and functions.		X
		Identify and describe training efforts to educate City staff on re-use, waste reduction and recycling programs.		X
	Achieve an annual 10% reduction in annual paper use (copy and janitorial) as measured against a base year of FY 2013. (10% paper use reduction per year beginning in Fiscal Year 2013.	Develop a baseline for the amount of photocopy, printer paper, janitorial paper (paper towels, toilet paper) purchased for FY2013 (base year).		X
		Ensure all City government printers and photocopiers are set to duplex as the default.		X
		As part of an Environmentally Preferable Product or 'Green' Procurement Policy all new printers and copiers purchased must have the capability for two-sided copying and to be set to duplexing as the default.		X
		Explore and implement the use of paperless management systems as well as other paper use reduction measures to reduce the use of paper throughout government operations.		X
		As part of Green Procurement Policy maximize the use of post-consumer recycled paper, seeking to purchase and use 100% post consumer recycled paper and paper from sustainable sources for all municipal government business and the practice of municipal contractors.		X

## D. SUSTAINABLE RESOURCE MANAGEMENT

While energy, land use, transportation and materials management are the primary sectors in which measures can be taken to reach GHG emissions reduction targets there are a number of other actions to address climate change and improve overall sustainability in the community.

The intent of this section is to capture some of the issues that more broadly address sustainability. Local sustainability initiatives important for the City to consider will be water conservation, green infrastructure, tree planting and urban forestry, native planting, local food production, and environmentally friendly building operation and maintenance.

Due to the broad focus of this section it is organized slightly different than the other sections. The section is divided into four subsections: water conservation and efficiency, landscape management, local food production and sustainable building operation and maintenance.

Background information is presented for each subsection along with the recommended initiatives associated for each subsection topic.

These sustainability initiatives will not only help reduce GHG emissions but make the City of Kingston a more efficient, attractive and healthy place to live, work and play.

### FINDINGS

#### WATER CONSERVATION AND EFFICIENCY

It takes energy and therefore creates GHG emissions to move water to homes and business. In 2010 the Kingston Water Department (KWD) used 388,331 kWh of electricity and 6,266 CCF of natural gas as well as fuel oil, propane, gasoline and diesel fuel in its operations to deliver water to City of Kingston residents and businesses. This resulted in the release of 300 metric tonnes of CO<sub>2</sub>e.



The KWD is primarily a gravity fed system that uses relatively small amounts of energy to pump and treat water compared to some water systems. As a result, the KWD energy costs, when considered as a part of the overall City government energy expenditures, account for only about 6% of the total energy costs of City government. However it is important to continue to explore

opportunities to improve energy efficiency in water delivery as *“energy as a percent of operating costs for drinking water systems can reach as high as 40 percent and is expected to increase 20 percent in the next 15 years due to population growth and tightening drinking water regulations”*<sup>xlii</sup>

In addition it takes energy, usually in the form of burning fossil fuels to heat water in homes and businesses. As water is used and becomes ‘wastewater’ it takes additional energy, again the burning of fossil fuels, to pump and treat that ‘wastewater.’ Reducing water use has many benefits, including the potential to reduce GHG emissions.

Water conservation involves measures that curtail the use of water, whereas efficiency entails improved technologies and practices that result in less water used. Water conservation and efficiency can include a combination of approaches from changing fixtures to changing behavior.

*Residential demands account for about three-fourths of the total urban water demand. Indoor use accounts for roughly 60% of all residential use, and of this, toilets (at 3.5 gallons per flush) use nearly 40%. Toilets, showers, and faucets combined represent two-thirds of all indoor water use. More than 4.8 billion gallons of water is flushed down toilets each day in the United States.*<sup>xliii</sup>

## High Efficiency Toilets and Urinals

The largest consumer of water in a home, commercial or office building is the toilet.

*Nearly one-third of a building's water consumption is attributed to toilets and urinals. Toilets consume the most water in a residential home. Flushing a toilet accounts for 14% of the water used both inside and outside a home.*<sup>xliv</sup>

Conventional toilets use 3.5 to 5 gallons or more of water per flush. The current federal standard established by the Energy Policy Act of 1992, requires that all new toilets produced for home use must operate on 1.6 gallons per flush (gpf) or less. A low-flow or low-flush toilet means they consume no more than 1.6 gpf as compared to the standard 3.5 to 5 gpf toilet. Commercial toilets must use no more than 1.6 gpf and urinals must use no more than 1 gpf.

Since low-flush toilets use less water, they also reduce the volume of wastewater, which will reduce the demand for energy needed to pump and treat wastewater.

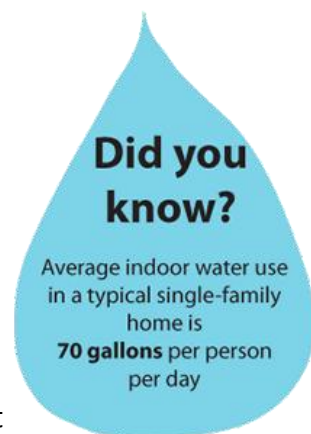
New high efficiency toilets (HET) with the *WaterSense* label go above and beyond the standard of 1.6gpf and use less than 1.28 gpf.

High efficiency urinals (HEU) use 0.5 gallons per flush or less compared to the current federal standard for urinals of 1.0 gallons per flush. Older urinals may use 2-3 gallons or more per flush.

A simple, no cost measure to reduce toilet water use is through 'Toilet Displacement Devices', which is a fancy way of saying that plastic containers (such as a plastic milk jug) filled with water or pebbles and placed in a toilet tank can reduce the amount of water used per flush. More than 1 gallon of water can be saved per flush using this technique. A toilet dam, which holds back a reservoir of water when the toilet is flushed, can also be used instead of a plastic container to save water.

Also important to consider are dual flush and waterless toilets and urinals.

*The United States uses about 5.8 billion gallons of water every day to flush waste. Since toilets and urinals account for nearly one-third of building water consumption, there is a significant potential for savings.*<sup>xlv</sup>



The National Health and Environmental Effects Research Laboratory (NHEERL), in Rhode Island replaced nine urinals with waterless urinals and retrofitted 23 toilets with dual flushing mechanisms. Two years after installing the fixture upgrades, EPA estimates that it saves 350,000 gallons per year (gpy) of water, resulting in an annual cost savings of roughly \$760.

Waterless urinals are urinals that require no flushing, thereby eliminating the need for water. A cartridge is located at the bottom of the urinal that contains a liquid that is lighter than urine, allowing the waste to pass through the cartridge and out the waste drain. The cartridge seals the waste drain, which is plumbed as usual.

Dual flush toilets allow two different flush options for the toilet, depending on the user's needs. Lifting the handle in one direction initiates a reduced flush of 1.1 gallons per flush (gpf), eliminating liquid and paper waste. Pushing the handle in the opposite direction initiates a full flush (1.6 gpf), eliminating solid waste and paper.

[http://www.epa.gov/greeningepa/documents/narragansett\\_casestudy\\_508.pdf](http://www.epa.gov/greeningepa/documents/narragansett_casestudy_508.pdf)

## Water Saving Faucets

The standard flow rate for kitchen faucets with aerators is 2.2 gpm however there are low-flow options available reducing flow to 1.8 gpm. Older faucets use 3 to 5 gallons per minute.

The standard public bathroom faucet flow rate is .5 gpm or .25 gal/cycle.

*Standard kitchen and bathroom water faucets use 4 to 7 gallons of water per minute (gpm). This means that a single incidence of washing dishes may consume up to 120 gallons of water. Non-conserving showerheads use 5 to 8 gpm, consuming up to 40 gallons of water for a single five-minute shower.<sup>xlvi</sup>*

One of the simplest and most inexpensive ways to reduce water flow from a faucet is to replace the aerator. Faucet aerators, which break the flowing water into fine droplets and entrain air, are inexpensive devices that can be installed in sinks to reduce water use. Aerators can be easily installed and can reduce the water use at a faucet by as much as 60%. For maximum water efficiency, the U.S. Department of Energy recommends using aerators that have flow rates of no more than 1.0 gpm.<sup>xlvii</sup>



## Other Water and Energy Saving Fixtures

After toilets, clothes washers and showers are large water consumers in a home. Showerheads that pre-date 1992 should be replaced with low-flow fixtures.

High efficiency washers can help save water, energy and detergent all of which translate to saving money. Inefficient clothes washers can cost

three times as much to operate as energy-efficient ones. Efficient clothes washers can also save energy when drying as they spin-dry clothes more effectively. Front-loading machines use less water and less energy than top loaders.

## Graywater

Graywater is untreated water from bathtubs, showers, sinks and clothes and dish washing machines. This is water that has not had contact with toilet or urinal water, which is referred to a 'blackwater.'

Graywater is usually sent to a 'wastewater facility' however may have the potential to be reused for home gardening, lawn maintenance, landscaping, and other innovative uses.

## Water Efficient Landscaping

Lawn and landscape maintenance accounts for about 32% of the total residential outdoor water use.<sup>xlviii</sup> To reduce the use of potable water to care for landscape plants, water efficiency should be part of any building's landscape plan.



Village of Saddle Rock NY

Water efficient landscaping is also referred to as xeriscaping which is a comprehensive approach to landscaping for water conservation and pollution prevention. Xeriscaping involves choosing plants that are appropriate to their site and creating a landscape that can be maintained with little supplemental watering.

*Benefits of xeriscaping include reduced water use, decreased energy use (less pumping and treatment required), reduced heating and cooling costs because of carefully placed trees, decreased storm water and irrigation runoff, fewer yard wastes, increased habitat for plants and animals, and lower labor and maintenance costs.*<sup>xlix</sup>

## Green Infrastructure

The use of 'green' or 'natural' infrastructure can not only help manage stormwater, but can enrich habitats, improve health and provide cleaner air and water by protecting and restoring natural functioning systems. 'Green infrastructure' techniques include the use of rain gardens, vegetated swales, green roofs and porous pavement.

In addition to protecting water resources, using light colored permeable surfaces (permeable surfaces are cooler in the summer and warmer in the winter) and generous tree and other vegetated areas can reduce the heat generating impacts of the non-pervious black surfaces of roofs, parking lots and streets.



This rain garden was installed as a public demonstration project at the Ulster County Department of the Environment office located at 17 Pearl Street in a former historic home in the City of Kingston. It illustrates what can be done to capture and treat stormwater runoff in an urbanized area.

## PROPOSED GOALS

- Promote the use of ‘green infrastructure.’
- Protect water resources, reduce water usage and associated energy costs.
- Reduce water and energy inputs associated with landscape management.
- Plant, manage, maintain and protect street trees and urban forests.
- Promote local food production.
- Integrate sustainable practices in building operations and maintenance.

### By 2020:

- 30 rain gardens have been created in the City, 15 on City owned property.
- Pervious pavement or pavers are being used to repave City lots and streets.
- Water and energy use at all City buildings and facilities is being tracked and monitored.
- [WaterSense](#) high efficiency water saving fixtures are being used to replace or upgrade fixtures in City owned buildings.
- The number of community and school gardens has doubled.
- Each school and City building has developed a successful ‘green’ cleaning program.

## RECOMMENDATIONS: WATER CONSERVATION AND EFFICIENCY

### A. Green Infrastructure

#### Community Recommendations

It is recommended that the City adopt a local ‘green infrastructure’ ordinance. Amongst its many benefits, the use of green infrastructure can lessen the flow of water to the wastewater treatment plant thereby reducing the energy needed to pump and treat wastewater.

A local ordinance can advance the development of ‘green infrastructure’ by using rain gardens, pervious pavement and green roofs, to manage stormwater and minimize the amount of stormwater entering the wastewater system.

‘Green infrastructure’ should be carefully considered as a means of reducing flow of stormwater to the wastewater treatment plant, particularly in areas of the City that experience regular overflow problems.

Also, a goal of the Comprehensive Plan and Zoning Update should be to establish standards and guidelines to encourage or in some cases require the use of ‘green infrastructure’ ensuring that ecologically beneficial stormwater quality and retention features are integrated into landscaping design on both public and private land.



Pervious Pavers, RUPCO Parking Lot

A local ordinance should address the broad benefits of ‘green infrastructure’.

### Municipal Government Recommendations

City projects, such as any road or building improvements, should integrate the use of ‘green infrastructure’ exploring such techniques early in the planning process.

The City should continue to use, demonstrate and promote ‘green infrastructure’ such as the recently installed porous pavement parking lot at the Forsyth Nature Center and the Rain Harvesting Program, sponsored by the *Friends of Forsyth Nature Center* and the *ALCOA Foundation* distributing free rain barrels to residents willing to participate in a stormwater management project.

City buildings and parks are ideal settings to use and advance ‘green infrastructure’ such as rain gardens, rain barrels and porous pavement.

It is also recommended that the City encourage the use of ‘green infrastructure’ in local development by providing outreach and guidance consistent with the building code.

## **B. Water Use Reduction**

### Community Recommendations

It is recommended that municipal codes and regulations be reviewed and enhanced to promote water conservation through the use water efficient fixtures including toilets, showerheads, and faucets in all new development and redevelopment projects, including waterless fixtures.

Consider requiring new construction & major renovations to install *WaterSense* high efficiency water saving fixtures. Conduct community outreach regarding water conservation and the use of water efficient fixtures consistent with the local building code.

## Municipal Government Recommendations

To establish a baseline of municipal government water use and to annually track water use it is recommended that the City government use *EPA's Portfolio Manager* or a similar software. This information can be used to set water conservation goals to reduce water use and wastewater in government buildings and facilities. Water use reductions will result in reducing the overall energy usage and costs to pump and treat water and wastewater. It is also recommended that the City encourage local businesses to track energy and water use with *EPA Portfolio Manager*.

It is also recommended that the City establish a policy to reduce water use in its buildings and facilities by using waterless or high efficiency toilets and urinals, low-flow and water efficient fixtures, waterless fixtures, capturing and re-using rainwater, native planting and xeriscaping.

To promote *WaterSense* and water efficiency it is recommended that the City of Kingston become an EPA *WaterSense* partner, which is free. Partnership will provide access to outreach and marketing resources to help increase water efficiency.



It is also recommended that the City:

- Examine energy costs as a percentage of the Water Department's total operation and maintenance (O&M) costs and use the *EPA Energy Management Handbook for Wastewater and Water Utilities*<sup>1</sup> and other resources to analyze their current energy usage.
- Use energy audits to identify opportunities to improve the energy efficiency of the Kingston water delivery system.
- Implement energy efficiency projects at water delivery facilities and measure the effectiveness of energy projects, and
- Strongly consider the implementation of renewable energy sources such as solar photovoltaic's to offset electricity usage by water delivery systems.

## LANDSCAPE MANAGEMENT

Well-groomed fertilizer and pesticide enhanced lawns come with a number of environmental costs.

In addition to the energy needed to move water for maintaining lawns and landscapes, there are a number of other ways that landscape management affects energy use and results in GHG emissions. There is energy used and greenhouse gases emitted in the production and transportation of fertilizers and pesticides. The commercial production and transportation of other landscape materials such as mulch also results in GHG emissions.

### A. Lawn and Landscape Equipment

The operation of lawn and landscape equipment is usually fossil fuel based and will result in the release of GHG emissions. The City of Kingston GHG emissions from landscape maintenance equipment were not analyzed separately as the fuel record keeping system used by the City currently makes it impossible to accurately distinguish fuels used in vehicles versus fuels used in equipment. For example the City Parks

and Recreation Department has one master gas key which the entire department uses for all fuel purchases. Therefore it was not feasible to distinguish between the fuels used for off-road equipment versus fuel used by department vehicles. Fuel usage for off-road equipment and for vehicles had to be estimated for this GHG inventory.

Measuring and managing fuel usage in landscaping equipment can help in analyzing and understanding the potential savings that can be realized as part of energy efficiency improvements. Improvements can include a reduced mowing program and the use of alternative fuels in equipment such as bio-fuels.

## B. Native Plantings

Landscaping using local native plants can greatly reduce or eliminate the need for irrigation, pesticides, and gasoline powered maintenance equipment thereby reducing GHG emissions and improving environmental quality.

## C. Non-toxic Landscape Maintenance

In November of 2011, the Kingston Conservation Advisory Council (CAC) began the process of investigating the feasibility of a non-toxic landscape management plan for the City of Kingston. The CAC is currently reviewing a model plan adopted by the Ulster County legislature which includes guidelines to use integrated pest management (IPM), eliminating the use of synthetic chemicals.

## D. Urban Forests

By maintaining a healthy urban forest, prolonging the life of trees, and continually increasing tree stock, communities can increase their net carbon storage over the long-term.

Trees play an important role in the community that goes well beyond aesthetics. Trees remove CO<sub>2</sub> from the atmosphere, use the carbon to form the physical structure of the tree (roots, trunk, branches and leaves), and return the oxygen to the atmosphere. A single mature tree can absorb as much as 48 lbs of CO<sub>2</sub> per year. It is estimated that between 660 and 990 million tons of carbon is stored in our urban forests nationally.<sup>li</sup>

Because of their ability to absorb CO<sub>2</sub> and produce oxygen, trees have aptly been called the “lungs of the planet.”

Tree shade helps to offset air conditioning use in the summer, and they can reduce heating costs by blocking cold winds in the winter. This not only reduces associated emissions, but also saves money. The shade from a single well-placed mature tree reduces annual air conditioning use two to eight percent (in the range of 40-300 kWh), and peak cooling demand two to ten percent (as much as 0.15-0.5 kW).



A healthy urban forest has several benefits, including:

- Reducing the amount of energy (electricity, natural gas, or other fuel) used to cool and heat buildings.
- Reducing local ambient temperatures by shading paved and dark colored surfaces like streets and parking lots that absorb and store energy rather than reflecting it.
- Intercepting and storing rainwater, thereby reducing water runoff volume.
- Improving community quality of life through beautification and by reducing noise pollution and encouraging pedestrian traffic.
- Locking up pollutants that would otherwise end up in local streams and rivers.

## RECOMMENDATIONS: LANDSCAPE MANAGEMENT

### Community Recommendations

As part of the Comprehensive Plan and Zoning Update it is recommended that the City explore the enhancement of municipal codes and regulations that:

- Conserve water, including reviewing building stormwater retention requirements and vegetation requirements, and revising codes to encourage non-toxic land management practices.
- Encourage and promote the use of native plants.
- Encourage and promote the use of water conserving landscape plants and techniques known as xeriscaping.
- Support and strengthen tree planting and management.
- Integrate standard 'green' principles for tree planting and permeability requirements.

It is recommended that the City:

- Continue to support the Kingston Tree Commission to meet the requirements necessary to be deemed a 'Tree City USA', including such criteria as: having a tree board, allotting City money for tree plantings and hosting Arbor Day celebrations.
- Support Kingston Tree Commission projects to promote urban forestry which includes actively seeking funding through grants and other funding opportunities to expand the urban forest landscape.
- It is recommended that the Kingston CAC, the Kingston City School District and others continue to work with Kingston's Tree Commissions to develop measures to fund tree planting, maintenance and education.
- Work with the Tree Commission, the Kingston CAC and others to develop best practices to:
  - provide street trees more space for healthy roots such as engineered soils,
  - allow generous space for development of street trees, and
  - encourage tree planting to help shade buildings to conserve energy and water.

The City may want to consider the development of an Urban Forestry Master Plan as part of the Comprehensive Master Plan process.

## Municipal Government Recommendations

As part of an overall effort to promote the local economy and protect the local environment, it is recommended that the City:

- Use and promote the use of native plants.
- Use and promote the use of water conserving landscape plants and techniques known as xeriscaping.
- Adopt a non-toxic landscape management policy as recommended by the Kingston CAC.
- Develop a procedure to improve the tracking of fuel usage by off road landscape equipment so as to be able to better manage it.
- Examine current mowing practices and consider initiating and implementing a reduced mowing program.
- Support and promote the 'Leave it on the Lawn, Kingston' campaign.

[http://www.ci.kingston.ny.us/filestorage/50/Leave\\_On\\_Lawn\\_2011\\_\(2\).pdf](http://www.ci.kingston.ny.us/filestorage/50/Leave_On_Lawn_2011_(2).pdf)

## LOCAL FOOD PRODUCTION

Gardening and local 'slow food' movements are making a comeback. Communities' desire to cut costs, eat healthier, and reduce their carbon footprint, along with concerns about our food system's dependence on rapidly depleting fossil fuels, is spurring a move toward more sustainable food production and distribution. Sustainable food systems reduce the distance food must travel to get to our tables. When food is produced, processed and distributed near where it is consumed, transportation miles are minimized as are the associated pollutants. According to a WorldWatch Institute study, a typical meal brought from a conventional supermarket chain consumes 4-17 times more petroleum for transport than the same meal using local ingredients.

Local food systems offer a host of social and economic benefits. Growing a garden can make a difference for a family's food budget. Efforts to increase access to local, affordable, healthy food for low-income families, the elderly, and others with mobility challenges can improve public health. Local food systems also help to insulate communities from volatile oil prices, which in turn affect food prices. Finally, food localization can create high-quality local green jobs in the farming, food processing and distribution trades.

### Community Gardens

Currently there is a School and Community Gardens Committee in the City of Kingston working to create, promote and sustain community and school gardening in the City. The committee is also working on developing local produce markets in walkable distance from Kingston neighborhoods in the form of farmer's markets and increased access to local produce at corner stores.

Additionally, in 2010, the Common Council of the City of Kingston passed a Community Garden Resolution supporting the proliferation of food gardens throughout the City.



In 2011, in partnership with Kingston Cares (a program of Family of Woodstock), the South Pine Street City Farm and with the support of Kingston Parks and Recreation Department, the Kingston Land Trust created 'The Dig Kids.' The program is designed to teach Kingston youth to grow food, learn farming practices, and encourage entrepreneurship, beautification, pride and good health through hands-on farming experiences. In 2012, its second year, youth "Garden Mentors" will farm for a four-month period (May-August) at the Everett Hodge Center on Franklin Street and the Van Buren Street Playground in Midtown, Kingston.

### **South Pine Street City Farm**

The South Pine Street City Farm located at 27 South Pine Street off of Greenkill Avenue in Midtown, Kingston has successfully turned a vacant lot into a thriving organic farm created by first generation farmer Jesica Clark. In August 2011 a "Midtown Farm Stand" was started and operated on site selling fresh vegetables three days a week.

The Farm grows fresh, local and sustainably-grown produce that feeds guests at the Queens Galley less than a mile away. In addition, Farmer Clark delivers seasonal vegetables to local stores and restaurants in a 'farm to table' effort. With the addition of the Midtown Farm Stand, residents can now purchase seasonal organic vegetables at a better price due to the elimination of transportation and other associated costs.

The South Pine Street City Farm operates in partnership with the Queens Galley, Binnewater Ice Co. and the Kingston Land Trust. The Midtown Farm Stand was made possible by a material and build donation by Hugh Cummings of Hugh-Name-It Builders, Kingston NY.

<http://www.kingstonlandtrust.org/category/south-pine-street-city-farm/>

## **RECOMMENDATIONS: LOCAL FOOD PRODUCTION**

It is recommended that the City:

- Continue to actively support the efforts to advance community and school gardens in the City of Kingston to encourage local food production.
- Work with the Kingston Land Trust, Kingston CAC, Kingston Schools and others to provide financial and other resources needed to advance local food production.
- 'Grow' the number of community gardens.
- Continue to support programs such as 'The Dig Kids.'
- Actively support and promote the Kingston Farmers Market.
- Use local produce and local food products at City events, meetings, etc.
- Promote the use of locally produced food and local products.
- Start a government employee operated community garden.

## SUSTAINABLE BUILDING MAINTENANCE AND OPERATION

As was identified in the ***Local Government Operations Energy and Greenhouse Gas Emissions Inventory Report***, existing City government buildings use the most energy and produce the greatest amount of GHG emissions of City government operations. In addition to improving energy efficiency in these buildings there is an opportunity to look at sustainability in the overall operations of existing buildings. Operation and maintenance practices such as recycling programs and 'green' cleaning can reduce environmental impacts of building maintenance and create healthier and more productive employee workspaces.

### Green Cleaning

Using non-toxic cleaners has many benefits. In addition to reducing exposure to toxic chemicals and improving indoor air quality, it can also improve cleaning processes and systems and promote increased productivity and learning. The NY State Office of General Services<sup>40</sup> runs a green cleaning program for state facility managers and maintains a web site, <https://greencleaning.ny.gov/>, that is a useful resource for developing a green cleaning program. The web site offers a wealth of free information and tools to promote adoption of effective green cleaning practices.

### Environmentally Preferable Product or 'Green' Procurement Policy

At the federal and state level Executive Orders direct agencies, public authorities and public benefit corporations to 'green' their procurements and to implement sustainability initiatives. Greenhouse gas reductions as well as many other environmental, economic and social benefits can result from the adoption and implementation of a local 'green' purchasing policy that integrates environmental guidance and principles into contract language, specifications and policies.

New York State has a 'green procurement' program initiated by Executive Order directing state agencies, public authorities and public benefit corporations to 'green' their procurements. <http://ogs.ny.gov/EO/4/Default.asp>

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<sup>40</sup> <https://greencleaning.ny.gov/Entry.asp>

## RECOMMENDATIONS: SUSTAINABLE BUILDING OPERATION AND MAINTENANCE

### Community Recommendations

It is recommended that the City:

- Adopt a local 'green' building code supporting and promoting 'green' operations and maintenance for existing commercial buildings within the City.
- Work with the Kingston Business Alliance and others to promote 'green' practices that can help business owners reduce energy use, reduce waste and provide a cleaner, healthier work environment for their employees.
- Work with the Kingston CAC, the Kingston City School District as well as private schools, day care centers and pre-schools to support the development and implementation of 'green' cleaning programs in all City schools.

#### **Creating Healthy Schools**

- Schools have four times the number of occupants per square foot than most office buildings;
- The EPA estimates that 40% of our nation's 115,000 schools suffer from poor environmental conditions that may compromise the health, safety, and learning of our students;
- Asthma affects one in 13 children and results in over 14 million missed schools days each year, making it the leading cause of absenteeism; and
- A successfully implemented Green Cleaning Program can reduce the levels of cleaning chemicals, mold, and airborne dust, major indoor triggers of asthma attacks.

<https://greencleaning.ny.gov/faq.aspx>

### Municipal Government Recommendations

It is recommended that the City of Kingston government:

- Develop and implement a non-toxic or 'green' cleaning program for all City of Kingston buildings and facilities using guidance and resources available through the NY State 'green' cleaning program: <https://greencleaning.ny.gov/>.
- Create and implement an 'Environmentally Preferable Product' or 'Green' Procurement Policy and program using the State 'Green' procurement program as guidance.

## MONITOR AND EVALUATE

### City Office of Energy & Sustainability

To advance these and other sustainability initiatives in the community and within City government, it is strongly recommend that the City create, fund and sustain a City Office of Energy and Sustainability. A more complete discussion of this recommendation can be found in Section IV.A.

## SUMMARY OF RECOMMENDATIONS: SUSTAINABLE RESOURCE MANAGEMENT

<u>Sector</u>	<u>Goal</u>	<u>Action/Initiative</u>	<u>Community</u>	<u>Municipal Government</u>
<b>Water Conservation and Efficiency</b>				
	Promote the use of Green Infrastructure.	Adopt a local 'green infrastructure' ordinance.	X	
		Establish standards and guidelines to encourage or require the use of 'green infrastructure.'	X	X
		Encourage the development of green infrastructure such as rain gardens and green roofs by providing outreach and guidance consistent with the building code.	X	
		City projects such as any road or building improvements should consider the use of green infrastructure techniques as part of its project planning process.		X
		Demonstrate and promote 'green infrastructure' in City properties.		X
	Protect water resources, reduce water usage and associated energy costs.	As part of the building code ensure that low-flow water saving or waterless fixtures are used in new construction and renovations.	X	
		Consider requiring new construction & major renovations to install <a href="#">WaterSense</a> high efficiency water saving fixtures.	X	
		Establish a water use reduction policy for government buildings and facilities.		X
		Use EPA Portfolio Manager or similar free software to establish baseline water use in government buildings and facilities.		X
		Encourage local businesses to track energy and water use with EPA Portfolio Manager.	X	
		Use <a href="#">WaterSense</a> high efficiency water saving fixtures or waterless fixtures in government facility upgrades, new construction and renovations.		X

		Identify and implement energy efficiency and renewable energy project opportunities to improve the overall energy efficiency of the Kingston water delivery system.		X
<b>Landscape Management</b>				
	Reduce water and energy inputs associated with landscape management.	Review building stormwater retention requirements and vegetation requirements, and revise codes to encourage non-toxic land management practices.	X	
		Use native plants.	X	X
		Use and promote xeriscaping.	X	X
		Adopt a municipal non-toxic landscape maintenance policy for City-owned properties.		X
		Support and promote "Leave It On The Lawn, Kingston!" Leaf Management Plan	X	
		Track the fuel usage by off-road landscape equipment.		X
		Examine current mowing practices and consider initiating and implementing a reduced mowing program for City-owned properties.		X
	Plant , manage, maintain and protect street trees and urban forests.	Enhance municipal codes and regulations to support and strengthen tree planting and management.	X	
		Support the Kingston Tree Commission efforts in strengthening local codes, funding tree planting and maintenance initiatives, and promoting urban forestry.	X	
		Consider the development of a comprehensive urban forestry master plan as part of the Comprehensive Master Plan process.	X	
		Develop best practices to advance the health of street trees and the use of trees to conserve water.	X	
		Develop best practices to encourage tree planting to help shading buildings and factor into tree planting their ability to	X	

		conserve energy and water.		
		Integrate standard 'green' principles into planning codes for tree planting and permeability requirements.	X	
<b>Local Food Production</b>				
	Promote Local Food Production.	Continue to actively support the efforts to advance community and school gardens.	X	
		Work with the Kingston Land Trust, Kingston CAC, Kingston Schools and others to provide financial and other resources needed to advance local food production.	X	
		'Grow' the number of community gardens.	X	
		Continue to support programs such as 'The Dig Kids.'	X	
		Actively support and promote the Kingston Farmers Market.	X	
		Use local produce and local food products at City events, meetings, etc.		X
		Promote the use of locally produced food and local products.	X	X
		Start a City government employee operated community garden.		X
<b>Sustainable Building Operation and Maintenance</b>				
	Integrate sustainable practices in building maintenance and operations.	Encourage, support and promote sustainable green operations and maintenance for existing commercial buildings.	X	
		Work with the Kingston Business Alliance and others to promote 'green' practices.	X	
		Support the development and implementation of 'green' cleaning programs in all City schools.	X	
		Create and implement a non-toxic or 'green' cleaning program for all City of Kingston buildings and facilities.		X
		Create and implement an		

		Environmentally Preferable or 'Sustainable' Purchasing Policy.		X
	Monitor and evaluate.	Create, fund and sustain City Office of Energy & Sustainability.	X	X

## E. OUTREACH, EDUCATION & TRAINING

### FINDINGS

It is recognized that engaging the public and decision makers in the implementation of this plan requires “the facts, and more.” The easy part, drafting this Plan, has been done. The hard part, putting this Plan into action, will now be the challenge. Recommendations in this Plan are based on a strong scientific consensus and on a thorough inventory of impacts and opportunities for response by the City of Kingston. The facts provide a foundation. But to achieve the concerted action that will propel the City of Kingston into a low-carbon, prosperous and innovative future, there is a need for vision, leadership, and a communications strategy.

A majority of Americans are concerned, or very concerned, about climate change. The entire Kingston community is affected by the changing climate, energy choices, and the opportunities for economic improvement connected with vigorous climate action. The entire community should have access to the conversation, protection from risks and the benefits of participation. Open, transparent planning and action, guided by stakeholder feedback, will result in a Plan and implementation strategy that has consensus from a broad base of community members.

With release of this Draft Plan, the Climate Smart and Green Jobs Community Task Force is seeking additional stakeholder input on the initial climate action planning work that has been done over the past year. This public engagement process should build upon, and not duplicate, the outreach that was conducted by the Kingston Conservation Advisory Council and Climate Smart and Green Jobs Community Task Force to build initial support for the Plan and frame the inputs to this report.

Over the coming months the Task Force will be actively looking to engage the Common Council, City government staff and the community in the review, prioritization and implementation of the proposed goals and initiatives.

The communications strategy should have a clear message to engage community leaders, City policy makers and local government staff in the further development, refinement and implementation of the goals and initiatives outlined in this Plan.

*“The ultimate solutions to climate change are workable, cost-effective technologies which permit society to improve living standards while limiting and adapting to changes in the climate. Yet scientific, engineering, and organizational solutions are not enough. Societies must be motivated and empowered to adopt the needed changes. For that, the public must be able to interpret and respond to often bewildering scientific, technological, and economic information. Social psychologists are aware, through their painstaking scientific research, of the difficulties that individuals and groups have in processing and responding effectively to the information surrounding long-term and complex societal challenges.”*

- Center for Research on Environmental Decision Making

The overarching message:

***Reduce the City of Kingston's energy consumption  
and greenhouse gas emissions 20% by 2020. (20 by 20).***

## PROPOSED GOALS

- Engage people who live, work and play in the City of Kingston in energy and climate action.
- Improve awareness of opportunities to improve energy efficiency and reduce GHG emissions.
- Promote and create 'Green' Jobs.
- Empower and expand the Climate Smart and Green Jobs Community Task Force.

## RECOMMENDATIONS

The Climate Smart and Green Jobs Community Task Force is developing a communications strategy that will result in community stakeholders, City policy makers and government staff vetting, reviewing and prioritizing the proposed goals and initiatives of this Plan.

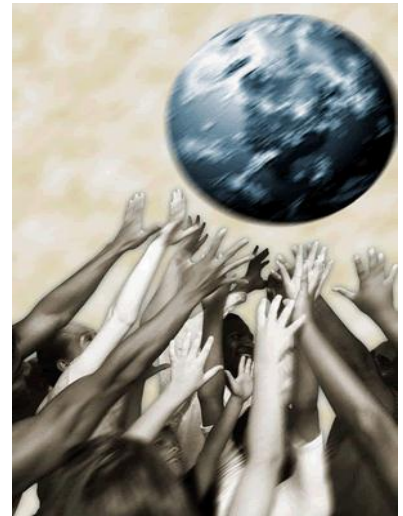
Prioritization should be based on the City's priorities and constraints taking into consideration the triple bottom line of sustainability – people, planet and profits.

Prioritization and implementation will need to include consideration of what measures can be achieved in the near- term and what measures are more long-term efforts.

This effort needs the expertise of County and City government staff, such as County and City planning and engineering, emergency services, public works and public health and safety. Coordination with State and federal agencies is also critical.

The Climate Smart and Green Jobs Community Task Force may want to consider 'branding' this effort as 'Sustainable Kingston' or 'Kool Kingston' as other communities have done such as 'Energize Bedford'<sup>41</sup> or Sustainable Ulster.'<sup>42</sup>

Some of the elements of a communication strategy to engage the community in this important effort are discussed below.



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<sup>41</sup> <http://energizebedford.org/>

<sup>42</sup> [www.sustainableulster.org](http://www.sustainableulster.org)

## COMMUNITY RECOMMENDATIONS

### A. Build Strategic Partnerships

Tremendous opportunities exist locally for advancing sustainability, particularly energy conservation and efficiency in the City of Kingston.

NYSERDA's Mid-Hudson Energy Smart Communities Program is located on Broadway right next to City Hall. Rural Ulster Preservation Company (RUPCO) recently became NYSERDA's Green Jobs/Green NY coordinator for the Hudson Valley providing outreach, marketing and education services for NYSERDA and promoting energy efficiency within priority communities. SUNY Ulster offers a wide range of clean energy and sustainability courses. The Solar Energy Consortium (TSEC) an industry-led not-for-profit headquartered in Kingston is working to expedite the adoption of solar energy. TSEC has already helped the City through installation of a solar hot water heating system at Benedictine Hospital. Energy improvements done by key institutions throughout the City provide a basis for 'sustainability' tours to be built upon and establish an innovation 'green' corridor which could help leverage financial and creative resources.

There are also strong regional and state level partners to work with to create a 'Model City' of sustainability. They include the professionals at the State Office of Climate Change, the Hudson River Estuary Program, the Hudson River National Estuarine Research Reserve and non-profit environmental organizations that are locally addressing climate change and climate adaptation.

It is strongly recommended that the City further develop and take advantage of these strategic partnerships to advance energy efficiency, renewable energy and sustainable development in the City of Kingston.

### B. Public Education

It is recommended that the Task Force and the City of Kingston take advantage of the tremendous opportunities that exist to demonstrate sustainable practices to its residents and those that visit and use City public facilities. For example, a solar panel installation at the Rondout Neighborhood Center could be used to educate its users about renewable energy.

Additionally through the City of Kingston's existing environmental education programs the City and the Task Force can work with schools to engage teachers and students in advancing the goals and initiatives of this Plan.

To achieve this, it is recommended that the City of Kingston continue to incorporate sustainability education into the City's overall education and interpretation programming that is offered through the Parks and Recreation Department. Enriching City educational offerings can bring public awareness and support for creating a 'Model City' of sustainability.



Source NYSDEC web site

The City's many events and festivals provide an excellent platform for promoting sustainability to thousands.

### C. Energy Challenge

As discussed in Section IV.A. a local community energy awareness or energy challenge program is a useful tool to create awareness about energy issues and provide information to businesses and residents about energy audits, energy conservation measures, existing energy efficiency program incentives and the opportunity to change energy habits. A change in energy consumption requires motivation, incentives, help in overcoming barriers, and above all, leadership.

There are a number of good models to look at that will help the City of Kingston to determine the best way to engage members of the community in energy and climate issues.

One model, SHV's 10% Challenge, is a voluntary program by which local residents, businesses and governments pledge to reduce energy use by 10% and to get at least 10% of the local population engaged in the effort. Offering a variety of clever prizes for the first community to achieve a 10% energy reduction, these campaigns have used tactics from school contests to smart grid pilots to spark participation. Other local municipalities such as Red Hook, the City of Hudson, and the Town of Montgomery have successfully created energy challenge programs for their residents and businesses.

Another model to explore is the Green Blocks Pilot Project used by the City of Missoula, MT.

Such campaigns can motivate neighborhoods and the community as a whole to go beyond awareness raising and build momentum for energy-conserving behavior.

#### **Red Hook's 10% Challenge**

The campaign challenges community members, businesses, institutions and households to reduce energy use by 10% and also to motivate 10% of citizens, employees, or social contacts to become involved.

Designed and spearheaded by Sustainable Hudson Valley, the campaign is supported by partners including Central Hudson Gas & Electric Corporation, Mid-Hudson Energy Smart Communities, the Student Conservation Association's AmeriCorps team, The Town and Village of Red Hook, the Village of Tivoli and the local leadership coalition Red Hook Together .

According to the Town web site, using [MYENERGYPLAN.NET](http://MYENERGYPLAN.NET), the Town of Red Hook has 68 households saving \$44,571 in energy costs, pledging to reduce GHG emissions by 342,677 pounds of CO<sub>2</sub>.

<http://redhookchallenge.org/>

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

### **City of Missoula Green Blocks Pilot Project**

In the summer of 2011, the City of Missoula and NorthWestern Energy (an investor owned utility) teamed up on an exciting project called the Green Blocks Pilot Project. It aims to:

- Demonstrate home energy savings and bring significant energy-saving home improvements to residents in 300 Missoula homes free of charge to participating homeowners.
- Bring neighbors together and build community.
- Encourage the green economy and create jobs.

<http://www.ci.missoula.mt.us/index.aspx?NID=977>

While it is important for the Task Force to attend public events, hold traditional public education forums such as community meetings, workshops, conferences, etc, an ‘Energy Challenge’ initiated in the community may be the best way to engage the community in the effort to advance the goals set forth in this Plan.

It is recommended that the City of Kingston and the Climate Smart and Green Jobs Community Task Force work with the Mid-Hudson Energy Smart Communities, the Rural Ulster Preservation Company, Cornell Cooperative Extension of Ulster County, SHV, Central Hudson’s Energy Efficiency program and others to determine the potential to successfully engage the community in an energy awareness or energy challenge program in the City of Kingston. An energy awareness and outreach strategy should envelop the energy programs and incentives available through NYSERDA, Central Hudson and other federal and state agencies, highlighted below.

### **Energy Efficiency Savings from Central Hudson Gas & Electric**

Central Hudson offers a variety of energy efficiency rebates and incentives to homeowners and businesses.

For example Central Hudson offers a rebate of up to \$600 for having your home professionally sealed by a Building Performance Institute (BPI) certified Trade Ally after a blower door test. The blower door test is one of several special diagnostic tools BPI certified Trade Allies use to pinpoint and seal hidden air leaks. Sealing your home’s envelope (outer walls, ceiling, windows, doors, and floors) is often the most cost effective way to improve energy efficiency and comfort. A skilled Trade Ally can save you up to 20% on heating and cooling costs (or up to 10% on your total annual energy bill) by sealing and insulating, according to estimates from Energy Star.

For more information on Central Hudson’s energy efficiency rebates visit:

<http://www.savingscentral.com/>

## Home Energy Audit

Most New Yorkers qualify for a free or reduced-cost comprehensive home energy assessment, also referred to as an energy audit. Visit: <http://nyserdagreenyny.org/home-performance>

## Energy Assistance for Low and Moderate Income Households

To reduce the energy burden on households that are particularly susceptible to high and fluctuating energy costs, the following programs provide cost-effective home improvements:

- Assisted Home Performance with ENERGY STAR
- Assisted New York ENERGY STAR Homes
- EmPower New YorkSM
- Low-Income Home Energy Assistance Program (HEAP)
- Weatherization Assistance Program (WAP)

<http://www.nyserda.ny.gov/en/Page-Sections/Residential/Programs/Low-Income-Assistance.aspx>

## Weatherization Assistance Services

Ulster County Community Action Committee, Inc.  
70 Lindsley Ave  
Kingston, NY 12401

**Contact:** Anthony Pampinella

**Phone:** (845)338-8750

**Email:** [uccawx@hotmail.com](mailto:uccawx@hotmail.com)

**Service Profile:** Weatherization assistance providers can assist eligible homeowners and owners of rental properties with measures to improve energy efficiency including:

- an energy audit of the home to identify specific needs;
- weatherstripping and caulking around doors and windows;
- cleaning, testing, repairs, or replacement of heating systems;
- replacement or repair of storm windows;
- replacement or repair of broken windows and/or outside doors;
- addition of insulation to walls or ceilings;
- mitigation of health and safety concerns, in particular assure that all dwelling units receive smoke detectors and carbon monoxide detectors.

Weatherization Services may also include other energy-related improvements such as: water heater repair/replacement, roof repair/replacement, chimney repairs, lighting fixture replacement, venting systems, heating distribution system replacement, refrigerator replacement, installation of GFI outlets, and electrical service upgrade.

Weatherization services are available to income-eligible (60% of State median income) individuals who may be either home owners or renters living in a mobile home, an apartment, or a single-family home.

[http://www.dhcr.state.ny.us/Apps/profiles/profile\\_detail.asp?applid=3242](http://www.dhcr.state.ny.us/Apps/profiles/profile_detail.asp?applid=3242)

#### D. Sustainability Ambassador Program

It is recommended that the City develop a well-designed Sustainability Ambassador Program involving City leaders as trained and recognized ambassadors to advance the goals of the Plan.

A well-designed Sustainability Ambassador Program with City leaders working side-by-side with community members would send a strong signal that this initiative is serious and defining for the City. The Ambassadors can attend events and make presentations to specific groups such as the Kingston Business Alliance, faith-based groups, Kingston Digital Corridor, Kingston Uptown Residents' Alliance, Kingston Neighborhood Watch, and The Arts Society of Kingston.

#### E. Communications Media

It is recommended that the Task Force:

- Use 'Facebook' and other web-based social networking tools to engage the community in plan implementation and local climate action.
- Maintain the 'Climate Action' page on the City's web site.
- Develop a separate 'Sustainable Kingston' web page working with a company such as 'Blue Springs Energy', which helps local governments access clean and renewable energy grants.

See <http://www.sustainableulster.org/>.

#### F. Other Outreach Tools

The Plan should be accessible to the public on the City's website. A 'hard' copy of the Plan should also be available in the City Clerk's office, at the Public Library and in other public venues such as community centers and café literature racks.

Traditional written outreach materials such as a simple, condensed and well designed flier or brochure will also be important. It is recommended that with funds available through the Clean-Air Cool Planet grant the Task Force develop a simple tri-fold brochure on 'Reducing Your Ecological Footprint' with a particular focus on energy saving and money saving tips that will also benefit the environment.

All printed material should be produced on an as needed basis and printed on 100% post-consumer recycled paper.

For Energy Saving Tips visit: <http://www.savingscentral.com/energysavingtips.html>.

#### G. Integrate Energy and Climate Outreach into Comprehensive Plan Process

Lastly, it will be important to incorporate the goals and initiatives outlined in the Climate Action Plan into the current Comprehensive Plan outreach and communications. The 'Climate Conversations' held by the City of Albany during its Comprehensive Master Planning outreach process is a good model to emulate.

### **Climate Conversations, City of Albany**

In the summer of 2011, the City of Albany as part of its Comprehensive Planning process, Albany2030, held a series of public forums called 'Climate Conversations.'

These participatory question and answer sessions engaged members of the community by addressing questions such as:

How will climate change affect Albany?

What can the City do to protect its citizens, buildings, roads, and water supply?

How can residents and businesses help?

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

### **H. Green Jobs**

An important component of the City's Climate Smart and Green Jobs Community Pledge is to ensure that overarching economic and environmental goals are integrated with job development. Implementation of many of the initiatives in this Plan will create 'green' jobs.

Energy conservation programs and renewable energy development will provide opportunities for local job creation.

To date, the Task Force has considered the potential for the following opportunities:

- Create a model district – a “green corridor” – with visible demonstration projects of technology, building restoration, and landscaping.
- Include space(s) for exhibits and business incubation.
- Assess the feasibility of a Zero Net Energy District that produces its own clean energy, as they're working on in Fort Collins, CO ([www.fortzed.com](http://www.fortzed.com)) and other places.
- Strengthen university/community connections, starting by locally promoting the clean energy training available at SUNY Ulster's Business Resource Center and engaging regional schools of architecture, engineering, planning and development.
- Consider industries that bring multiple benefits, such as solar-powered urban greenhouses that can produce food.
- Integrate these ideas with the City's key focus on arts and digital media.
- Advocate for local policies to strengthen the green economy and build the tax base.



Such opportunities should be mapped out in more detail and prominently featured in the public conversation as this Plan is carried forward. Key elements to identify and organize are industry clusters, development districts, and local entrepreneurs.

## I. Regional Energy and Climate Conference

It is also recommended that the City commit the resources necessary to organize a regional ‘Energy, Climate and Green Jobs Conference’ in the City of Kingston working with the NYSDEC Climate Smart Communities Program and other Climate Smart communities and appropriate partners to advance the goals and initiatives in this Plan.

## MUNICIPAL RECOMMENDATIONS

### A. Municipal Government Education and Training

An important aspect of this initiative is to create awareness among municipal staff about the importance of addressing energy management and incorporating sustainability practices into day-to-day operations. A strong commitment to training and education of City staff is essential.

It is recommended that the City:

- Work with the Climate Smart and Green Jobs Community Task Force to create a better understanding amongst City official and staffs about the goals set forth in this Plan.
- Adopt an energy efficiency and conservation policy providing for the training and education of City employees.
- Build energy efficiency and sustainability training into other mandated internal training and education programs.
- Consider using the City’s environmental educators to help train City staff.

Over time, all City employees should become familiar with the goals of this Plan and understand how their day-to-day work activities and actions can contribute to making the City more sustainable.

Educational Topics can include:

- Understanding Sustainability
- Winter Energy Conservation Tips
- Summer Energy Conservation Tips
- Funding Sources for Renewable Energy Projects
- Waste Reduction Tips
- Greening Your Meeting
- Composting Food and Yard Waste
- Benefits of Green Procurement
- The Efficacy of Green Cleaning Products
- Measuring and Tracking Greenhouse Gases
- Green Infrastructure and Stormwater Management

## B. Climate Smart and Green Jobs Community Task Force

The Climate Smart and Green Jobs Community Task Force is the group primarily responsible for advancing the implementation of this Plan and will be leading the outreach effort.

The Task Force should continue to move forward with a communications strategy that will result in community stakeholders, City policy makers and government staff vetting, reviewing and prioritizing the proposed goals and initiatives of this Plan. The Task Force should also continue to work with local groups such as RUPCO, Clearwater, Cornell Cooperative Extension of Ulster County and others to convene participatory meetings with stakeholders from the community and municipal government, including elected officials. Such participation will be instrumental in prioritizing the goals and initiatives outlined in this Plan. The Task Force will also want to regularly review and update initiatives and actions.

It is strongly recommended that the City of Kingston Common Council adopt a resolution recognizing this Task Force as an official body of the City government. It is also recommended that the City of Kingston government, the Mayor and Council through resolution, rename the Task Force as the 'Energy and Sustainability Task Force' and expand the membership and role of the Task Force by appointing and encouraging active participation of City department heads and other key staff. The 'Sustainability Ambassador' program used by the City of Albany Office of Energy & Sustainability and highlighted below is a model for the City of Kingston to consider.

The public representation of the Task Force should also be expanded. Task Force meetings should be held on a regular basis and advertised and open to the public.

### **Sustainability Ambassador Program Launched**

In November 2011, the City of Albany Office of Energy & Sustainability kicked off the Sustainability Ambassador Program. In order to more effectively implement the City of Albany [Energy Conservation Policy](#), each City department has assigned a Sustainability Ambassador (SA) to act as a liaison to the Office of Energy & Sustainability. The Ambassadors will be the first point of contact for fellow employees regarding the Conservation Policy and responsible for promoting the policy using posters, labels, and other means. The SAs will also provide progress reports to monitor how effective the Policy is and whether any changes need to be made. <http://www.albanysustainability.org/>

## SUMMARY OF RECOMMENDATIONS: OUTREACH, EDUCATION & TRAINING

<u>Sector</u>	<u>Goal</u>	<u>Action/Initiative</u>	<u>Community</u>	<u>Municipal Government</u>
<b>Outreach, Education &amp; Training</b>				
	Engage people who live, work and play in the City of Kingston in energy and climate action.	Develop communications strategy identifying audiences and clear message.	X	X
		Develop strategic partnerships to engage businesses and residents in energy efficiency and renewable energy improvements.	X	
		Identify and work with area churches, NGOs, schools, business associations, and community and neighborhood groups to 'get the word out.'	X	
		Brand the local effort as 'Sustainable Kingston' or 'Kool Kingston' as part of being a 'Model City.'	X	
		Develop a Sustainability Ambassador Program.	X	X
		Integrate the goals and initiatives of the draft Climate Action Plan into the current Comprehensive Plan outreach and communications.	X	
		Attend local events and meetings to promote plan.	X	
	Improve awareness of opportunities to improve energy efficiency and reduce GHG emissions.	Use City facilities to demonstrate energy leadership and existing environmental education programs to advance energy awareness and sustainability.	X	
		Continue to integrate sustainability education into the City's overall education and interpretation programming, with topics such as energy conservation and renewable energy.	X	
		Work with partners to create a community wide energy awareness program.	X	
		Use web-based social networking tools, such as Facebook to engage the community.	X	
		Maintain the Climate Action page on the City's web site.	X	
		Create a sustainability section on the City's website highlighting	X	

		sustainability projects in the City.		
		Create and maintain 'Sustainable Kingston' Program.	X	
		Create and Maintain 'Sustainable Kingston' web site.	X	
		Organize a regional 'Energy, Climate and Green Jobs Conference' in the City of Kingston.	X	
		Make plan and supporting documents available in City Clerk's office and at Kingston Public Library.	X	
		Develop a simple tri-fold brochure on 'Reducing Your Ecological Footprint.'	X	
		Create and distribute outreach material of energy efficiency, renewable energy programs, including County weatherization programs.	X	
		Obtain and distribute free materials from NYSERDA and others to encourage community and City staff to participate in reducing energy consumption.	X	X
		Work with Central Hudson to promote utility energy efficiency programs.	X	
		Work with local foundations to develop and implement energy and other sustainability initiatives.	X	
		Work with Kingston Schools to promote and increase awareness of energy efficiency improvements.	X	
		Organize a regional 'Energy, Climate and Green Jobs' Conference.	X	
		Develop a comprehensive energy and sustainability training program for City personnel.		X
		Develop specific sustainability training modules on energy conservation, waste reduction and recycling and green procurement.		X
		Develop an internal electronic newsletter to provide targeted City staff with energy conservation and waste reduction tips as well as information on upcoming training events and relevant publications.		X
	Promote and create Green Jobs.	Create a model district – a “green corridor” – with visible demonstration projects of technology, building restoration, and landscaping.	X	

		Include space(s) for exhibits and business incubation.	X	
		Assess the feasibility of a Zero- Net Energy District that produces its own clean energy.	X	
		Strengthen university/community connections.	X	
		Consider industries that bring multiple benefits, such as solar-powered urban greenhouses that can produce food.	X	
		Advocate for local policies to strengthen the green economy and build the tax base.	X	
		Implement this Plan.	X	
	Empower and expand the Climate Smart and Green Jobs Community Task Force.	Adopt a resolution recognizing Task Force as an official body of the City government.		X
		Rename the Task Force as the 'Energy and Sustainability Task Force.'		X
		Expand Task Force with additional community and City government representation.	X	

## F. CLIMATE ADAPTATION PLANNING

This Climate Action Plan primarily addresses the mitigation of climate change impacts by outlining recommendations to reduce GHG emissions. It is important, however, to understand the role of adaptation in addressing climate change. Preparing for and adapting to a changing climate is essential because of the impacts that have already been observed and will continue to occur due to the increased levels of greenhouse gases in the atmosphere.

Adaptation is defined by the Intergovernmental Panel on Climate Change as:

*Adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities.<sup>lii</sup>*

The City of Kingston Climate Smart and Green Jobs Community Pledge calls for adaptation planning:

***Plan for Adaptation to Unavoidable Climate Change:*** *Evaluate risks from unavoidable climate change, set adaptation goals and plan for adaptation. Identify climate change impacts (such as flooding, drought, and extreme temperatures) that could affect the community. Identify areas such as water supply and sewer infrastructures that may be at risk due to increased intensity of rainfall, turbidity and sedimentation, increased flash floods and increased droughts in late summer, sea-level rise, and other future changes in climate. Factor risks into long-term investments and decision-making. Execute climate change adaptation and preparedness measures through local government planning, development, and operation, giving priority to the highest risk areas.*



This section provides general information on the climate change impacts that have been studied and documented by various government, academic and scientific institutions. There is a substantial body of knowledge on climate change adaptation. A comprehensive assessment of the potential local climate change impacts in the City of Kingston and preparation of a climate adaptation plan were beyond the scope of this one-year planning effort. As a next step, it is imperative that the City move forward with adaptation planning and implementation and integrate it into this Climate Action Plan and Comprehensive Planning. Mitigation and adaptation are complementary and both essential to locally addressing the overall issue of climate change.

The purpose of this section is to lay the foundation for the process of preparing for climate change in the City of Kingston. The goal proposed for this section needs to be further developed and refined by the Task Force and others engaged in local adaptation planning. Climate adaptation planning should include

an assessment of the vulnerabilities and risks to Kingston's built social and natural systems; develop strategies to address the risks and craft an implementation plan. It is important to engage the knowledge and opinions of experts and stakeholders.

## FINDINGS

### SUMMARY OF CLIMATE IMPACTS

While New York has a wide range of vulnerabilities to a changing climate, it also has the potential to adapt to and take advantage of some of these changes.

Some of the climate change hazards most relevant to Hudson Valley communities include:

- Sea level rise
- Intense downpours
- Extreme storms
- Extreme heat
- Short term drought

The New York State Climate Action Plan summarizes the climate changes impacts that need to be addressed in climate adaptation planning:

*Climate hazards include higher temperatures and more frequent and intense heat waves leading to greater incidence of heat morbidity and mortality, decreased air quality and increased health risks for those with medical conditions such as cardiovascular disease, renal disease, emphysema, and others; increased short-duration warm season droughts and extreme rainfall events affecting food production, natural ecosystems, and water resources; and sea level rise, resulting in both gradual inundation of natural and human habitats and greater risk of damage from coastal storms.*<sup>liii</sup>

#### Sea Level Rise

A NYSERDA-funded report 'Responding to Climate Change in NYS' or 'ClimAID', found:

*The risks associated with sea level rise and coastal flooding are among the greatest climate-related challenges faced by New York State, affecting public health and ecosystems as well as critical infrastructure across many sectors including water, energy, transportation, and telecommunication.* .<sup>liv</sup>

A Sea Level Rise Task Force was created by the New York State Legislature in 2007. It was tasked with preparation of a report to summarize the causes and effects of sea level rise in New York State and develop recommendations for an action plan to protect coastal communities and natural resources from rising sea levels. The report found that:

1. Sea level rise and coastal flooding from storm surge are already affecting and will increasingly affect New York's entire ocean and estuarine coastline from Montauk Point to the Battery and up the Hudson River to the federal dam at Troy.

2. The likelihood that powerful storms will hit New York State's coastline is very high, as is the associated threat to human life and coastal infrastructure. This vulnerability will increase in magnitude over time.

Sea level is projected to rise in the Mid-Hudson Valley by up to 26 inches by 2050 under a rapid ice melt scenario.

**Table 13: Projected Sea Level Rise in New York**

Lower Hudson Valley & Long Island	2020s	2050s	2080s
Sea level rise*	2 to 5 in	7 to 12 in	12 to 23 in
Sea level rise with rapid ice-melt scenario**	5 to 10 in	19 to 29 in	41 to 55 in
Mid Hudson Valley & Capital Region			
Sea level rise*	1 to 4 in	5 to 9 in	8 to 18 in
Sea level rise with rapid ice-melt scenario**	4 to 9 in	17 to 26 in	37 to 50 in

NYSERDA ClimAID Team 2010. Integrated Assessment for Effective Climate-change Adaptation Strategies in New York State. C. Rosenzweig, W. Solecki, A. DeGaetano, M. O'Grady, S. Hassol, P. Grabhorn, Eds. New York State Energy Research and Development Authority, 17 Columbia Circle Albany NY 12203

\*Shown is the central range (middle 67%) of values from model-based probabilities (16 global climate models by 3 GHG emissions scenarios) rounded to the nearest inch.

\*\*The rapid ice-melt scenario is based on acceleration of recent rates of ice melt in the Greenland and west Antarctic ice sheets and paleoclimate studies.

## Sea Level Rise & The Kingston Waterfront

One of the most significant climate change impacts the City of Kingston will need to prepare for will be the potential impact of flooding to its waterfronts on the tidal Hudson River and Rondout Creek. The Rondout Creek is used for a variety of commercial, residential and industrial uses and is an important component of the local economy, for land and water based activities. Many structures and features along the shoreline may be in jeopardy due to increased flooding and inundation due to sea level rise, including the Kingston Lighthouse, Island Dock, the trolley tracks, Kingston Point Beach and Kingston Point Park.

The City's Rondout waterfront revitalization program calls for the re-use of waterfront properties that are already subject to occasional flooding and will require stormwater controls for development that occurs on those sites. The wastewater treatment plant is located on the Rondout Creek waterfront.

The City is currently in the early stages of seeking design solutions to address stormwater controls and intermittent flooding conditions along the East Strand.



According to the City of Kingston's Rondout Creek Waterfront Revitalization Program:

"Land immediately adjacent to the Rondout Creek and Hudson River are subject to flooding according to its designation as a Flood Hazard Area (Floodplain) under the National Flood Insurance Program..... The area most affected by periodic flooding is adjacent to Rondout Creek. Flooding occurs along the entire Rondout Creek Waterfront, especially during storms when the tide is in and storm drainage outlets are covered. Stormwater backs up and flows out inlets and manholes. The worst conditions exist on East Strand between Broadway and North Street; at Tompkins Street, Ponckhockie Street, Abruyn Street and Gill Street: and at the intersection of Abeel Street and Wilbur Avenue." Page II-13,14<sup>lv</sup>

### Temperature and Precipitation

In this region temperatures are projected to rise 3 to 5°F by the 2050's and 4 to 8°F by the 2080's. Across the state temperatures are expected to rise 3 to 5.5°F by the 2050's, and 4 to 9°F by the 2080's.

Although the projected increase in annual average precipitation is low, 0 to 10% by 2050, the intensity of heavy rainfall events has been increasing and this trend is expected to continue.<sup>lvi</sup>

*Heat waves will become more frequent and intense, increase heat related illness and death and posing new challenges to the energy system, air quality and agriculture.<sup>10</sup>*

<sup>10</sup>Responding to Climate Change in New York, ClimAID, Synthesis Report

Statewide it is projected that much of the additional precipitation is likely to occur during the winter months as rain, with the possibility of slightly reduced precipitation projected for the late summer and early fall.<sup>lvii</sup>

**Table 14: Projected Temperature and Precipitation Changes  
in Catskill Mountains and West Hudson River Valley**

	Baseline	2050s	2080s
Temperature	48°F	+3.0 to 5.0°	+4.0 to 8.0°
Precipitation	48 in	0 to +10%	+5 to 10%

The temperature and precipitation data for this ClimAID region, the Catskill Mountains and West Hudson River Valley, summarized in Table 11, is taken from the 2011 Synthesis Report, Responding to Climate Change in New York, ClimAID.

## Climate Justice

Impacts of a changing climate, rising waters and rising temperatures disproportionately compromise the social, economic, cultural and environmental health of low-income and people of color making climate change a human rights and environmental justice issue.

Hudson River Sloop Clearwater works locally to advocate for climate justice and should be engaged in this element of adaptation planning.

## PROPOSED GOAL

- A commitment, a Plan and systems are in place to be prepared for and adapt to a changing climate.

## RECOMMENDATIONS

### A. Local Climate Adaptation Plan

It is recommended that the City move forward with a climate adaptation planning process. While an adaptation plan for the City may stand alone, planning to adapt to climate change should be incorporated into all Citywide planning efforts. However the City chooses to move forward, the ultimate goal is for the community to have the tools to take action to plan for and adapt to the impacts of climate change.<sup>43</sup>

<sup>43</sup> <http://coastalmanagement.noaa.gov/climate/adaptation.html>



Educators participate in an exercise to demarcate the projected location of potential sea level rise of the Rondout along Broadway

A full plan should address vulnerabilities to the local natural, built and social environments by examining ecosystems, energy, public health, transportation, and water resources. The State's ClimAID report provides a model for assessment.

Local adaptation planning should consider the public health risks associated with a changing climate including compromised air quality, drinking water impacts, increases in disease vectors, impaired access to health care and loss of reliable access to food and medical supplies.

The City of Kingston's water supply is crucial to public health and economic development. Expertise and interest within the Water Department should be utilized to assess potential risk to the local water supply and prepare accordingly.

Strategies should address potential cost, timing, and environmental justice. A local adaptation plan should create policies that speak to the fair treatment of all people and locally address the systems that create climate change so as to provide freedom from discrimination.

The final adaptation plan should provide recommendations for land use, legal, engineering and natural resource management strategies that will protect public health and welfare and achieve the ultimate goal of creating a more resilient community. Although this is a local plan, there should be integration with county, regional, state and federal programs as applicable and feasible.

#### Recommendations for climate adaptation planning:

- Refer to state climate change documents for detailed climate projections and recommendations.
- Conduct additional local and on-site analysis of potential impacts and risks, if necessary and feasible.
- Identify and address climate/environmental justice areas in the City, along the Rondout Creek, Midtown and other areas of the City.
- Involve all sectors of City government, including emergency management, in development of strategies.
- Involve stakeholders and experts including the Comprehensive Planning Advisory Committee, Complete Streets Advisory Council, the Tree Commission, the Kingston Land Trust, and Scenic Hudson's Sea Level Rise Task Force.
- Evaluate alternative adaptation strategies based on risk, costs, and benefits to human and natural systems.
- Utilize and adapt existing reports, plans, studies and ordinances.
- Carry out targeted and general outreach on climate change adaptation issues and actions.
- Collaborate with neighboring municipalities and county government, to plan, prioritize and implement climate preparedness actions that are best accomplished on a larger scale.
- Utilize the climate adaptation resources offered through the City of Kingston ICLEI membership.

- Adopt a policy to consider climate change for all capital projects.
- Investigate sources of external funding and apply for funding to carry out adaptation planning.
- Keep abreast of new research, climate and sea level rise models.
- Create a Citizen Science Program to locally monitor meteorological and natural systems such as recording daily temperatures and making simple observations and records of first bloom of vegetation, arrival of migratory species, etc.
- Integrate into Comprehensive Plan and Zoning update.

It is recommended that the City look at the *'Roadmap for Adapting to Coastal Risk'* developed and delivered by the NOAA Coastal Services Center. This is a community participatory planning process designed to:

- Engage key staff members and stakeholders in a comprehensive, yet rapid, assessment of local vulnerabilities;
- Use existing information resources to evaluate potential hazards and climate impacts;
- Collaborate across disciplines to better understand and plan for impacts; and
- Identify opportunities for improving resilience to current and future hazard risks. <sup>lviii</sup>

## B. Stormwater and Flooding

It is recommended that the current analysis to address stormwater controls and intermittent flooding conditions along the Rondout take into consideration the impacts of climate change and build in measures to make Kingston's Rondout waterfront more resilient to the hazards and risk associated with storm surges, flooding and an increase in water levels. It is recommended that the City and its engineering consultants seek advice from the NYSDEC Hudson River Estuary Program, the NYS Department of State Office Communities and Waterfronts and the Hudson River National Estuarine Research Reserve regarding non-structural measures and natural protective features such as natural or 'green infrastructure' and shoreline stabilization techniques for the Kingston waterfront.

Flooding in other areas of the City particularly along the Esopus Creek and in Wards 1 and 3 should also be specifically addressed in a climate adaptation planning process.



### C. Comprehensive Planning and Zoning Update

Local climate adaptation planning, preparation and response, including sea level rise, flooding, threats to the local drinking water supply, changes in precipitation and temperature and the associated public health risks should be addressed as part of the Comprehensive Master Planning and Zoning Update process.

#### Implement, Monitor & Evaluate

The adaptation plan should be considered a working document. It can be implemented in stages and should be revised as knowledge, observations and conditions change. Some of the recommendations discussed and listed in the summary table below can be implemented immediately.

**‘Resources for Climate Adaption Planning’** can be found in Appendix O.

## SUMMARY OF RECOMMENDATIONS: CLIMATE ADAPTATION

<u>Sector</u>	<u>Goal</u>	<u>Action/Initiative</u>	<u>Community</u>	<u>Municipal Government</u>
<b>Adaptation</b>				
	Prepare for and adapt to a changing climate.	Prepare and adopt a City of Kingston Climate Adaptation Plan.	X	
		Utilize and adapt existing reports, plans, studies and ordinances.	X	
		Assess and address vulnerabilities to the natural, built and social environment.	X	
		Establish adaptation goals.	X	
		Coordinate with climate mitigation strategies.	X	
		Involve stakeholders and experts.	X	X
		Carry out targeted and general outreach on climate change adaptation issues and actions.	X	
		Collaborate with neighboring municipalities and county government.	X	
		Utilize the climate adaptation resources offered through ICLEI membership.	X	
		Utilize existing resources available through federal, state, county and NGOs.	X	
		Integrate adaptation planning into Comprehensive Master Plan and Zoning Update.	X	
		Integrate into all City planning efforts.	X	
		Adopt a local policy to consider climate change for all capital projects.		X
		Factor risks into long-term investments and decision-making.	X	
		Investigate sources of external funding.	X	
		Consider the public health risks including drought, heat, sea level rise and flooding.	X	
		Create policies that speak to the fair treatment of all people.	X	X
		Create clear implementation plan/program.	X	
		Keep abreast of new research, climate and sea level rise models.	X	
		Create Citizen Science Monitoring Program.	X	
		Adopt and implement local Climate Adaptation Plan.	X	

## REFERENCES/NOTES

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- <sup>i</sup> Responding to Climate Change in New York Synthesis Report (ClimAID) <http://www.nyserda.ny.gov/>
- <sup>ii</sup> Ibid
- <sup>iii</sup> <http://www.epa.gov/sustainability/basicinfo.htm#sustainability>
- <sup>iv</sup> <http://www.rwjf.org/childhoodobesity/product.jsp?id=73938>
- <sup>v</sup> New York State Climate Action Council Interim Report 11-9-10, Chapter 2 Climate Projections and Vulnerabilities <http://www.nyclimatechange.us/InterimReport.cfm>
- <sup>vi</sup> New York State Climate Action Plan Interim Report 11-9-10 Executive Summary (ES-4) <http://www.nyclimatechange.us/InterimReport.cfm>
- <sup>vii</sup> List of Climate Smart Communities New York State's Climate Partners <http://www.dec.ny.gov/energy/56876.html> March 22, 2012
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## APPENDIX A. CITY OF KINGSTON, NY COMMUNITY ENERGY AND GREENHOUSE GAS EMISSIONS INVENTORY REPORT

### I. INTRODUCTION

This report provides an overview of the community-wide energy assessment and greenhouse gas (GHG) emissions inventory for the City of Kingston. The community-wide inventory assesses energy usage and GHG emissions resulting from residential, commercial, industrial and transportation sectors within the City of Kingston.

The energy used and the greenhouse gas emissions in the community-wide inventory are for the City of Kingston as a whole, not just the City government. Local government operations energy usage and GHG emissions are a subset of the community-wide energy usage and GHG emissions.

Although the City of Kingston government may have limited influence over the level of emissions from some activities in the community, every effort has been made to compile a complete analysis of all activities that result in greenhouse gas emissions. References to 'Kingston' pertain only to the City of Kingston.

Aggregate electricity and natural gas usage for the residential, commercial, and industrial sectors was obtained from the Central Hudson Gas and Electric Corporation for calendar year 2010. Commercial data includes all commercial building accounts such as the hospital, the library, county and municipal government accounts.

Residential and commercial heating fuel data (fuel oil, kerosene and propane) was obtained from the U.S. Energy Information Administration (USEIA) and U.S. Census Bureau. To the greatest extent possible all data is for base year 2010. However some USEIA data for heating fuel is from 2009 and while some 2010 Census data was available, some housing and home heating fuel usage data was obtained from the 2005- 2009 American Community Survey.

Vehicles miles traveled data for the City of Kingston was obtained from the Ulster County Transportation Council, Ulster County Department of Planning.

New York State Energy Research and Development Authority (NYSERDA) energy pricing data was used along with ICLEI Clean Air Climate Protection 2009 software to characterize energy usage, cost and greenhouse gas emissions for the community.

Following summaries of energy usage and GHG emissions data, the community-wide information is presented in more detail according to the following:

- Community Energy Use
- Community Greenhouse Gas Emissions by Fuel
- Residential Energy Use
- Residential GHG Emissions

- Commercial Energy Use
- Commercial GHG Emissions
- Transportation
- Transportation GHG Emissions
- Solid Waste/Materials Management
- Solid Waste/Materials Management GHG Emissions
- Government Operations Energy Usage as Percentage of Community Energy Usage
- Government Operations GHG Emissions as Percentage of Community GHG Emissions

## II. COMMUNITY SUMMARY

Table 1 outlines the community-wide energy usage by sector and by fuel type. Residential, commercial and industrial energy usage as well as transportation related data are depicted including vehicle miles traveled in the City of Kingston and vehicles' fuel usage. The energy data was used to generate GHG emissions for each of these sectors.

**Table 1: 2010 Community-wide Energy, City of Kingston**

Community-Wide Energy Usage-City of Kingston	2010 Total Usage
Residential Electricity (kWh)	62,782,267
Residential Heating Fuel Oil (Gal)	1,238,245
Residential Heating Fuel-Kerosene (Gal)	56,487
Residential LPG* Total (Gal)	252,706
Residential Natural Gas (MCF)	441,305.8
Commercial Electricity (kWh)	109,954,288
Commercial Heating Fuel Oil-Kerosene(Gal)	596,843
Commercial LPG Total (Gal)	81,670
Commercial Natural Gas (MCF)	472,746.8
Industrial Electricity (kWh)	4,492,604
Industrial Natural Gas (MCF)	22,596.5
Wood (Tons)	1,573.63
Vehicle Miles Traveled	158,782,140
Vehicle Fuel Gas (Gal)	8,613,576
Vehicle Fuel Diesel (Gal)	1,507,951

\* Liquid Petroleum Gas

Community-wide energy usage is summarized in Table 2. In 2010, 177,229,159 kWh of electricity and 9,366,490 CCF of natural gas were used in the City of Kingston, along with close to 1.9 million gallons of heating fuel and over 330,000 gallons of propane. Approximately 159,000,000 vehicle miles were traveled in Kingston 2010 consuming more than 8.6 million gallons of gas and 1.5 million gallons of diesel fuel.

**Table 2: 2010 Community-wide Energy Usage Summary, City of Kingston**

Energy Source	2010 Total Community Usage
Electricity (kWh)	177,229,159
Natural Gas (CCF)	9,366,490
Heating Fuel Oil-Kerosene(Gal)	1,891,575
LPG Total (Gal)	334,376
Vehicle Miles Traveled	158,782,140
Vehicle Fuel Gas (Gal)	8,613,576
Vehicle Fuel Diesel (Gal)	1,507,951

#### A. COMMUNITY ENERGY CONSUMPTION

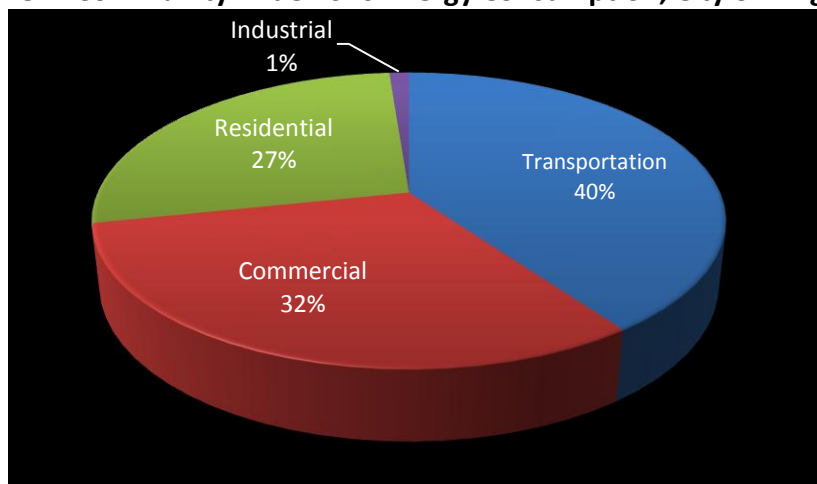
Using the ICLEI CACP 2009 software the energy data in Table 2 was used to estimate the total energy consumption for each sector. As depicted in Table 3 and displayed in Figure 1, in 2010 the transportation sector in Kingston consumed the largest percentage of the community's energy. The commercial sector is second, however the commercial and residential sectors combined, primarily energy consumed in buildings and facilities, accounted for 59% of the community's energy consumption.

**Table 3: Community-wide 2010 Energy Consumption Summary, City of Kingston<sup>1</sup>**

City of Kingston Community-Wide Usage	2010 Community Total Energy Consumption (MMBTU)	% of Total Energy Consumption
Transportation	1,284,800	40
Commercial	1,012,178	32
Residential	867,671	27
Industrial	38,472	1
<b>Total</b>	<b>3,203,121</b>	

<sup>1</sup> Energy consumption data generated by ICLEI CACP 2009 software

**Figure 1: Community-wide 2010 Energy Consumption, City of Kingston**



Based on 2010 U.S Census data, energy use in the City of Kingston was 134 MMBTU per capita and 287 MMBTU per household.

**Table 4: City of Kingston 2010 Energy Consumption per Person & Household**

2010 Community Total Energy Consumption (MMBTU)	2010 Population	Energy Used per Capita (MMBTU/capita)	2010 Total Housing Units	Energy Used per Household* (MMBTU/household)
3,203,121	23,893	134	11,147	287

\* Based on total Energy Consumption. Based only on residential energy consumption, energy use is 78 MMBTU per household.

## B. COMMUNITY GREENHOUSE GAS EMISSIONS SUMMARY

Community-wide GHG emissions in the City of Kingston in 2010 were estimated at approximately 225,097 metric tons (tonnes) of CO<sub>2</sub>e.<sup>2</sup>

As is depicted in Table 5 and in Figure 2 the transportation sector (gasoline and diesel use) accounted for 41% of the communities GHG emissions, with commercial energy usage contributing 32%, residential 26% and industrial approximately 1%. Emissions from waste accounted for less that 0.5% of the total.<sup>3</sup>

<sup>2</sup> All emissions estimated using ICLEI's CACP 2009 Software.

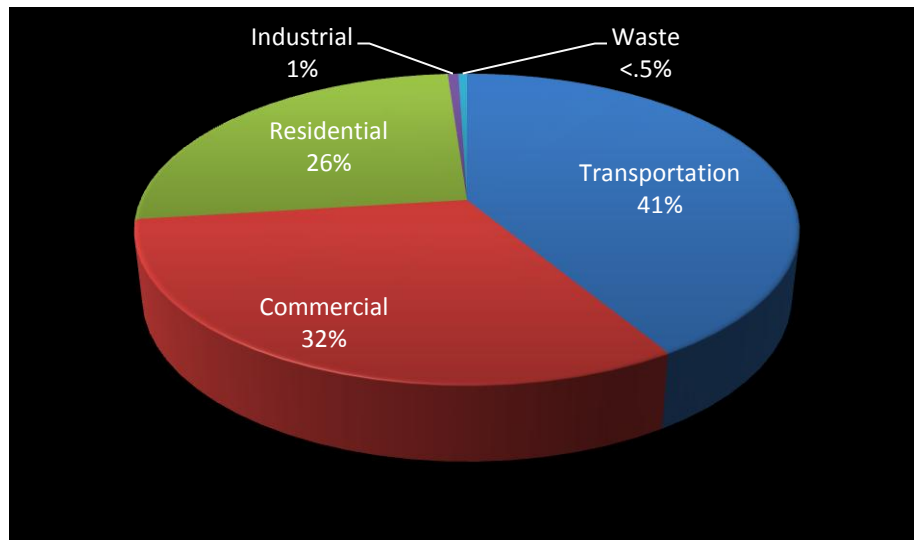
<sup>3</sup> Only waste collected by the City DPW is factored into these GHG emissions. Not all waste generated in the City was accounted. Also emissions from waste have technically not yet been created as landfill gas is created over time.

**Table 5: Community-wide 2010 GHG Emissions, City of Kingston**

City of Kingston Community GHG Emissions Summary by Sector	Total CO <sub>2</sub> e (tonnes)	% of Total
Transportation*	93,048	41
Commercial	71,281	32
Residential	58,247	26
Industrial	1,400	1
Waste	1,121	<1
<b>Total</b>	<b>225,097</b>	

\* Includes 352 tonnes of CO<sub>2</sub>e from Waste Transport

**Figure 2: 2010 Community-wide GHG Emissions by Sector, City of Kingston**



### III. COMMUNITY ENERGY USE

#### A. COMMUNITY ELECTRICITY USAGE

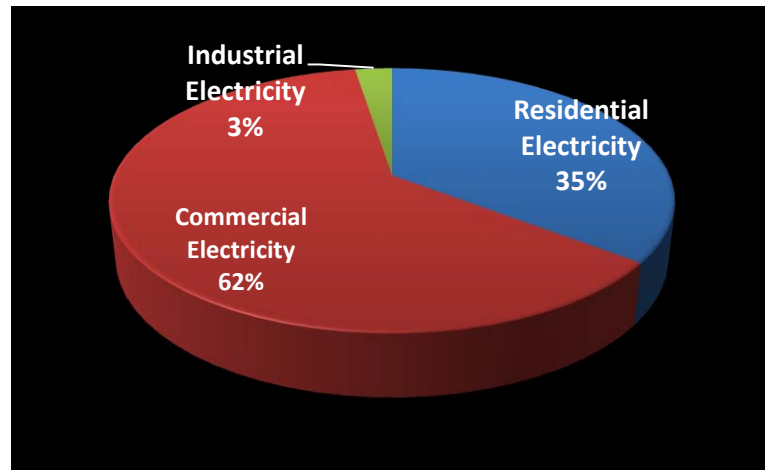
In 2010 the community used 177,229,159 kWh of electricity. As depicted in Table 6 and Figure 3 the commercial sector consumed the greatest portion of electricity usage at 63% (109,954,288 kWh) and the industrial sector used the least, 3% (4,492,604 kWh).

The residential sector accounted for 35% of electricity usage at 62,782,267 kWh which is equivalent to 2,676.6 kWh per capita.

Commercial electricity data encompasses municipal accounts including street lighting. The primary provider of electricity in the City of Kingston is the Central Hudson Gas and Electric Corporation. Fuel sources used by Central Hudson to generate electricity can be found in Appendix F.

**Table 6: Community-wide 2010 Electricity Usage Summary, City of Kingston**

City of Kingston Community-Wide Electricity Usage	2010 Community Total Usage (kWh)	% of Total Electricity Usage
Commercial Electricity (kWh)	109,954,288	62
Residential Electricity (kWh)	62,782,267	35
Industrial Electricity (kWh)	4,492,604	3
<b>Total Electricity (kWh)</b>	<b>177,229,159</b>	

**Figure 3: Community-wide Electricity Usage- City of Kingston**

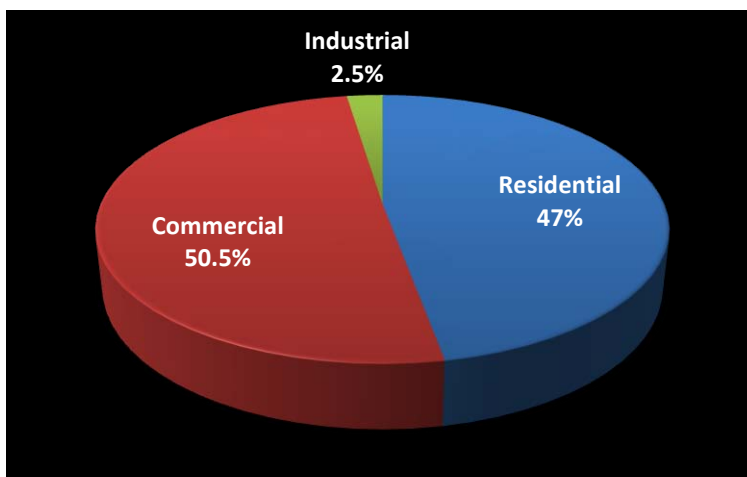
## B. COMMUNITY NATURAL GAS USAGE

As illustrated in Table 7 and Figure 4, natural gas usage in 2010 in the City was fairly equally split between commercial, 50.5% and residential, 47%. Industrial usage accounted for 2.5%.

**Table 7: Community-wide Natural Gas Usage Summary, City of Kingston**

City of Kingston Community-Wide Natural Gas Usage	2010 Total Usage CCF	2010 Usage Therms	% of Total
Commercial	472,746.8	4,840,927.23	50.5
Residential	441,305.8	4,518,971.39	47
Industrial	22,596.5	231,388.16	2.5
<b>Total</b>	<b>936,649.1</b>	<b>9,591,286.78</b>	

**Figure 4: 2010 Community Natural Gas Usage**



### C. COMMUNITY FUEL OIL AND PROPANE USAGE

According to the USEIA it is estimated that a total of 1,891,575 gallons of fuel oil and kerosene was used in the City of Kingston in 2010. Most of the fuel oil, 1,238,245 gallons, or 65% was for residential heating.

**Table 8 : Community-wide Fuel Oil, City of Kingston**

Community-Wide Fuel Oil Usage City of Kingston	2010 Total Usage	% of Total
Residential Heating Fuel Oil (Gal)	1,238,245	65
Residential Heating Fuel-Kerosene (Gal)	56,487	3
Commercial Heating Fuel Oil/Kerosene(Gal)	596,843	32
<b>Total</b>	<b>1,891,575</b>	

In 2010, according to the USEIA, 334,376 gallons of liquid propane gas was used in the City of Kingston. Seventy-six percent, or 272,706 gallons, was used by the residential sector.

**Table 9: Community-wide Propane Usage - City of Kingston**

City of Kingston Community-Wide Propane Usage	2010 Total Usage (Gallons)	% of Total
Residential LPG	252,706	76
Commercial LPG	81,670	24
<b>TOTAL</b>	<b>334,376</b>	

### D. COMMUNITY GREENHOUSE GAS EMISSIONS BY FUEL

The use of gasoline resulted in an estimated 77,285 tonnes of CO<sub>2</sub>e, 34% of the City's total CO<sub>2</sub>e. Diesel fuel usage accounted for another 15,411 tonnes of CO<sub>2</sub>e, 7% of the total, resulting in transportation fuels contributing approximately 41% of the total GHG emissions or 92,696 tonnes of CO<sub>2</sub>e as illustrated in Figure 5.

Electricity usage contributed 25% of community GHG emissions, 55,204 tonnes of CO<sub>2</sub>e and natural gas usage another 22%, 49,651 tonnes of CO<sub>2</sub>e. Fuel oil usage accounted for approximately 8% of the community-wide GHG emissions with commercially used residual fuel oil<sup>4</sup> accounting for 2% of Kingston community-wide GHG emissions. Propane, kerosene and transported related emission each accounted for 1% or less the community-wide GHG emissions.

Transportation of waste, 352 tonnes of CO<sub>2</sub>e, and the future GHG emissions from City waste land filled at Seneca Meadows Landfill in western NY, 1,121 tonnes of CO<sub>2</sub>e, accounted for less than 1% of total community GHG emissions.<sup>5</sup>

**Table 10: Community-wide GHG Emissions by Source, City of Kingston**

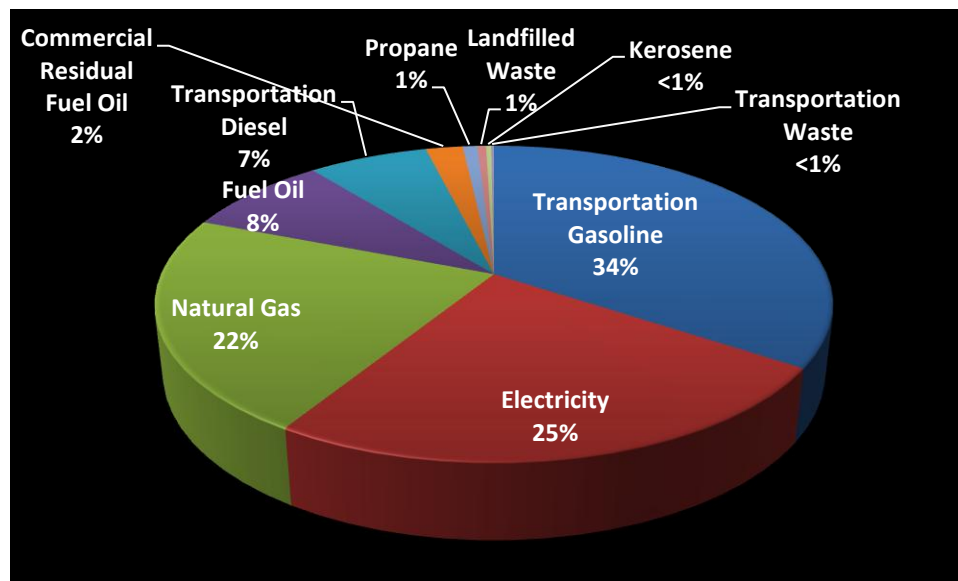
GHG Emissions by Source	CO <sub>2</sub> tonnes	N <sub>2</sub> O (kg)	CH <sub>4</sub> (kg)	CO <sub>2</sub> e (tonnes)	Energy (MMBtu)	% of Total CO <sub>2</sub> e
Transportation Gasoline	75,627	5,058	4,294	77,285	1,076,581	34
Electricity	54,928	796	1,399	55,204	604,878	25
Natural Gas	49,523	95	4,702	49,651	959,129	22
Fuel Oil	18,647	183	2,740	18,762	252,124	8
Transportation Diesel	15,396	45	46	15,411	208,218	7
Commercial Residual Fuel <sup>6</sup>	4,735	42	714	4,763	63,043	2
Propane	1,870	33	335	1,887	30,428	1
Landfill Emissions	0	0	53,362	1,121		<1
Kerosene	655	7	97	660	8,720	<1
Transportation Waste	352	1	1	352	7,983	<1
<b>TOTAL</b>	<b>221,733</b>	<b>6,260</b>	<b>67,690</b>	<b>225,097</b>	<b>3,211,104</b>	

<sup>4</sup> A general classification for the heavier oils, known as No. 5 and No. 6 fuel oils, that remain after the distillate fuel oils and lighter hydrocarbons are distilled away in refinery operations. (Local Government Operating Protocol, May 2010).

<sup>5</sup> Only waste collected by the City DPW is factored into these GHG emissions. Not all waste generated in the City was accounted. Also emissions from waste have technically not yet been created as landfill gas is created over time.

<sup>6</sup> A general classification for the heavier oils, known as No. 5 and No. 6 fuel oils, that remain after the distillate fuel oils and lighter hydrocarbons are distilled away in refinery operations. (Local Government Operating Protocol, May 2010)

**Figure 5: 2010 Community-wide GHG Emissions by Fuel Source**



#### IV. RESIDENTIAL ENERGY USE & GREENHOUSE GAS EMISSIONS

Based on the most recent U.S. Census data, in 2010 there were a total of 11,147 housing units in the City of Kingston of which 10,217 were occupied. Of those units, 4,747 housing units were owner-occupied (46.5%) by 11,442 individuals and 5,470 units renter-occupied (53.5 %) by 11,743 individuals. There were 930 vacant housing units.

Based on the information available from the American Community Survey, in 2009 the majority of housing, 47%, (4,899) are single family units. Two family units make up 19% (1,934) of the housing stock, 12% (1,236) are 5-9 units and about 10% (1,108) are 3-5 units. The majority of housing units, 59% (6,172) were built before 1939.

##### A. HOME HEATING FUEL

Based on American Community Survey 2009 data<sup>7</sup>, of the 9,410 occupied housing units, the majority, more than 53% (5,020) use utility supplied natural gas to heat their homes using 441,305.8 MCF<sup>8</sup> of natural gas equaling 453,221.05 MMBTU<sup>9</sup> and 4,518,971 therms<sup>10</sup> at a cost of \$6,654,891 (2009 - \$15.08 per MCF)<sup>11</sup>.

<sup>7</sup> American Community Survey data estimates for 2005-2009 were used for breakdown of home heating fuels as 2010 data was not available when this report was prepared. There is however a significant difference in the number of total occupied housing units, an 8.5% increase or 807 additional units based on available 2010 data.

<sup>8</sup> MCF is the volume of 1,000 cubic feet (CF) of natural gas. Natural gas usage at a home is metered in units of hundreds of cubic feet (CCF). This is a measure of the volume of natural gas that is used. Each CCF of natural gas contains the energy value of approximately 1 therm. <http://www.clearwatergas.com/bill/natural.asp>

<sup>9</sup> Natural gas is often measured in BTUs. The heating capacity of natural gas supplied by Central Hudson is 1000 to 1025 British Thermal Units (BTUs) per cubic foot. *Email from Samuel C. Rosenberry, Supervisor, New Business & Customer Accounts, Upper Hudson Division, Central Hudson Gas & Electric, August 16, 2011*

Fuel oil and kerosene was used by 32% of homes in the City of Kingston (3,000 units) for heating in 2009. These 3,000 households used an estimated 30,827 barrels or 1,294,732 gallons of fuel oil and kerosene to heat their homes, approximately 431.6 gallons per household. The greenhouse gas emissions from the burning of fuel oil and kerosene by City of Kingston residents released 13,293 tonnes of CO<sub>2</sub>e emissions or 4.43 tonnes of CO<sub>2</sub>e per household.

Most of the fuel usage is fuel oil no. 1, 2, 4 (aka distillate fuel) as outlined below:

- 29, 482.02 barrels or 1,238,245 gallons of distillate fuel (Fuel Oil No. 1, 2, 4) was used for home heating by City of Kingston residents at a cost of \$3,225,133 (Distillate Oil, \$2.6046/gallon)<sup>12</sup>
- The greenhouse gas emissions from the burning of distillate fuel by City of Kingston residents released 12, 716 tonnes of CO<sub>2</sub>e emissions.<sup>13</sup>

Kerosene usage in 2009:

- 1,345 barrels or 56,487 gallons of kerosene was used for home heating by City of Kingston residents at a cost of \$158,847 (Kerosene, \$2.8121 per gallon).<sup>14</sup>
- The greenhouse gas emissions from the burning of kerosene by City of Kingston residents released 577 tonnes of CO<sub>2</sub>e emissions.

In 2009 approximately 11%, 1,050 households in the City of Kingston used electricity for heating.

An estimated 226 households in the City of Kingston used propane for home heating in 2009.

- An estimated 252,706 gallons of propane were used for home heating by City of Kingston residents at a cost of \$706,718 (Propane, \$2.7966 per gallon),<sup>15</sup> approximately 950 gallons per household.
- The greenhouse gas emissions from the burning of propane by City of Kingston residents released 1,426 tonnes of CO<sub>2</sub>e emissions.

Similar percentages of home heating fuel usage can be presumed for 2010 housing data, estimating that approximately 5,450 housing units use utility gas for home heating; about 3,257 homes use fuel oil or

---

One BTU is the heat required to raise the temperature of one pound of water by one degree Fahrenheit. A wooden kitchen match produces approximately 1 BTU, and air conditioners for household use typically produce between 5,000 and 15,000. One cubic foot of natural gas produces approximately 1,000 BTUs, so 1,000 cu.ft. of gas is comparable to 1 MBTU. MBTU is occasionally expressed as MMBTU. 1 MMBTU is 1 million BTU.

[http://www.energyvortex.com/energydictionary/british\\_thermal\\_unit\\_\(btu\)\\_mbtu\\_mmbtu.html](http://www.energyvortex.com/energydictionary/british_thermal_unit_(btu)_mbtu_mmbtu.html)

US Energy Information Administration, <http://205.254.135.7/tools/faqs/faq.cfm?id=45&t=8>

<sup>10</sup> A Therm is a measurement of energy content of gas and is equal to 100,000 BTU whereas CCF is the measurement of space or volume of gas. A CCF is approximately equivalent to 1.024 therms.

<sup>11</sup> New York State Residential Energy Prices in Nominal Dollars, 1995–2009

[http://www.nyserda.org/energy\\_information/residential\\_energy05\\_09.pdf](http://www.nyserda.org/energy_information/residential_energy05_09.pdf)

<sup>12</sup> Ibid

<sup>13</sup> CACP 2009

<sup>14</sup> New York State Residential Energy Prices in Nominal Dollars, 1995–2009

[http://www.nyserda.org/energy\\_information/residential\\_energy05\\_09.pdf](http://www.nyserda.org/energy_information/residential_energy05_09.pdf)

<sup>15</sup> New York State Residential Energy Prices in Nominal Dollars, 1995–2009

[http://www.nyserda.org/energy\\_information/residential\\_energy05\\_09.pdf](http://www.nyserda.org/energy_information/residential_energy05_09.pdf)

kerosene and 1,140 that use electricity for heating. Greenhouse gas emissions would have been expected to rise accordingly based on the increase in housing units.

**Table 11: 2009 Home Heating Fuels, City of Kingston**

HOME HEATING FUEL	Housing Units	Margin of Error	Percentage of Total Units	Margin of Error
Occupied Housing Units	<b>9,410</b>	<b>+/-321</b>	<b>9,410</b>	<b>(X)</b>
Utility gas	5,020	+/-353	53.3%	+/-3.4
Bottled, tank, or LP gas	226	+/-103	2.4%	+/-1.1
Electricity	1,050	+/-196	11.2%	+/-2.0
Fuel oil, kerosene, etc.	3,000	+/-341	31.9%	+/-3.5
Coal or coke	0	+/-123	0.0%	+/-0.4
Wood	73	+/-70	0.8%	+/-0.7
Solar energy	0	+/-123	0.0%	+/-0.4
Other fuel	26	+/-24	0.3%	+/-0.3
No fuel used	15	+/-23	0.2%	+/-0.2

2009 Data from American Community Survey includes both owner and renter occupied.

## B. RESIDENTIAL GHG EMISSIONS

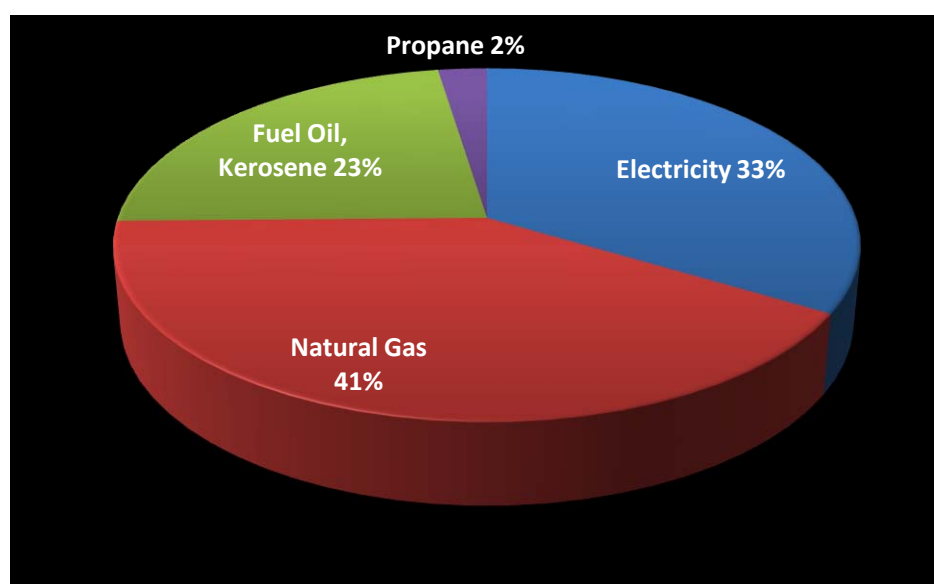
The City of Kingston's residential sector generated an estimated 58,247 tonnes of CO<sub>2</sub>e or 26% of community-wide GHG emissions in 2010. This estimate was calculated using 2010 electricity and natural gas consumption data provided by Central Hudson, and only includes consumption from residential buildings. Data on residential equipment usage, such as lawnmowers or on-site electricity generation, is not included in this inventory. GHG emissions associated with residential transportation and residential waste generation are included separately in the Transportation and Waste Sector emissions totals.

Table 11 and Figure 6 illustrate the breakdown of residential GHG emissions by fuel source. According to the USEPA, GHG emissions associated with home electricity use are about twice those associated with heating<sup>16</sup>, however for the City of Kingston more than 41% of residential GHG emissions were generated from the use of natural gas. Natural gas is typically used in residences as a fuel for home heating, water heating and cooking. Approximately 34 percent of residential GHG emissions were generated through electricity and 25% by fuel oil, kerosene and propane used for home heating.

<sup>16</sup> [http://www.epa.gov/climatechange/emissions/ind\\_home.html](http://www.epa.gov/climatechange/emissions/ind_home.html)

**Table 12: Residential GHG Emissions Summary by Fuel Source, City of Kingston**

Residential GHG Emission Sources 2010	CO <sub>2</sub> (tonnes)	N <sub>2</sub> O (tonnes)	CH <sub>4</sub> (tonnes)	CO <sub>2</sub> e (tonnes)	Energy (MMBtu)	% of CO <sub>2</sub> e
Electricity	19,458	282	496	19,556	214,274	34
Natural Gas	23,910	45	2,259	23,971	451,897	41
Fuel Oil, Kerosene	13,212	129	1,942	13,293	178,518	23
Propane	1,413	25	253	1,426	178,518	2
<b>TOTALS</b>	<b>57,993</b>	<b>481</b>	<b>4,950</b>	<b>58,246</b>	<b>867,685</b>	

**Figure 6: Residential GHG Emissions Summary by Fuel Source, City of Kingston**

### C. GREENHOUSE GAS EMISSIONS PER HOUSEHOLD

Table 13 provides information on residential emissions on a per household basis. Based on residential energy usage occupied households in the City of Kingston generated 58,246 metric tons (tonnes) of CO<sub>2</sub>e (GHG emissions) in 2010, Based on 9,410 occupied households (2009 ACS data); GHG emissions are estimated to be 6.19 metric tons (tonnes) of CO<sub>2</sub>e per occupied household.<sup>17</sup>

Per household emissions can be a useful metric for measuring progress in reducing greenhouse gases and for comparing one's emissions with neighboring cities and against regional and national averages. According to the USEPA, approximately 4 tonnes of CO<sub>2</sub>e (almost 9,000 pounds) per person per year (about 17% of total U.S. emissions) are emitted from people's homes<sup>18</sup>. The three main sources of GHG gas emissions from homes are electricity use, heating and waste.

<sup>17</sup> 2010 US Census data 11,147 households, 5.22 tonnes of CO<sub>2</sub>e per household

<sup>18</sup> [http://www.epa.gov/climatechange/emissions/ind\\_home.html](http://www.epa.gov/climatechange/emissions/ind_home.html)

**Table 13 : 2010 Greenhouse Gas Emissions per Household<sup>19</sup>**

Greenhouse Gas Emissions per Household	
Number of Occupied Housing Units	9,410
Total Residential GHG Emissions (metric tons CO <sub>2</sub> e)	58,247
Residential GHG Emissions/Household (metric tons CO <sub>2</sub> e)	6.19

\*Does not include transportation related GHGs

#### D. GHG EMISSIONS FROM WOOD USED FOR HOME HEATING

The use of wood as a fuel source creates GHG emissions however these are not included in the total GHG emissions because it is presumed that the carbon from wood will return to the atmosphere whether burned or through natural decomposition.

Based on data gathered from the U.S. Energy Information Administration it was estimated that 1,573.63 tons of wood was used as fuel in the City of Kingston in 2010. This created 193 tonnes of CO<sub>2</sub>e or 2,270 tonnes of BioCO<sub>2</sub>.

**Table 14: City of Kingston Community GHG Emissions -Wood**

GHG Emissions by Source	CO <sub>2</sub> (tonnes)	N <sub>2</sub> O (kg)	CH <sub>4</sub> (kg)	CO <sub>2</sub> e (tonnes)	Bio CO <sub>2</sub> (tonnes)	Energy (MMBtu)
Wood Home Heating	0	102	7,648	192	2,270	24,202

#### E. PER CAPITA GHG EMISSIONS

Per capita emissions can be a useful metric for measuring progress in reducing greenhouse gases and for comparing one community's emissions with neighboring cities and against regional and national averages. That said, due to differences in emission inventory methods, it can be difficult to get a directly comparable per capita emissions number, and one must be cognizant of these differences in methods when comparing figures.

As detailed in Table 15, dividing the total 2010 community GHG emissions by the 2010 population yields a result of an estimated 9.43 tonnes of CO<sub>2</sub>e per capita for the City of Kingston. It is important to understand that this number is not the same as the carbon footprint of the average individual living in City of Kingston (which would include lifecycle emissions, emissions resulting from air travel, etc.). This is also not the same as the GHG emissions per household given above in Section IV.C.

<sup>19</sup> Based on the 2010 census data of 10,217 occupied households 2010 GHG emissions are estimated to be 5.70 metric tons (tonnes) of CO<sub>2</sub>e per occupied household.

**Table 15 : City of Kingston 2010 Greenhouse Gas Emissions per Capita**

2010 Greenhouse Gas Emissions per Capita	
2010 Population	23,893
Community GHG Emissions (metric tons CO <sub>2</sub> e)	225,097
GHG Emissions / Resident (metric tons CO <sub>2</sub> e)	9.43

According to the New York State Climate Action Council Interim Report, from 1990 to 2008 New York residents emitted, on a per-capita basis, about 13.7 metric tons of CO<sub>2</sub>e. Over the same time period the Council found the national average to be about 24.4 metric tons of CO<sub>2</sub>e.<sup>20</sup> While not for the same time period, the City of Kingston per capita GHG emissions of 9.42 metric tons (tonnes) of CO<sub>2</sub>e per capita is significantly lower than both the New York and national average.

## V. COMMERCIAL ENERGY USE & GREENHOUSE GAS EMISSIONS

More specific information such as the square footage of commercial space in the City of Kingston and specific data on fuel usage within the commercial sector was unavailable or was beyond the scope and time frame for preparation of this report. A more specific analysis of energy usage within the commercial sector of Kingston may be useful in the future.

### A. COMMERCIAL GHG EMISSIONS

The City of Kingston's commercial sector generated as estimated 71,281 tonnes of CO<sub>2</sub>e or 32% of community-wide GHG emissions in 2010.

Table 16 outlines the breakdown of commercial GHG emissions by fuel type. The majority of commercial GHG emissions, 34,249 tonnes or 48% were generated from the use of electricity.

**Table 16: Commercial 2010 GHG Emissions Summary by Fuel Source**

Commercial GHG Emission Sources 2010	CO <sub>2</sub> (tonnes)	N <sub>2</sub> O (kg)	CH <sub>4</sub> (kg)	CO <sub>2</sub> e (tonnes)	Energy (MMBtu)	% of CO <sub>2</sub> e
Electricity	34,078	494	868	34,249	375,271	48
Natural Gas	25,613	48	2,420	25,679	484,093	36
Fuel Oil	6,009	59	883	6,046	81,246	8
Residual Fuel Oil	4,735	42	714	4,763	63,043	7
Propane	457	8	82	461	7,432	<1
Kerosene	82	1	12	83	1,094	<1
Residual Fuel Oil	<u>0</u>	<u>42</u>	<u>714</u>	<u>28</u>	<u>63,043</u>	<1
<b>TOTALS</b>	70,974	652	4,979	71,281	1,012,179	

<sup>20</sup> Chapter 3 Inventory and Forecast of New York State's Greenhouse Gas Emissions, New York State Climate Action Council Interim Report November 9, 2010, p.3-10.

## VI. TRANSPORTATION

In 2010, there were 158,782,140 vehicle miles traveled in the City of Kingston.<sup>21</sup> The vehicle miles traveled (VMT) includes miles from all vehicle use within the City of Kingston's boundaries (whether on local roads or State highways passing through the City of Kingston).

### A. TRANSPORTATION FUEL USAGE

Based on the miles traveled it is estimated that in 2010, 10,121,527 gallons of fuel were used.<sup>22</sup> Most fuel is estimated to be gasoline, 8,613,576 gallons or 85%, with 1,507,951 gallons being diesel fuel.

**Table 17: Community-wide Vehicle Fuel Usage**

Community-Wide Vehicle Fuel Usage	2010 Total Usage (Gallons)	% of Total
Gasoline	8,613,576	85
Diesel Fuel	1,507,951	15
<b>TOTAL</b>	<b>10,121,527</b>	

It is estimated that 93%, or 147,684,000 vehicle miles traveled in the City of Kingston in 2010 were by gasoline vehicles. The majority of the miles traveled, 65%, are by passenger vehicles using 57% of the gas.

Approximately 7% of the vehicles miles traveled are done so by diesel vehicles using 1,507,951 gallons of diesel fuel. Most of these miles are by heavy duty diesel vehicles, 77%, which use 91% of the diesel fuel.

**Table 18: Vehicle Miles Traveled and Gasoline Usage by Vehicle Type**

Vehicle Type	Gas VMT	% of Gas VMT	Gas Gallons	% of Gas Gallons	% of Total VMT
Heavy Duty	-	-	-	-	
Light Truck	51,451,200	35	3,678,113	43	
Passenger	<u>96,232,800</u>	65	<u>4,935,464</u>	57	
<b>TOTALS</b>	<b>147,684,000</b>		<b>8,613,577</b>		<b>93</b>

**Table 19: Vehicle Miles Traveled and Diesel Fuel Usage by Vehicle Type**

Vehicle Type	Diesel VMT	% of Diesel VMT	Diesel Gallons	% of Diesel Gallons	% of Total VMT
Heavy Duty	8,575,200	77	1,375,352	91	
Light Truck	2,064,400	19	110,346	7	
Passenger	<u>476,400</u>	4	<u>22,253</u>	1	
<b>TOTALS</b>	<b>11,116,000</b>		<b>1,507,951</b>		<b>7</b>

<sup>21</sup> Ulster County Transportation Council

<sup>22</sup> Gas and diesel fuel estimates made using ICLEI's CACP 2009 Software

## B. CITY OF KINGSTON VMT BY ROAD CLASS

Vehicles miles traveled in the City of Kingston are broken down by the Federal Highway Administration's functional class system<sup>23</sup> in Table 20.

**Table 20: City of Kingston Vehicles Miles Traveled (VMT) by Functional Class 2010**

Functional Systems for Urban Areas	City of Kingston Estimated Daily VMT	City of Kingston Estimated Annual (VMT)
Urban Principal Arterial - Interstate (87, 587)	62,558	20,644,140
Urban Principal Arterial - Other Freeways and Expressways	55,813	18,418,290
Urban Principal Arterial - Other (no control of access)	47,395	15,640,350
Urban Minor Arterial	132,346	43,674,180
Urban Collector	66,523	21,952,590
Urban Local Street	116,523	38,452,590
<b>TOTAL</b>	<b>481,158</b>	<b>158,782,140</b>

The principal and minor arterial road systems include Interstate I -87 and 587, Route 32 and Route 209 as well as other principal arterial roadways. These roadways are defined as the highest traffic volume corridors, and carry the major portion of trips entering and leaving the City. This includes the majority of through movements desiring to bypass the central city. The local and minor arterial streets located within City of Kingston boundaries augment the principal arterial system but offer a lower level of traffic mobility and may carry local bus routes and provide intra-community continuity, but ideally should not penetrate identifiable neighborhoods.

The collector and local streets provide access, service and traffic circulation within residential neighborhoods, commercial and industrial areas. These roadways collect traffic from local streets in residential neighborhoods and channel it into the arterial system. Local streets offer the lowest level of vehicle mobility.

## C. TRANSPORTATION GHG EMISSIONS

The City of Kingston's transportation sector generated as estimated 92,696 tonnes of CO<sub>2</sub>e<sup>24</sup> or more than 41% of community-wide GHG emissions in 2010.

The transportation analysis includes emissions from all vehicle use within the City of Kingston's boundaries (whether on local roads or State highways passing through the City of Kingston).

<sup>23</sup> Functional classification is the process by which streets and highways are grouped into classes, or systems, according to the character of service they are intended to provide. Basic to this process is the recognition that individual roads and streets do not serve travel independently in any major way. Rather, most travel involves movement through a network of roads. It becomes necessary then to determine how this travel can be channelized within the network in a logical and efficient manner. Functional classification defines the nature of this channelization process by defining the part that any particular road or street should play in serving the flow of trips through a highway network. [http://www.fhwa.dot.gov/planning/fcsec2\\_1.htm](http://www.fhwa.dot.gov/planning/fcsec2_1.htm)

<sup>24</sup> Does not include 352 tonnes of CO<sub>2</sub>e from transportation of Municipal Solid Waste.

Transportation is the largest contributor of greenhouse gas emissions in the City of Kingston. The transportation sector also accounts for the largest share of GHG emissions in New York State.<sup>25</sup>

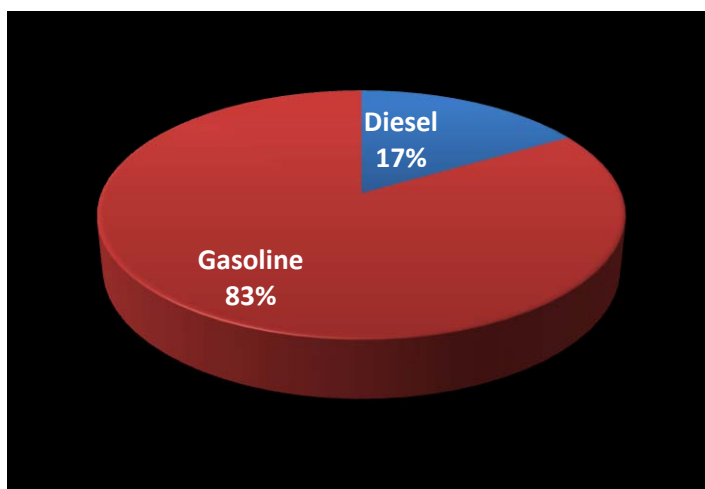
As illustrated in Table 21 and Figure 7, in 2010 the use of gasoline accounted for 83% of the transportation GHG emissions with diesel fuel accounting for 17%.

**Table 21: Transportation GHG Emissions by Fuel Source**

Transportation GHG Emissions *	CO <sub>2</sub> (tonnes)	N <sub>2</sub> O (kg)	CH <sub>4</sub> (kg)	CO <sub>2</sub> e (tonnes)	Energy (MMBtu)	% of CO <sub>2</sub> e
Diesel	15,396	45	46	15,411	20,8218	17
Gasoline	75627	5,058	4,294	77,285	1,076,581	83
<b>TOTAL</b>	<b>91,023</b>	<b>5,102</b>	<b>4,340</b>	<b>92,696</b>	<b>1,284,799</b>	

\*Does not include 352 tonnes of CO<sub>2</sub>e from Waste Transport

**Figure 7: Transportation GHG Emissions by Fuel Source**



#### D. VMT GHG EMISSION BY FUNCTIONAL ROAD CLASS

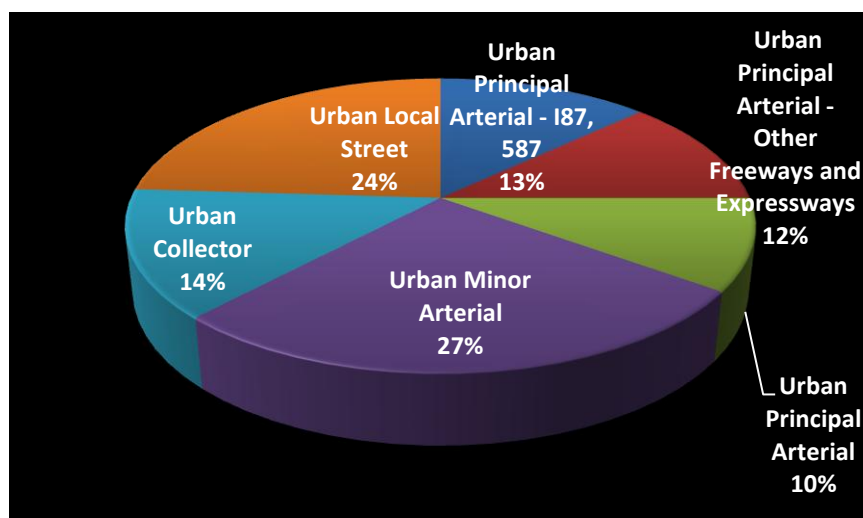
The total GHG emissions from the transportation sector in 2010 were 92,697 tonnes of CO<sub>2</sub>e. Since the majority of miles are traveled on the minor arterial roads and local streets, these road systems have the largest impact on GHG emissions, accounting for more than half of all transportation related GHG emissions as illustrated in Table 22 and Figure 8.

<sup>25</sup>Transportation accounted for 34 percent of New York's gross GHG emissions in 2008. Chapter 3 Inventory and Forecast of New York State's Greenhouse Gas Emissions, New York State Climate Action Council Interim Report November 9, 2010, p.3-14.

**Table 22: City of Kingston GHG Emissions by Functional Class 2010**

Functional Road Class Systems for Urban Areas	CO <sub>2</sub> e (tonnes)	% of CO <sub>2</sub> e
Urban Principal Arterial - Interstate (87, 587)	12,048	13
Urban Principal Arterial - Other Freeways and Expressways	10,741	12
Urban Principal Arterial - Other (no control of access) *	9,130	10
Urban Minor Arterial **	25,491	27
Urban Collector ***	12,813	14
Urban Local Street ****	22,474	24
<b>TOTAL</b>	<b>92,697</b>	

**Figure 8: Transportation GHG Emissions by Functional Road Class 2010**



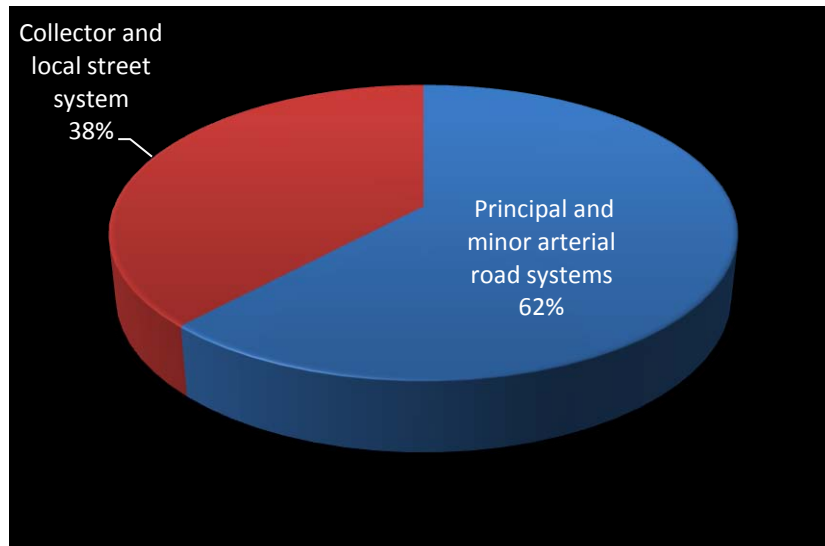
Functional road systems can be summarized into two groups: 1) the principal and minor arterial road systems and 2) the collector and local streets.

Table 23 shows that nearly 62% of the City of Kingston's transportation-related greenhouse gas emissions were generated from vehicle miles traveled (VMT) on principal and minor arterial road systems as defined above. The remaining 38% of City of Kingston's transportation-related greenhouse gas emissions were generated from VMT on the collector and local street system.

**Table 23: Transportation GHGs Functional Class Summary**

City of Kingston Transportation GHG by Functional Highway Class	CO <sub>2</sub> e (tonnes)	% of Total CO <sub>2</sub> e
Principal and minor arterial road systems	57,410	<b>62</b>
Collector and local street system	35,287	<b>38</b>
<b>TOTAL</b>	<b>92,697</b>	

**Figure 9: Transportation GHG Emissions Functional Road Class Summary**



Transportation information from railroad use<sup>26</sup> for the movement of goods within the City of Kingston and transportation emissions from the use of fuel and movement of motor craft on the City of Kingston's waterfront (the Rondout) were not available at the time of this report and therefore transportation emission from these sources are not included in this analysis.<sup>27</sup>

Since there are no airports located within the geographic boundaries of the City of Kingston it is reasonable to exclude air travel from this inventory.

## **VII. SOLID WASTE/MATERIALS MANAGEMENT**

The City of Kingston DPW provides solid waste collection to all of its residents and to some of its businesses and institutions. The DPW is also responsible for the curbside collection of recyclable commingled containers and mixed paper. Scrap metal, yard waste and brush are also collected separately at curbside.

The City of Kingston DPW does not provide solid waste and recycling services to all generators with the City. Businesses and institutions such as the Kingston Hospital and the Kingston School District, contract with private haulers. Due to the limited timeframe for preparation of this report collecting the waste data generated by all sectors in the City of Kingston was beyond the scope of this report as was the transportation related information from private haulers. Therefore the waste generation and transportation data used and the greenhouse gas emissions reported are a partial picture of the waste related greenhouse gas emissions.

<sup>26</sup> Staff attempted to include railroad emissions however efforts to obtain fuel consumption and other rail/freight data from CSX were unsuccessful. Staff recommends pursuing a detailed railroad GHG emissions inventory.

<sup>27</sup> Staff attempted to include City of Kingston's Port GHG emissions data in this report, however, upon investigation, discovered that detailed data would need to be gathered individually from each of the Rondout tenants, requiring a substantial amount of staff time to investigate. Given that the constraints for gathering Port data would have delayed this report significantly, staff recommends pursuing a detailed Port GHG emissions inventory.

Summary information on energy use and greenhouse gas emissions associated with the solid waste management by the City of Kingston DPW can be found in the Local Government Report.

## **A. SOLID WASTE/MATERIALS MANAGEMENT GHG EMISSIONS**

Solid waste management is analyzed separately due to the potential for landfills to produce methane, a greenhouse gas. The evaluation and reporting of GHG emissions, primarily methane (CH<sub>4</sub>), from landfills is usually done by a local government if they own and operate a landfill within their community. The City of Kingston does not own or operate its own landfill. The waste the City DPW collects is transported to the Ulster County Resource Recovery Agency (UCRRA) and then trucked to a landfill in western New York. The City government has control over the operation of the waste collection it performs but once the waste leaves the City the transportation and ultimate disposal of the waste is not within the City's jurisdiction.

However, due to the potential for the decomposition of waste in landfills to emit methane (CH<sub>4</sub>) and due to the fact that the City of Kingston has a variety of active programs to reduce waste, mainly through recycling and composting, it was determined that it was important to begin to get an idea of the emissions associated with both the generation and transportation of waste materials in the City of Kingston.

Based on the fact that the waste collected by the City DPW is from residents and businesses in the community and based on the fact that the most significant form of GHG emissions from waste is from the generation of methane from a landfill outside of Kingston, waste related GHG emissions are provided in this report. Again, this is a partial picture of waste related GHG emissions, being there is additional waste generated in Kingston that is hauled, transported and disposed of by private companies, not by the City DPW.

The City's operation of the transfer station and the fuel used by DPW refuse packers to collect and transport garbage and recyclable materials are part of the overall GHG emissions associated with solid waste management. The emissions from the electricity used at the transfer station and the emissions associated with the use of the DPW refuse packers are reported in the *Local Government Operations Energy and Greenhouse Gas Emissions Report*. And in Appendix N.

Waste related greenhouse gas emission sources are analyzed separately to enable policy development to address energy usage associated with waste management, waste reduction and GHG reduction targets.

## **B. LANDFILL GHG EMISSIONS**

In 2010 the City of Kingston collected 13,827.1 tons of material: 8,768.8 tons of garbage, 1,538.49 tons from curbside recycling and 3,519 tons of other recyclables. For purposes of this inventory all 8,768.8 tons of trash generated by the City of Kingston was transported from UCCRA to Seneca Meadows Landfill.

The GHG emissions are an estimate of methane generation from the anaerobic decomposition of organic wastes (such as paper, food scraps, plant debris, wood, etc.) that are sent to and deposited at the Seneca

Meadows Landfill in western New York.<sup>28</sup> The waste generation emissions are the estimated future emissions from waste that was sent to this landfill by the City of Kingston in the base year 2010.

The landfill GHG emissions will be released over time as the waste that was deposited in the landfill in 2010 decomposes over the full 100+ year cycle of its decomposition. It is assumed that waste will not begin to generate methane until 6 months after it is deposited in the landfill, and only a small portion of the waste will decompose in the first year.

To generate CH<sub>4</sub> emission from the landfills, City waste was categorized separated based on the waste types in the CACP software<sup>29</sup>. Using a waste composition analysis done by UCCRA the waste composition of the material that the City of Kingston is sending to Seneca Meadows is identified in Table 24. The waste type determines the methane produced by the waste as it decomposes in the landfill.

Attempts to contact officials at Seneca Meadows to obtain the annual landfill gas recovery rate data were unsuccessful. Therefore the default factor of a 75% methane recover factor<sup>30</sup> was used for Seneca Meadows to determine the percentage of all generated emissions that was likely escaping into the atmosphere (fugitive emissions).<sup>31</sup> It is important to note, however, that the Seneca Meadows site uses landfill methane gas, a byproduct of organic waste decomposition, to power a 17.6 megawatt/hour capacity industrial development initiative located adjacent to the landfill. The landfill gas is collected from the landfill and piped to the gas plant to burn as fuel in the engine generators. Seneca Meadows reported collecting 2,953,837,274 cubic feet of gas to generate 143,685 mega-watt hours of energy in 2009. This facility is expected to provide the equivalent power to satisfy the requirements of approximately 20,000 homes annually.

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<sup>28</sup> Waste generation emissions figures are the product of a modeling exercise that estimates the future emissions that will result from the full decomposition of the organic waste sent to any landfill in the base year 2010. The model used to run this estimation is based on the U.S. EPA Waste Reduction Model (WARM). In order to estimate the relative quantities of various types of waste included in the general disposal figures obtained from the City, waste characterization figures were utilized from the Local Government Operations Greenhouse Gas Emissions Inventory Instructions Part 2: CACP 2009 v3.0 Data Entry July 2011.

<sup>29</sup> CACP 2009 Software uses the EPA Waste Reduction Model (WARM) to calculate GHG emissions from landfills.

[http://www.epa.gov/climatechange/wycd/waste/calculators/Warm\\_home.html](http://www.epa.gov/climatechange/wycd/waste/calculators/Warm_home.html)

<sup>30</sup> Methane recovery factor specified by the U.S. EPA AP 42 guidelines on emissions factors is 75%.

The AP 42 emission factors for waste/landfills in the controlled emissions section states that landfill gas collection systems are not 100% efficient in collecting gas and therefore emissions of methane will still occur. Based on reported collection efficiencies between 60% – 85%, a value of 75% collection efficiency is stated as most commonly used, and is used in this Protocol as conservative default collection efficiency. EPA AP 42 Emission Factors, Solid Waste Disposal, pg 2, 4-6 (1998).

<sup>31</sup> See Appendix E for more information on methods and emissions factors used in the Waste Sector analysis.

**Table 24: Waste Composition**

Materials	% of Waste Type based on UCCRA Waste Comp Analysis
Paper	31
Food	14
Plant	7
Wood/Textiles	10
All Other*	38

\*'All Other' includes metals, plastics, glass, organic and miscellaneous waste such as electronics, diapers, and C&D waste.

The City of Kingston's trash that was landfilled at Seneca Meadows Landfill in 2010 will generate 53,362 kg of CH<sub>4</sub> which is equivalent to 1,121 tonnes of CO<sub>2</sub>e. The methane produced from the waste sector is 79% of the total community wide CH<sub>4</sub> as depicted in Table 25.

**Table 25: Methane Emission by Sector**

Sector	CH <sub>4</sub> (kg)	% of CH <sub>4</sub> Emissions
Residential	4,950	7
Commercial	4,980	7
Industrial	59	<1
Transportation	4,340.5	6
Waste	53,362	79
<b>TOTAL</b>	<b>67,691.5</b>	

Again it is important to note that the fugitive methane released by the decomposition of organic waste is over time in the landfill, future GHG emissions, not 2010 GHG emissions as are all other GHG emissions identified in this report.

### C. GHG EMISSIONS FROM TRANSPORTATION OF WASTE

The GHG emissions associated with the transportation of waste are based on the movement of the material from UCRRA to the Seneca Meadows Landfill. The emissions associated with the transportation of waste are estimated as well.

As seen in Table 26 one trailer headed to the landfill can carry approximately 28.5 tons of trash. Based on 8,768.8 tons collected by the City of Kingston in 2010, it is estimated that there were approximately 308 trips needed to haul the City's garbage to Seneca Meadows. Also as seen in Table 25 a round trip to Seneca Meadows is 470 miles. The number of trips, 308, multiplied by the number of miles, 470, resulted in 144,760 miles traveled to transport the City's garbage in 2010. Based on an estimated 112 gallons of diesel fuel used for each round trip, it was estimated that 34,496 gallons of diesel fuel were used to transport garbage in 2010. Hauling 8,768.8 tons, approximately 3.93 gallons of diesel fuel was used per

ton of garbage. Based on a cost of \$2.55 per gallon, total cost to haul city garbage to Seneca Meadows in 2010 was approximately \$87,985.

Based on the amount of fuel and the miles traveled, transportation emissions generated from the transportation of solid waste from the UCCRA facility to Seneca Meadows in 2010 was 352 tonnes of CO<sub>2</sub>e. The fuel usage, costs and associated GHG emissions from the collection and transportation of waste by City of Kingston DPW refuse packers can be found in Appendix J.

**Table 26: Transporting City of Kingston Solid Waste to Seneca Landfill<sup>32</sup>**

Transporting City of Kingston Trash 2010	
<b>No. of Miles to Seneca Falls LF from Ulster Transfer Station (R/T)</b>	<b>470</b>
<b>Fuel Used –R/T (Diesel Gallons)</b>	<b>112</b>
<b>Total Waste Transported - 2010 (tons)</b>	<b>8,768.8</b>
<b>Tonnage of Garbage per trailer</b>	<b>28.5</b>
<b>Number of Trailers 2010 for City of Kingston MSW*</b>	<b>308</b>
<b>VMT City of Kingston MSW</b>	<b>144,760</b>
<b>Fuel Used to Transport City of Kingston MSW (Diesel Gallons)</b>	<b>34,496</b>
<b>Cost to Transport City of Kingston Trash**</b>	<b>\$87,965</b>

\*Based on 28.5 tons of trash per trailer (Estimated 308 trailers of garbage go to Seneca LF with City of Kingston Garbage – 8,768.80 tons of City garbage/28.50 tons per trailer = 308 trailers full)

\*\*Average Fuel Cost 2010 (price per gallon) \$2.55 (34,496 gallons x \$2.55/gallon)

Recyclable materials are shipped to several different markets in several different locations many of which are intermediary markets and not ultimate locations. Therefore it was not feasible to collect the fuel usage, miles and associated GHG emission from the transportation of recyclable materials.

The total Scope 3 GHG emissions associated with the transport and disposal of solid waste is 1,473 tonnes of CO<sub>2</sub>e, less than 1% percent of total 2010 emissions for the community of the City of Kingston. The methane emissions associated with the waste sector are significant. It is also important to note that this is a partial picture of methane emissions as these numbers do not reflect the total waste generated within the City of Kingston.

<sup>32</sup> **Data From UCCRA:**

Total trash 2010: City of Kingston: 8,768.80 tons

Percentage of trash from City of Kingston that went to:

High Acres Landfill: 0%

Seneca Meadows Landfill: 100%

Approximate tonnage of trash per trailer: 28.50 tons

# Miles to Seneca R/T from UCCRA: 470 miles

Gallons of fuel used R/T to Seneca Meadows Landfill (1 trailer), From UCRAA: 112 gallons

Average fuel cost for 2010 (1 gallon): \$2.55 per gallon (excludes taxes)

Estimated 308 trailers of garbage go to Seneca LF with City of Kingston Garbage:

8,768.80 tons of City garbage/28.50 tons per trailer = 308 trailers full

Estimated 144,760 vehicle miles traveled (308 trailers x 470 miles round trip)

Estimated 34, 496 gallons of diesel fuel (308 trailers x 112 gallons per trip)

Estimated Cost \$87,964.8 (34,496 gallons x \$2.55/gallon)

**Table 27: City of Kingston Scope 3 Solid Waste GHG Emissions**

Solid Waste Scope 3 GHG Emissions	CO <sub>2</sub> (tonnes)	N <sub>2</sub> O (kg)	CH <sub>4</sub> (kg)	CO <sub>2</sub> e (tonnes)	Energy (MMBtu)	% of Total CO <sub>2</sub> e
Landfill Emissions	0	0	53,362	1,121		<1
Transportation Waste	352	1	1	352	7983	<.2
<b>TOTALS</b>	<b>3522</b>		<b>53,363</b>	<b>1,473</b>		
<b>TOTAL Community GHG Emissions</b>	<b>184,838</b>	<b>6,259</b>	<b>67,690</b>	<b>188,200</b>	<b>3,211,118</b>	

## VIII. GOVERNMENT OPERATIONS AS PERCENTAGE OF COMMUNITY

### A. ENERGY USAGE

In 2010 the City of Kingston government operations used approximately 4% of the community's total electricity, 1% of the natural gas, and less than half a percent of propane and fuel oil. Government operations consumed 6% of the total diesel fuel but only 1% of the gasoline.

City of Kingston government operations energy usage is discussed in more detail in Appendix B. *City of Kingston Government Operations Energy and GHG Emissions Inventory Results*.

**Table 28: City Government and Community 2010 Energy Usage \***

Energy Source	2010 Community Usage	2010 Government Operations Usage	Government Operations % of Total Usage
Electricity (kWh)*	177,229,159	6,461,721	4
Natural Gas (CCF)*	9,366,490	113,267	1
Heating Fuel Oil-Kerosene(Gal)	1,891,575	4,582	<0.5
LPG Total (Gal)	334,376	1044.1	<0.5
Vehicle Miles Traveled	158,782,140	1,874,932	1
Vehicle Fuel Gas (Gal)	8,613,576	84,403	1
Vehicle Fuel Diesel (Gal)	1,507,951	83,513	6

\*These percentages do not include the Kingston Housing Authority, Kingston Water Department and Dietz Stadium which were analyzed as part of the local government operations. This use of the electricity and natural gas by the Kingston Housing Authority is primarily for 'residential' purposes. The KHA used 1,337,647 kWh of electricity in 2010, about ¾ of a percent of the community's total electricity. The KHA used 283,795 CCF of natural gas in 2010 which would result in the City Government percentage of natural gas going from 1% up to 4.3% of the total community usage.

## B. GREENHOUSE GAS EMISSIONS

In 2010, the City of Kingston government resulted in the release of an estimated 7,281 tonnes of CO<sub>2</sub>e. This includes the GHGs generated by City employee commuting, the Kingston Housing Authority, Kingston Water Department and Dietz Stadium.<sup>33</sup>

Not including employee commuting, the Kingston Housing Authority, Kingston Water Department and Dietz Stadium, City government operations resulted in the release of an estimated 4,587 tonnes of CO<sub>2</sub>e.

As seen in Table 29, City of Kingston government operations accounted for approximately 2.04% of the total GHG emissions in the City of Kingston in 2010. Including KHA, KWD and Dietz Stadium in the operations, GHG emissions were approximately 3.23% of the total. Government operations energy usage and GHG emissions are discussed in greater detail in the *'Local Government Operations Energy and Greenhouse Gas Emissions Report'*.

**Table 29: City Government and Community GHG Emissions**

2010 Community CO <sub>2</sub> e	2010 Government Operations CO <sub>2</sub> e*	Government Operations CO <sub>2</sub> e % of Total *	2010 Government Related Total CO <sub>2</sub> e**	Government Related CO <sub>2</sub> e % of Total**
225,097	4,587	2.04	7,281	3.23

\* Does not include KHA, KWD and Dietz Stadium

\*\* Includes KHA, KWD and Dietz Stadium

## IX. CONCLUSION

The City can make great strides in reducing energy use and GHG emissions by addressing the land use and transportation sector and by recognizing and realizing opportunities to reduce vehicle miles traveled and vehicle fuel usage.

In addition, through focused and concerted strategies in both the residential and commercial sector, electricity saving measures can realize significant energy and GHG reductions.

The energy and GHG emissions information contained in this report will be useful as the City of Kingston embarks on an update to its Comprehensive Master Plan and Zoning Code.

<sup>33</sup> Kingston Housing Authority, Kingston Water Department and Dietz Stadium are not a part of regular government operations but were included in government analysis because City has some operational control over these entities.

## APPENDIX B. CITY OF KINGSTON NY LOCAL GOVERNMENT OPERATIONS ENERGY AND GREENHOUSE GAS EMISSIONS REPORT

### I. INTRODUCTION

This report comprehensively examines the electricity, natural gas and fuel used by City government operations for calendar year 2010. Energy data and other information were used to establish a 2010 greenhouse gas (GHG) emissions baseline for City government operations. Following summaries of energy usage and cost and GHG emissions data, the government operations information is presented in more detail according to the following:

- Buildings and Facilities
- Vehicle Fleet
- Transit Fleet/Citibus
- Wastewater Treatment Plant
- Water Department
- Public Lighting
- Solid Waste
- Employee Commute

Presentation of this information in this manner is intended to assist city officials and the policy-makers in making informed decisions to reduce energy usage, save taxpayer dollars and cut GHG emissions associated with City operations. Energy and greenhouse gas baseline information can be used to develop the strategies and measures in the Climate Action Plan that can be employed to meet energy and GHG emissions reduction goals set by the City.

City government operations covered in this analysis include the activities and functions of all city departments including the Department of Public Works (DPW), the Kingston Police (KPD) and Fire Departments (KFD), Parks and Recreation, and Citibus. While the budgeting for the Kingston Water Department (KWD), Kingston Housing Authority (KHA) and the Dietz Commission<sup>34</sup>, as well as their utility billing, are handled separately from the City government budget, the KWD, KHA and the Dietz Commission are included in this analysis. The KWD, KHA and Dietz Stadium were included due to their structure and operations, in-part being determined by the City of Kingston Mayor. Therefore it was determined that the City has some operational control over these entities.

In addition, fuel usage and costs from employee commuting were estimated through an Employee Commuting Survey. This information is presented as part of local government operations because City government, through policy and incentives, can have a direct impact on employee commuting.

For the purposes of GHG accounting, public lighting, wastewater and solid waste energy and GHG emissions are analyzed separately.

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<sup>34</sup> Energy costs associated with the operation of Dietz Stadium. The energy costs associated with the operation of the Andretta (Dietz Pool) are part of the energy expenses of the City of Kingston Department of Parks and Recreation.

## II. CITY OF KINGSTON GOVERNMENT OPERATIONS 2010 ENERGY SUMMARY

The City of Kingston government energy costs<sup>35</sup> in 2010 were \$1,590,415, 4.6% of the 2010 budget as modified (\$34,776,803). Taking into account the energy costs of the KWD, (\$97,034), the KHA, (\$268,389)<sup>36</sup>, and Dietz Stadium (\$19,564) the overall 2010 total energy costs for city government related operations totaled \$1,975,402.

Adding in the estimated employee commuting fuel costs of \$119,904, energy related expenses were equal to \$2,095,306.

Table 1 provides a summation of the total energy cost for each City department, separating out the energy costs of KHA, KWD, Dietz and employee commuting.

A more specific breakdown of energy usage and cost by these various sectors is described in more detail in other sections of this report.

**Table 1: City of Kingston Government Energy Usage and Cost Summary**

City of Kingston Government Sector	2010 Total Cost
<b>City Government Operations</b>	<b>\$1,590,415</b>
Kingston Housing Authority	\$268,389
Kingston Water Department	\$97,034
Dietz Stadium	\$19,564
<b>TOTAL</b>	<b>\$1,975,402</b>
Employee Commute	\$119,904
<b>TOTAL with Employee Commute</b>	<b>\$2,095,306</b>

The energy costs of the KHA, KWD and Dietz are displayed separately as they are not part of the City government budgeting process. Additionally, KHA facilities are primarily 'residential' and not ordinarily considered part of city government operations. For the purposes of this energy analysis and GHG inventory they are included as the City has some degree of operation control of these entities.

### A. ENERGY USAGE AND COST SUMMARY BY FUEL SOURCE

Table 2 summarizes the energy usage and cost totals for City government operations as related to the City budgeting process, excluding KHA, KWD and Dietz Stadium and employee commuting. The most significant portion of the City's energy expenditures in 2010 were from purchased electricity, with government operations using 6,461,721 kWh of electricity in 2010 at a cost of \$1,012,384, 64% of the overall energy bill. Natural gas costs accounted for approximately 9% of the overall energy expenditures.

<sup>35</sup> The energy cost figures in this report are as accurate as possible based on best available data. The total energy costs may be greater. In 2010 the City of Kingston was transitioning utility accounts to have electricity and natural gas supplied by the Hess Corporation and delivered by Central Hudson Gas & Electric. In a few cases the cost of natural gas as supplied by Hess had to be estimated.

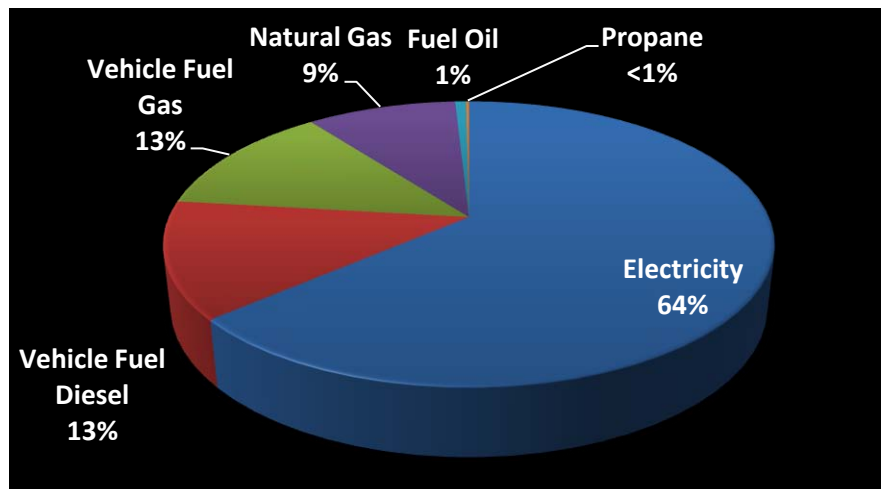
<sup>36</sup> Utility data for Stuyvesant Charter was inadvertently not accounted for. Therefore KHA energy usage and cost for 2010 will be slightly greater.

The cost of vehicle fuel was 26% of the total costs, with the split being almost equal between gas and diesel fuel costs.

**Table 2: City of Kingston Energy Usage and Cost Summary**

City of Kingston Energy Source	2010 Total Usage	2010 Total Energy Cost	% of Total Energy Costs
Electricity (kWh)	6,461,721	\$1,012,384	64
Natural Gas (CCF)	113,267	\$151,058	9
Fuel Oil (Gal)	4,582	\$11,225	1
Propane (Gal)	1044.1	\$2,748	<1
Vehicle Fuel Gas (Gal)	84,402.6	\$202,970	13
Vehicle Fuel Diesel (Gal)	83,513	\$210,026	13
<b>TOTAL City Government Costs</b>		<b>\$1,590,411</b>	

**Figure 1: City of Kingston Energy Usage and Cost Summary**



(Does not include KHA, KWD and Dietz and Employee Commute)

Table 3 (below) summarizes the energy costs by fuel source including KHA, KWD and Dietz Stadium. Similar percentages of fuel usage are found with the most significant portion of energy expenditures being from purchased electricity. The overall total of electricity used in 2010 was 8,264,278 kWh at a cost of \$1,233,953, 62% of the total energy costs. Natural gas usage was the second most significant cost, however vehicles fuel costs when summed accounted for more than 20% of energy expenses.

When factored into overall energy expenditures employee commuting was 6% of energy costs.

**Table 3: City of Kingston Government Energy Usage and Cost Summary (includes KHA, KWD and Dietz)**

City of Kingston Energy Source	2010 Total Usage	2010 Total Energy Cost	% of Total Energy Costs	% of Cost including Employee Commute
Electricity (kWh)*	8,270,947	\$1,233,953	62	59
Natural Gas (CCF)**	406,332	\$270,110	14	13
Fuel Oil (Gal)	8,934	\$21,978	1	1
Propane (Gal)	1,824.4	\$4,376	0	<.5
Vehicle Fuel Gas (Gal)	96,964.1	\$233,202	12	11
Vehicle Fuel Diesel (Gal)	84,210.1	<u>\$211,782</u>	11	10
<b>TOTAL City Government Costs</b>		<b>\$1,975,402</b>		
Employee Commute (Gas-Gal)	41,219	<u>\$119,904</u>		6
<b>TOTAL</b>		<b>\$2,095,306</b>		

\*KHA used 1,337,647 kWh at cost of \$156,023

\*KWD used 388,331 kWh at a cost of \$50,233

\*Dietz Stadium used 83,248 kWh at a cost of \$15,313

\*\*KHA used 283,795 CCF at cost of \$106,177

\*\* KWD used 6,266 CCF at a cost of \$8,624

\*\* Dietz used 3,004 CCF at a cost of \$4,251

## B. SUMMARY BY DEPARTMENT/SECTOR

As is seen in Table 4 and Figure 2, public lighting, primarily street lighting, was the most significant energy cost to the City of Kingston government, accounting for a third of the government's overall energy costs. DPW operations in total, public lighting (34%), wastewater treatment (21%), and the remainder of DPW (12%) account for approximately two-thirds of the City's energy expenditures.

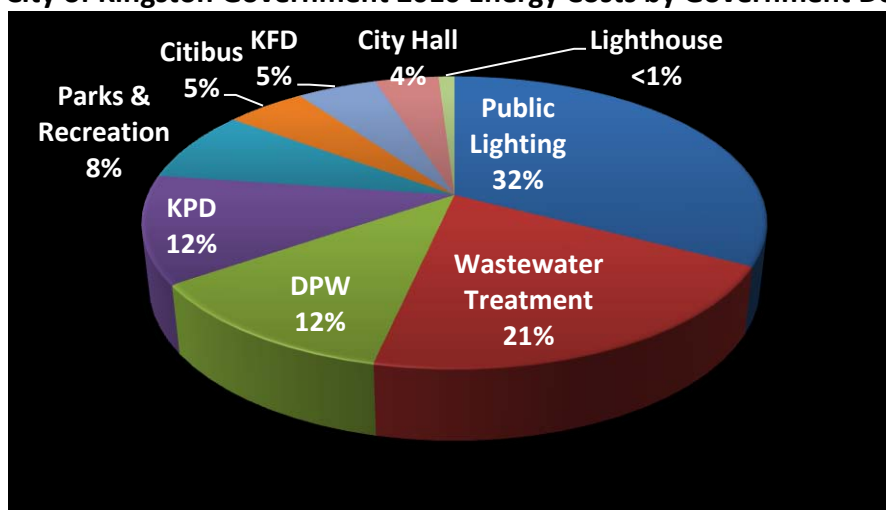
**Table 4: City of Kingston Government Energy Cost Summary by Department/Sector**

City of Kingston	2010 Total Energy Cost	% of City Government Costs *
Public Lighting - Street lights, traffic signals, other	\$524,620	33
Wastewater Treatment	\$335,992	21
DPW	\$185,729	12
KPD	\$183,474	12
Parks & Recreation	\$125,960	8
Citibus	\$87,195	5
KFD	\$85,789	5
City Hall	\$61,262	4
Lighthouse	\$394	<1
<b>TOTAL</b>	<b>\$1,590,415</b>	
KHA	\$268,389	
KWD	\$97,034	
Dietz Stadium	\$19,564	
<b>TOTAL</b>	<b>\$1,975,402</b>	
Employee Commute	\$119,904	
<b>TOTAL</b>	<b>\$2,095,306</b>	
<b>TOTAL DPW</b>	<b>\$1,046,341</b>	66

The energy costs of the KHA, KWD and Dietz are displayed separately as they are not part of the City government budgeting process. Additionally, KHA facilities are primarily 'residential' and not ordinarily considered part of City government operations. For the purposes of this energy analysis and GHG inventory they are included as the City has some degree of operational control of these entities.

\*Based on City budget

**Figure 2: City of Kingston Government 2010 Energy Costs by Government Dept/Sector**



### III. CITY OF KINGSTON GOVERNMENT OPERATIONS 2010 GREENHOUSE GAS EMISSIONS SUMMARY

In 2010, the GHG emissions from City of Kingston government operations, including the emissions from the KWD, the KHA, Dietz Stadium and employee commuting totaled 6,957 tonnes of CO<sub>2</sub>, 909 kg of N<sub>2</sub>O, 2,103 kg of CH<sub>4</sub> which is equal to an estimated 7,281 tonnes of CO<sub>2</sub>e.<sup>37</sup>

Excluding the KWD, KHA, Dietz Stadium and employee commuting, that is just looking at the operations that are traditionally part of the City government budgeting process, GHG emissions total were 4,278 tonnes of CO<sub>2</sub>, 867 kg of N<sub>2</sub>O, and 1,907 kg of CH<sub>4</sub> which is equal to an estimated 4,587 tonnes of CO<sub>2</sub>e.

While GHG emissions are discussed with and without the KWD, KHA, Dietz Stadium and employee commuting, the City of Kingston government has some degree of operational control over or ability to influence and affect each of these sectors to reduce the overall total GHG emissions of 7,281 tonnes of CO<sub>2</sub>e.

The GHG emissions of 7,281 tonnes of CO<sub>2</sub>e, is equal to the CO<sub>2</sub> emissions from the consumption of 740,800 gallons of gasoline, 15,367 barrels of oil, the *electricity* use of 824 homes for one year or the carbon sequestered by 1,409 acres of pine or fir forests.<sup>38</sup>

City government buildings and facilities were the largest producers of GHGs in as is depicted in Table 5. Including KHA, KWD, and Dietz Stadium buildings and facilities emitted 4,467 tonnes of CO<sub>2</sub>e, 65% of the total, not including employee commute GHG emissions.

**Table 5: City of Kingston GHG Emissions Summary\***

GHG Emissions Summary*	CO <sub>2</sub> (tonnes)	N <sub>2</sub> O (kg)	CH <sub>4</sub> (kg)	CO <sub>2</sub> e (tonnes)	Energy (MMBtu)	Cost (\$)	% of CO <sub>2</sub> e
Buildings & Facilities	4,171	811	2,000	4,467	63,636	\$1,005,796	65
Vehicles	1,731	54	55	1,750	56,127	\$444,985	25
Public Lighting	691	10	18	694	7,607	\$524,620	10
<b>TOTAL</b>	<b>6,593</b>	<b>875</b>	<b>2,073</b>	<b>6,911</b>	<b>127,370</b>	<b>\$1,975,401</b>	
Employee Commute	362	25	21	370	10,467	\$119,904	
<b>TOTALS</b>	<b>6,955</b>	<b>900</b>	<b>2,094</b>	<b>7,281</b>	<b>137,837</b>	<b>\$2,095,305</b>	

\*Includes KHA, KWD and Dietz Stadium

GHG emissions for City operations, excluding KHA, KWD, and Dietz Stadium are summarized in Table 6 and Figure 3. Buildings and facilities used for City operations including City Hall and DPW, KPD, KFD, and Parks and Recreation buildings and facilities created the majority of GHGs, an estimated 2,264 tonnes of CO<sub>2</sub>e, almost half of the City government operation GHGs of 4,587 tonnes of CO<sub>2</sub>e.

<sup>37</sup> All GHG emissions data was generated using ICLEI CACP 2009. Due to rounding within CACP 2009 and Excel Spreadsheets, GHG totals had variations of up to 4 tonnes of CO<sub>2</sub>e.

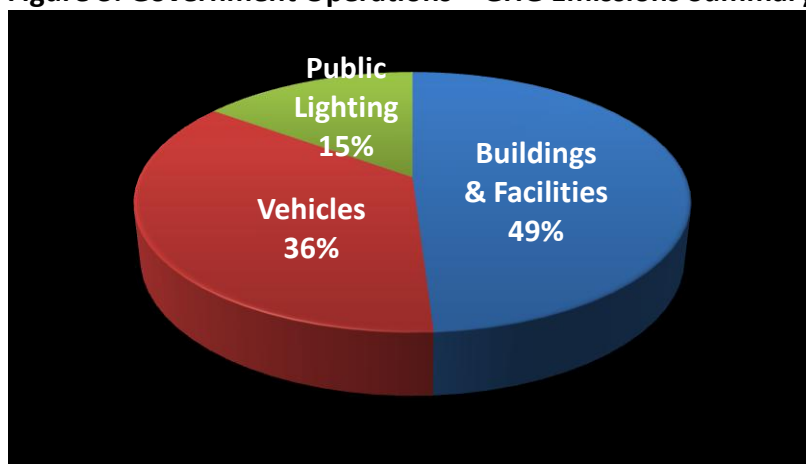
<sup>38</sup> EPA GHG Equivalency Calculator <http://www.epa.gov/cleanenergy/energy-resources/calculator.html>

**Table 6: City of Kingston Government Operations \* GHG Emissions Summary**

City Operation GHG Emissions Summary*	CO <sub>2</sub> (tonnes)	N <sub>2</sub> O (kg)	CH <sub>4</sub> (kg)	CO <sub>2</sub> e (tonnes)	Energy (MMBtu)	Cost (\$)	% of Total CO <sub>2</sub> e*
Buildings & Facilities	1,972	802	1,834	2,264	26,775	\$652,794	49
Vehicles	1,613	46	46	1,629	52,221	\$412,998	36
Public Lighting	691	10	18	694	7,607	\$524,620	15
	<b>4,276</b>	<b>858</b>	<b>1,898</b>	<b>4,587</b>	<b>86,603</b>	<b>\$1,590,412</b>	

\*Just Government Operation – Does not include KHA, KWD, Dietz Stadium or Employee Commuting

**Figure 3: Government Operations \* GHG Emissions Summary**



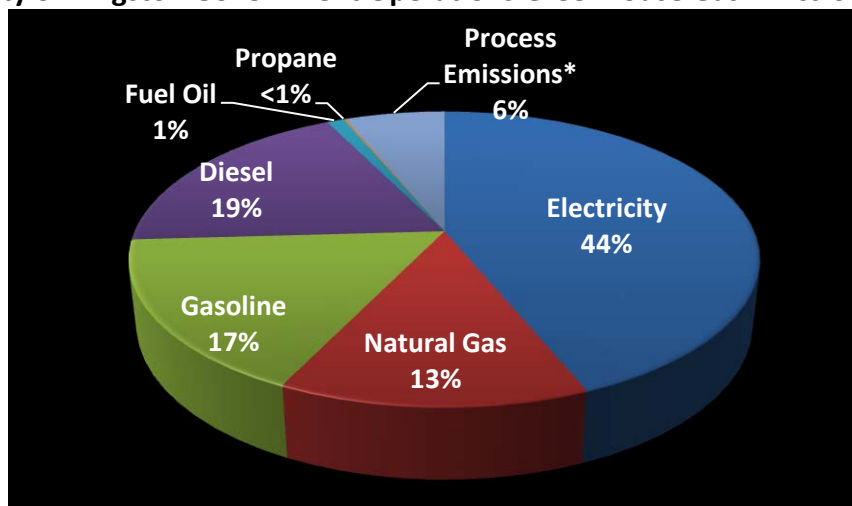
## A. GHG EMISSIONS BY FUEL SOURCE

Table 7 and Figure 4 (below) depict GHG emissions by fuel source for City operations, excluding KHA, KWD, and Dietz Stadium. Electricity purchased for City government operations created the majority of GHGs, 2,011 tonnes of CO<sub>2</sub>e, almost half of all the City government operation GHG emissions. Gasoline and diesel fuel usage combined accounted for more than a third of GHG emissions. Process emissions are nitrous oxide and methane emissions generated by the treatment of wastewater at the Kingston wastewater facility.

**Table 7: City of Kingston Government Operations Greenhouse Gas Emissions by Source**

Source	CO <sub>2</sub> e (tonnes)	% of CO <sub>2</sub> e
Electricity	2,011	44
Natural Gas	614	13
Gasoline	777	17
Diesel	854	19
Fuel Oil	48	1
Propane	6	<1
Process Emissions	<u>281</u>	6
<b>TOTAL</b>	<b>4,591</b>	

**Figure 4: City of Kingston Government Operations Greenhouse Gas Emissions by Source**



\* WWTP methane and nitrous oxide process emissions

Similarly when KHA, KWD and Dietz Stadium are included, electricity resulted in the greatest amount of GHG emissions, 2,575 tonnes of CO<sub>2</sub>e with natural gas usage being second at 2,205 tonnes of CO<sub>2</sub>e as depicted in Table 8 and Figure 5(below). Gasoline usage is third at 1,258 tonnes of CO<sub>2</sub>e which includes 370 tonnes of CO<sub>2</sub>e from employee commuting. Total GHG emissions from vehicle fuel use, gasoline and diesel fuel combined were estimated at 2,119 tonnes of CO<sub>2</sub>e.

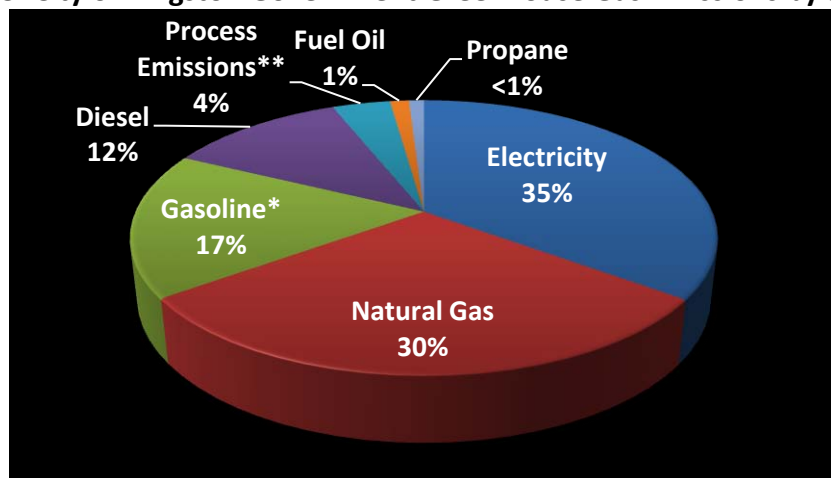
**Table 8: City of Kingston Government Greenhouse Gas Emissions by Source\***

Source	CO <sub>2</sub> e (tonnes)	% of CO <sub>2</sub> e
Electricity	2,575	35
Natural Gas	2,205	30
Gasoline	1,258	17
Diesel	861	12
Process Emissions**	281	4
Fuel Oil	92	1
Propane	10	<1
<b>TOTAL</b>	<b>7,281</b>	
Gasoline (Employee Commute)	370	
<b>TOTAL WITHOUT Employee Commute</b>	<b>6,911</b>	

\* Includes KHA, KWD and Dietz

\*\* Wastewater Treatment Plant Process Emissions

**Figure 5: City of Kingston Government Greenhouse Gas Emissions by Source\***



\*(Includes KHA, KWD, and Dietz Stadium)

\*\* WWTP methane and nitrous oxide process emissions

## B. GHG EMISSIONS BY DEPARTMENT/SECTOR

While KHA facilities produced a significant percentage of GHG emissions, an estimated 1,982 tonnes of CO<sub>2</sub>e, the electric and natural gas used at KHA facilities are primarily for residential purposes. Therefore it is important that City operations GHG emissions be examined separately.

DPW operations as a whole released 2,681 tonnes of CO<sub>2</sub>e, which includes the 694 tonnes of CO<sub>2</sub>e from public lighting and 1,329 tonnes of CO<sub>2</sub>e from wastewater treatment operations; 58% of the total 4,587 tonnes of CO<sub>2</sub>e. The wastewater treatment plant is the single largest producer of GHG emissions: 1,329 tonnes of CO<sub>2</sub>e, 29% of the total 4,587 tonnes of CO<sub>2</sub>e.

Due to the significant amount of gasoline used the Police Department is second to DPW in GHG emissions. The KFD, the Parks and Recreation Department, Citibus, KWD and employee commuting each contribute similar amounts of GHG emissions.

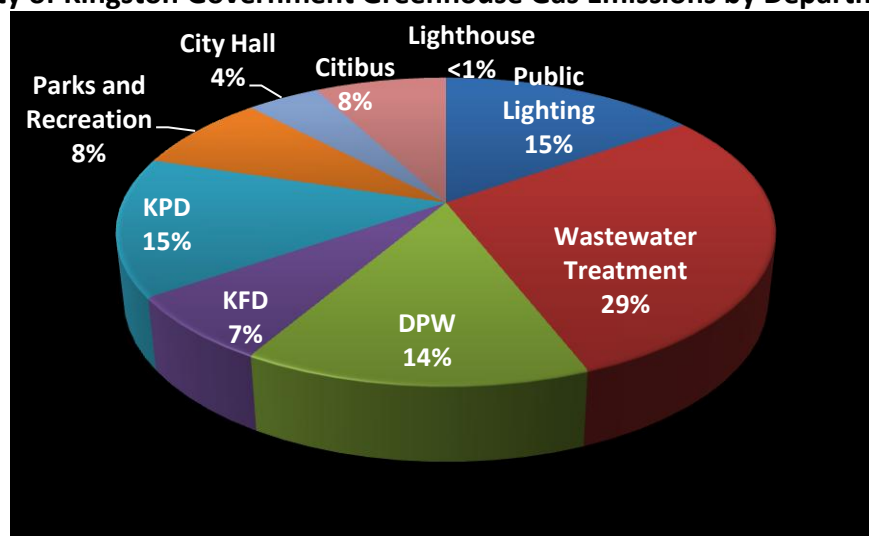
**Table 9: City of Kingston Government GHG Emissions Summary by Department**

GHG Emissions Summary by Department*	CO <sub>2</sub> tonnes	N <sub>2</sub> O (kg)	CH <sub>4</sub> (kg)	CO <sub>2</sub> e (tonnes)	Energy (MMBtu)	Cost (\$)	% of Total CO <sub>2</sub> e*	% of Total CO <sub>2</sub> e**
Public Lighting - Street lights, traffic signals	691	10	18	694	7,607	\$524,620	15	10
Wastewater Treatment	1,040	804	1,775	1,329	14,455	\$335,992	29	18
Public Works	655	6	17	658	13,455	\$185,728	14	9
Fire Department	312	2	15	316	5,739	\$85,789	7	4
Police Department	656	25	32	665	14,259	\$183,473	14	9
Parks and Recreation	370	5	27	373	7,078	\$125,960	8	5
City Hall	197	2	9	197	3,047	\$61,263	4	3
Citibus	354	3	4	355	20,962	\$87,195	8	5
Lighthouse	0	0	0	0	1	\$394	<1	0
<b>TOTAL</b>	<b>4,275</b>	<b>857</b>	<b>1,897</b>	<b>4,587</b>	<b>86,603</b>	<b>\$1,590,415</b>		
Kingston Housing Authority	1,979	8	151	1,982	34,170	\$268,390		27
Water Department	296	9	21	300	6005	\$97,035		4
Dietz Stadium	42	0	3	42	592	\$19,564		1
<b>TOTAL</b>	<b>6,592</b>	<b>874</b>	<b>2,072</b>	<b>6,911</b>	<b>127,370</b>	<b>\$1,975,402</b>		
Employee Commute	362	25	21	370	10,467	\$119,904		5
<b>TOTAL</b>	<b>6,954</b>	<b>899</b>	<b>2093</b>	<b>7,281</b>	<b>137,837</b>	<b>\$2,095,306</b>		
<b>*Total Public Works</b>	<b>2,386</b>	<b>820</b>	<b>1,810</b>	<b>2,681</b>	<b>35,517</b>	<b>\$1,037,828</b>		

\*Based on City budget

\*\*Based on Total Overall Costs

**Figure 6: City of Kingston Government Greenhouse Gas Emissions by Department/Sector\***



\* Does not include KHA, KWD and Dietz Stadium

## **IV. BUILDINGS & FACILITIES 2010 ENERGY USAGE AND COST**

The City of Kingston owns a number of buildings used to provide services typical of municipal governments. The City buildings vary widely in the type of structures, age of construction and use of the building. Building construction age ranges from 1877 to 2001.

This analysis included all City owned and operated buildings and facilities from DPW maintenance garages, City hall, all City fire houses, police and court, all Parks and Recreation facilities to the wastewater treatment plant and its pump stations. The facilities associated with water delivery operated by the KWD as well as the facilities operated by KHA are also part of this analysis.

Building and facility operations contribute to greenhouse gas emissions in two major ways. First, buildings and facilities consume electricity for lighting, cooling, computers, printers, copiers and moving water and wastewater. Facility operations also require the use of fuels such as natural gas, primarily for heating. This energy consumption resulted in the emissions of the majority of greenhouse gas emissions from facilities. Secondly, fire suppression, air conditioning and refrigeration equipment in buildings can emit hydrofluorocarbons (HFCs) and other greenhouse gases when these systems leak refrigerants or fire suppressants. Data on refrigerants used in fire suppression, air conditioning, and refrigeration equipment as well as in vehicles was either unavailable at the time of this analysis or beyond the scope but should be part of a future GHG evaluation.

### **A. BUILDINGS & FACILITIES ENERGY SUMMARY**

This section provides a summary explanation and an overview of all buildings and facilities associated with City government operation including wastewater treatment, water delivery facilities and the solid waste transfer station. The buildings and facilities information is presented below with and without KHA, KWD and Dietz Stadium energy usage and cost.

Energy usage and cost for buildings and facilities that are part of the city operating budget, that is buildings and facilities operated by KFD, KPD, Parks and Recreation, DPW, including the wastewater treatment plant, the solid waste transfer station and City Hall but excluding KHA, KWD and Dietz Stadium are summarized in Columns 1, 2 and 3 of Table 10 (below). The energy usage and costs for all buildings and facilities including KHA, KWD and Dietz Stadium are summarized in columns 4, 5 and 6 in Table 10. (below)

Excluding the energy costs associated with KHA, KWD and Dietz Stadium, the City government spent close to \$653,000 (\$652,793) on energy related expenses for building and facility operations, approximately 41% of the total City government energy expenditures of \$1,590,415. The primary energy cost to operate buildings and facilities is electricity, \$487,764, or 75% of the total of \$653,793.

Including the KHA, KWD and Dietz Stadium, building and facilities energy costs for 2010 were \$1,005,797. More than half, 51%, of the total overall energy costs of \$1,975,401 are attributed to operating buildings and facilities.

**Table 10: Building & Facility 2010 Energy Usage and Cost Summary\***

Energy Source	(1) 2010 Usage	(2) 2010 Energy Cost	(3) % of Total Cost	(4) 2010 Usage	(5) 2010 Energy Cost	(6) % of Total Cost
Electricity (kWh)	4,232,777	\$487,764	75	6,042,003	\$709,333	71
Natural Gas (CCF)	113,267	\$151,056	23	406,332	\$270,110	27
Fuel Oil (Gal)	4,582	\$11,225	2	8,934	\$21,978	2
Propane (Gal)	1044.1	<u>\$2,748</u>	<1	1,824.4	<u>\$4,376</u>	<1
<b>TOTAL</b>		<b>\$652,793</b>	<b>41</b>		<b>\$1,005,797</b>	<b>51</b>
<b>TOTAL ENERGY COSTS</b>		<b>\$1,590,415</b>			<b>\$1,975,401</b>	

\* Columns 1, 2 and 3 do not include KHA, KWD and Dietz Stadium

Columns 4, 5 and 6 includes KHA, KWD and Dietz Stadium

Table 11 provides a more detailed look at energy usage and costs associated with City of Kingston buildings and facilities, providing a summary of electricity, natural gas, fuel oil and propane. Buildings and facilities energy usage and costs for the wastewater treatment plant, the solid waste transfer station as well as water delivery facilities (KWD), KHA and Dietz Stadium are depicted in Table 11.

The wastewater treatment buildings and facilities energy costs, \$303,142, are close to half of the total energy costs of \$652,793, for City budget related facilities. All other City buildings and facilities energy costs, not including wastewater treatment and the solid waste transfer station, were \$345,950 in 2010.

Buildings and facilities energy costs for the KHA are significant as it operates six (6) residential facilities.

**Table 11: Building & Facilities Energy Usage and Cost Summary\***

Buildings and Facility Sectors	Electricity (kWh)	Electricity (\$)	Natural Gas (CCF)	Natural Gas (\$)	Fuel Oil (Gal)	Fuel Oil (\$)	Propane (Gal)	Propane (\$)	Total Cost (\$)
Wastewater Treatment	2,525,109	\$268,206	23,386	\$32,730	876.1	\$2,206			\$303,142
Solid Waste Transfer Station	24,880	\$3,702							\$3,702
Other City Buildings & Facilities	1,682,788	\$215,856	89,881	\$118,326	3,705.9	\$9,019	1,044.1	\$2,748	\$345,950
<b>TOTALS</b>	<b>4,232,777</b>	<b>\$487,764</b>	<b>113,267</b>	<b>\$151,056</b>	<b>4,582</b>	<b>\$11,225</b>	<b>1,044.1</b>	<b>\$2,748</b>	<b>\$652,793</b>
KWD	388,331	\$50,233	6,266	\$8,624	4,352	\$10,752	780.3	\$1,628	\$71,237
KHA	1,337,647	\$156,023	283,795	\$106,177					\$262,200
Dietz Stadium	83,248	\$15,313	3,004	\$4,251					\$19,564
<b>TOTALS</b>	<b>6,042,003</b>	<b>\$709,333</b>	<b>406,332</b>	<b>\$270,108</b>	<b>8,934</b>	<b>\$21,978</b>	<b>1,824.4</b>	<b>\$,4376</b>	<b>\$1,005,794</b>

\*Does not include vehicle costs

Energy usage and cost for each city department, the KWD, KHA, and Dietz Stadium including a more in-depth look at wastewater treatment, water delivery facilities and the solid waste transfer station are discussed in more detail in other sections of this report.

## B. BUILDINGS & FACILITIES ELECTRICITY USAGE

Purchased electricity is used for indoor and outdoor lighting<sup>39</sup> as well as other typical government building operations such as computers, printers, copiers, etc. In addition to the typical building uses of electricity, significant amounts of electricity are also consumed by the City to pump and treat wastewater. This section summarizes electricity used by buildings and facilities. Electricity usage associated with public outdoor lighting, primarily street lighting and traffic signals is discussed in Section VI.D. and Appendix M.

Electricity for the City of Kingston is acquired through the Central Hudson Gas and Electric Corporation and the Hess Corporation. In some cases, for City government facilities, Hess Corporation supplies the electricity and Central Hudson delivers it. For fuel sources of electricity from these companies see Appendix F.

Buildings and facilities excluding KHA, KWD and Dietz Stadium used 4,232,777 kWh at a cost of \$487,764 at an average of 11.5 cents/kWh. The overall amount of electricity used by government buildings and facilities, including the KHA, KWD and Dietz were 6,042,003 kWh at a cost of \$709,333, an average of 12 cents/kWh. Electricity usage and costs are summarized in Table 12.

**Table 12: City of Kingston 2010 Electricity Usage and Cost Summary**

City of Kingston Department	Electricity Usage (kWh)	% of Electric Usage	% of Electric Usage *	Total Electricity Costs (\$)	Cost per kWh (\$/kWh)	% of Electric Costs	% of Electric Cost *
Wastewater	2,525,109	60	42	\$268,206	0.11	55	38
DPW	337,231	8	6	\$46,472	0.14	10	7
KPD	481,360	11	8	\$46,702	0.10	10	7
Parks & Recreation	374,943	9	6	\$62,269	0.17	13	9
KFD	198,546	5	3	\$27,316	0.14	6	4
City Hall	315,360	7	5	\$36,405	0.12	7	5
Lighthouse	228	<1	<1	\$394	1.73	<1	<10
<b>TOTAL</b>	<b>4,232,777</b>			<b>\$487,764</b>	<b>0.115</b>		
KHA	1,337,647		22	\$156,023	0.12		22
KWD	388,331		6	\$50,233	0.13		7
Dietz Stadium	83,248		1	\$15,313	0.18		2
<b>TOTALS</b>	<b>6,042,003</b>			<b>\$709,333</b>	<b>0.12</b>		

\*Without KHA, KWD, Dietz

Average New York commercial electric rate is \$0.162/kWh.

<sup>39</sup> Outdoor lighting energy usage, costs and GHG emissions are discussed separately in Section VI.D. and in Appendix L.

Of all government operated facilities the wastewater treatment plant was the largest consumer of electricity in 2010. The buildings that were the top five largest consumers of electricity in the City of Kingston in 2010 are identified in Table 13.

**Table 13: Five Largest Consumers of Electricity - City of Kingston Government Buildings 2010\***

<b>Buildings</b>	<b>Area (sq ft)</b>	<b>2010 Electric Usage (kWh)</b>	<b>2010 Cost (\$)</b>
WWTP 91 E Strand St Bldg 17	**	2,233,440	\$223,018
Police and Court 1 Garraghan Drive	25,907	481,360	\$46,702
City Hall 420 Broadway	22,500	315,360	\$36,405
Water Treatment 1442 Sawkill	**	154,560	\$18,191
DPW Garage 478 Hasbrouck Ave	**	110,400	\$13,452

\* Does not include KHA facilities.

\*\* Data unavailable

### **C. BUILDINGS & FACILITIES NATURAL GAS USAGE**

Most of the government owned buildings use natural gas for heat and hot water. Natural gas for the City of Kingston is acquired through the Central Hudson Gas and Electric Corporation and the Hess Corporation. In some cases, for City government facilities, Hess Corporation supplies the natural gas and Central Hudson delivers it.

All of the natural gas consumed by City operations is for buildings and facilities.

Including KHA, KWD and Dietz Stadium these buildings and facilities used 406,332 CCF of natural gas in 2010 or 416,084 therms. Natural gas usage costs were \$270,108, approximately 12% of the City energy bill.

As seen in Table 14 the KHA facilities accounted for the majority of this natural gas usage and cost, 70% (283,795 CCF at a cost of \$106,177). All other City government facilities (not including KWD and Dietz Stadium) used 113,267 CCF on natural gas.

Considering that the use of natural gas at KHA facilities was primarily for 'residential' heating it is important to look at natural gas usage excluding KHA facilities. Additionally, the KWD used 6,266 CCF of natural gas at a cost of \$8,624 and Dietz used 3,004 CCF at a cost of \$4,251.

Excluding KHA, KWD and Dietz, City government facilities used 113,267 CCF at a cost of \$151,057.

To get a more accurate picture of natural gas usage by City facilities natural gas usage is presented by City department in Table 14.

Parks and Recreation, as a department, was the most significant user of natural gas in 2010, with all of the wastewater facilities second. The primary consumer of natural gas at the wastewater facility is the sludge pelletizer.

**Table 14: City of Kingston Government 2010 Natural Gas Usage and Cost Summary**

City of Kingston Department	Total Natural Gas Usage (CCF)	Natural Gas Usage (Therms)	% of Total Gas Usage* (CCF)	% of Total Gas Usage **(CCF)	Natural Gas Cost (\$)	% of Total Gas Cost*	% of Total Gas Cost **
Wastewater	23,386	23,947	6	21	\$32,730	12	22
DPW	18,758	19,208	5	17	\$26,634	10	18
KPD	8,926	9,140	2	8	\$10,970	4	7
Parks & Recreation	33,525	34,330	8	30	\$42,724	16	28
KFD	14,663	15,015	4	13	\$19,541	7	13
City Hall	<u>14,009</u>	<u>14,345</u>	<u>3</u>	<u>12</u>	<u>\$18,458</u>	7	12
<b>TOTALS</b>	<b>113,267</b>	<b>115,985</b>			<b>\$151,057</b>		
KHA	283,795	290,606	70		\$106,177	39	
KWD	6,266	6,416	2		\$8,624	3	
Dietz Stadium	<u>3,004</u>	<u>3,076</u>	<u>1</u>		<u>\$4,251</u>	2	
<b>TOTALS</b>	<b>406,332</b>	<b>416,084</b>			<b>\$270,109</b>		

\*Including KHA, KWD and Dietz

\*\*Excluding KHA, KWD and Dietz

Table 15, below, identifies the top five individual facilities that were the largest consumers of natural gas in the City of Kingston. The Andy Murphy Neighborhood Center, a Parks and Recreation Department operated facility was the largest consumer of natural gas in 2010. City Hall was second and Building 13 at the wastewater treatment facility plant, third.

**Table 15: Five Largest Consumers of Natural Gas - City of Kingston Government Buildings 2010**

Buildings	Area (sq ft)	2010 Natural Gas Usage (CCF)	2010 Natural Gas Usage (Therms)	2010 Cost (\$)
Andy Murphy Neighborhood Center	30,831	18,708	19,157	\$23,320
City Hall	22,500	14,009	14,345	\$18,458
WWTP 85 E Strand St Bldg 13	**	11,436	11,710	\$15,116
Police and Court	25,907	8,926	9,140	\$10,970
Rondout Neighborhood Center	**	8,826	9,038	\$11,002

\* Does not include KHA facilities.

\*\* Data unavailable

## D. BUILDINGS & FACILITIES FUEL OIL AND PROPANE

In 2010 fuel oil was used primarily to heat three municipal buildings and water department facilities. Propane was used for heating at one Parks and Recreation facility. The use of fuel oil and propane in 2010 was not as significant as electricity and natural gas usage.

Table 16 shows the fuel oil and propane used by City departments. The wastewater treatment plant, water department and fire department used fuel oil in 2010. In 2010 the City, including the KWD, used 8,934 gallons of fuel oil at a cost of \$21,978 and 1,824.4 gallons of propane at a cost of \$4,376. In 2010 fuel oil and propane were purchased from a few different suppliers primarily Main Care Energy, Bottini Fuel and the Kingston Oil Supply Co.

Fuel oil usage in 2011 is expected to drop as one the KFD facilities converted its heating from fuel oil to natural gas in 2011. Parks and Recreation, KWD and KFD used a small amount of propane.

**Table 16: City of Kingston Government 2010 Fuel Oil and Propane Usage and Cost Summary**

City of Kingston Sector Energy Source	Fuel Oil (Gal)	Cost of Fuel Oil (\$)	Propane (Gal)	Cost of Propane (\$)	Fuel Oil/Propane Costs
Wastewater	876.1	\$2,206			\$2,206
Parks & Recreation			1,023.8	\$2,672	\$2,672
KFD	3705.9	\$9,019	20.3	\$76	\$9,095
<b>TOTALS</b>	<b>4582</b>	<b>\$11,226</b>	<b>1,044.1</b>	<b>\$2,748</b>	<b>\$13,974</b>
KWD	4352	\$10,752	780.3	\$1,628	\$12,380
<b>TOTALS</b>	<b>8,934</b>	<b>\$21,978</b>	<b>1,824.4</b>	<b>\$4,376</b>	<b>\$26,354</b>

## E. BUILDINGS & FACILITIES GHG EMISSIONS

As with energy there are several different ways to present the GHG emissions data. To provide consistency, the buildings and facilities GHG emissions data is presented below similarly to the energy data.

Tables 17 and 18 below summarize the GHG emissions data. As depicted in Table 17, all buildings and facilities, including the KHA, KWD, Dietz Stadium as well as process GHG emissions from the wastewater treatment plant emitted an estimated 4,467 tonnes of CO<sub>2</sub>e.

With KHA included, natural gas usage was the biggest contributor to GHG emission from buildings and facilities, 2,205 tonnes of CO<sub>2</sub>e. Natural gas usage at KHA facilities emitted an estimated 1,941 tonnes of CO<sub>2</sub>e or 88% of the total of all GHG emissions from natural gas usage. Overall electricity from buildings and facilities was the largest contributor of GHGs when KHA is not included in the totals as is depicted in Table 17.

**Table 17: City of Kingston Government Building & Facility 2010 GHG Emissions Summary\***

Building and Facility* Energy Source	2010 Usage	CO <sub>2</sub> (tonnes)	N <sub>2</sub> O (kg)	CH <sub>4</sub> (kg)	CO <sub>2</sub> e (tonnes)	Energy (MMBtu)	2010 Energy Cost (\$)
Electricity (kWh)	6,042,003	1,873	27	48	1,881	20,621	\$709,333
Natural Gas (CCF)	406,332	2,202	4	208	2,205	41,609	\$270,108
Fuel Oil (Gal)	8,934	91	0	14	92	1,233	\$21,978
Propane (Gal)	1,824.4	10	0	2	10	166	\$4,376
Process Emissions**		0	0	1,738	37	0	
Process Emissions**		0	789	0	244	0	
<b>TOTAL</b>		<b>4,176</b>	<b>820</b>	<b>2,010</b>	<b>4,469<sup>40</sup></b>	<b>63,629</b>	<b>\$1,005,795</b>

\* Includes KHA, KWD and Dietz, does not include public lighting.

\*\* WWTP Methane and Nitrous Oxide Emissions

Table 18 presents GHG emissions for buildings and facilities operated by KFD, KPD, Parks and Recreation, City Hall and DPW, including the wastewater treatment plant. Excluding KWD, KHA, and Dietz Stadium the GHG emissions from city operated facilities including process emissions from the wastewater treatment plant are an estimated 2,264 tonnes of CO<sub>2</sub>e. Without wastewater process emissions, the GHG emission from buildings and facilities used of fossil fuels is 1,983 tonnes of CO<sub>2</sub>e.

As is expected electricity usage from city operation buildings and facilities is the primary contributor to GHG emissions, resulting in an estimated 1,316 tonnes of CO<sub>2</sub>e.

**Table 18: City of Kingston Government Building & Facility 2010 GHG Emissions Summary**

Building and Facility* Energy Source	2010 Usage	CO <sub>2</sub> (tonnes)	N <sub>2</sub> O (kg)	CH <sub>4</sub> (kg)	CO <sub>2</sub> e (tonnes)	Energy (MMBtu )	2010 Energy Cost
Electricity (kWh)	4,226,108	1,311	19	36	1,316	14,444	\$487,764
Natural Usage (CCF)	113,267	613	3	61	615	11,597	\$151,057
Fuel Oil (Gal)	4582	47	0	8	47	632	\$11,226
Propane (Gal)	1,044.1	6	0	1	5	95	\$2,748
<b>TOTALS</b>		<b>1,977</b>	<b>22</b>	<b>106</b>	<b>1,983</b>	<b>26,768</b>	<b>\$652,795</b>
Process Emissions		0	0	1738	37	0	0
Process Emissions		0	789	0	244	0	0
<b>TOTALS</b>		<b>1,977</b>	<b>811</b>	<b>1,844</b>	<b>2,264</b>	<b>26,768</b>	<b>\$652,795</b>

\*Excludes KWD, KHA, Dietz

Table 19 displays GHG emissions for wastewater treatment, the solid waste transfer station as well as water delivery facilities (KWD). The wastewater facilities contribute 1,202 tonnes of CO<sub>2</sub>e, water delivery facilities 204 tonnes and the solid waste transfer station 8 tonnes. Total CO<sub>2</sub>e emissions from all facilities are estimated at 4,473 tonnes. See Section VI.B and Appendix J for more information about the GHG emissions from the wastewater treatment plant. For more information about the Kingston Water Department see Section IV.C.

<sup>40</sup> 4,471 tonnes, rounding differences.

The GHG emissions from the all city buildings and facilities (including wastewater, water and solid waste facilities) , 4,473 tonnes of CO<sub>2</sub>e is equal to the CO<sub>2</sub> emissions from the consumption of 9,437 barrels of oil, 454,914 gallons of gasoline, the *electricity* use of 506 homes for one year or the carbon sequestered by 865 acres of pine or fir forests.<sup>41</sup>

**Table 19: City of Kingston Government Buildings and Facilities 2010 GHG Emissions**

Buildings and Facilities	CO <sub>2</sub> tonnes	N <sub>2</sub> O (kg)	CH <sub>4</sub> (kg)	CO <sub>2</sub> e (tonnes)	Energy (MMBtu)	Cost (\$)
Wastewater Facilities	918	799	1771	1,202	11,134	\$303,142
Solid Waste Transfer Station	8	0	0	8	85	\$3,702
Other City Buildings & Facilities	1,049	3	64	1,054	15,555	\$345,950
<b>TOTALS</b>	<b>1,975</b>	<b>802</b>	<b>1,835</b>	<b>2,264</b>	<b>26,774</b>	<b>\$652,795</b>
KHA	1,956	8	151	1,959	33,629	\$262,200
KWD	203	1	14	204	2639	\$71,237
Dietz Stadium	42	0	3	42	592	\$19,564
<b>TOTALS</b>	<b>4,178</b>	<b>811</b>	<b>2,012</b>	<b>4,469</b>	<b>63,628</b>	<b>\$1,005,794</b>

Table 20 identifies the top five facilities that contribute to GHG emissions based on tonnes of CO<sub>2</sub>e produced.

The WWTP facilities at 91 Strand are the top contributor to GHG emission, and this does not include the emissions from 85 Strand and Wilbur Ave. Three KHA facilities appear in the top five producers of GHG emissions.

**Table 20: Top Five Contributors to Greenhouse Gas Emissions from Buildings and Facilities\***

Buildings and Facilities	CO <sub>2</sub> tonnes	N <sub>2</sub> O (kg)	CH <sub>4</sub> (kg)	CO <sub>2</sub> e (tonnes)	Energy (MMBtu)
WWTP 91 E Strand St	747	799	1762	1,033	8,613
KHA Rondout Gardens	930	4	67	932	15,534
KHA Flatbush Ave Facilities	739	3	62	740	13,187
Police and Court	197	2	9	198	2,557
KHA Wiltwyck	190	1	14	190	3,137

\*(KHA, KWD and Dietz included in the ranking)

Excluding KHA facilities as well as KWD and Dietz Stadium in the ranking, the top five GHG producers are depicted in Table 21. Following the wastewater facilities at 91 Strand and the Police and court building, City

<sup>41</sup> EPA GHG Equivalency Calculator <http://www.epa.gov/cleanenergy/energy-resources/calculator.html>

Hall, the Andy Murphy Neighborhood Center and the DPW Garage at 478 Hasbrouck round out the top five GHG producing facilities.

**Table 21: Top Five Contributors to Greenhouse Gas Emissions from Buildings and Facilities\***

Buildings and Facilities	CO <sub>2</sub> (tonnes)	N <sub>2</sub> O (kg)	CH <sub>4</sub> (kg)	CO <sub>2</sub> e (tonnes)	Energy (MMBtu)
WWTP 91 E Strand St	747	799	1,762	1,033	8,613
Police and Court	197	2	9	198	2,557
City Hall	174	1	9	174	2,511
Andy Murphy Neighborhood Center	123	0	11	124	2,161
DPW Garage 478 Hasbrouck Ave	79	0	5	79	1,222

\*KHA, KWD and Dietz not included in the ranking

## V. CITY OF KINGSTON GOVERNMENT 2010 VEHICLE FLEET

From maintenance trucks used for parks and recreation to police cruisers and fire trucks, the vehicles and mobile equipment used in the City of Kingston's daily operations burn gasoline and diesel fuels which results in emissions of greenhouse gas. Also, vehicle air conditioning or refrigeration equipment use refrigerants that can leak. Information on vehicle refrigerant use was unavailable at the time of this inventory and therefore is not included; however a refrigerant analysis should be completed as part of a future inventory. The City of Kingston's vehicle fleet performs a number of essential services, including police and fire, refuse and recycling collection and public transportation.

### A. VEHICLE FUEL USE AND COST

In 2010, the City of Kingston operated a vehicle fleet with 165 vehicles, excluding KHA and KWD. These 165 vehicles used 84,402.6 gallons of gas at a cost of \$202,970 and 83,512.6 gallons of diesel fuel at a cost of \$210,026 for a total fuel cost of \$412,996 and traveled an estimated 1,874,932 miles. Vehicle fuel costs accounted for more than a quarter of the City energy costs in 2010 with gas costs and diesel fuel costs each being approximately 13% of the City's energy bill.

A total of 167,915.2 gallons of fuel was used in 2010 to travel an estimated 1,874,932 miles resulting in an average fuel efficiency of the city's fleet of just over 11 miles per gallon (mpg).

DPW operates the largest percentage of vehicles, 42%, and therefore uses the largest percentage of diesel fuel, 49%, with Citibus accounting for 42% of diesel fuel usage and cost.<sup>42</sup> The Police Department uses the majority of gasoline, 62% of that used by the City in 2010.

The majority of vehicle miles traveled are by Citibus (39%) and the Kingston Police Department (34%).

Approximately half, 79 of 165, of the vehicles in the City's fleet are heavy duty trucks. Vehicles are sorted by vehicle type to quantify respective GHG emissions.

<sup>42</sup> Percentages exclude vehicle usage and cost by KHA and KWD.

Including the Kingston Housing Authority and Water Department vehicles there are a total of 184 vehicles as depicted in Table 22. In 2010 the 184 City vehicles along with off-road equipment<sup>43</sup> used 96,964.1 gallons of gasoline at a cost of \$233,202 and 84,210 gallons of diesel fuel at a cost of \$211,731 for a total vehicle fuel cost of \$444,983. It is estimated that the 184 vehicles in the City's fleet traveled approximately 1,999,466 miles in 2010.

**Table 22: City of Kingston Government 2010 Vehicle Summary<sup>44</sup>**

2010 Vehicle Summary	DPW <sup>45</sup>	KPD	KFD	Parks & Rec <sup>46</sup>	City Hall	Citibus	TOTALS	KHA	KWD	TOTALS
Heavy Duty	50	2	10	8	0	9	<b>79</b>	0	10	<b>88</b>
Light Truck	20	5	5	6	4	0	<b>40</b>	5	3	<b>48</b>
Passenger	<u>0</u>	<u>37</u>	<u>4</u>	<u>1</u>	<u>4</u>	<u>0</u>	<b>46</b>	<u>0</u>	<u>1</u>	<b>47</b>
<b>TOTALS</b>	<b>70</b>	<b>44</b>	<b>19</b>	<b>15</b>	<b>8</b>	<b>9</b>	<b>165</b>	<b>5</b>	<b>14</b>	<b>184</b>
% of Vehicles	42	27	12	9	5	5				
Gas (Gal)	18,124.5	52,232.3	3,785.9	7,603.6	2,656.3		<b>84,402.6</b>	2,563.6	9,997.9	<b>96,964.1</b>
% of Gas	21	62	4	9	3					
Gas Cost	\$43,677	\$125,750	\$9,109	\$18,035	\$6,399		<b>\$202,970</b>	\$6,189	\$24,043	<b>\$233,202</b>
% of Gas (\$)	22	62	4	9	3					
Diesel (Gal)	40,735	21.5	7,989.5	103.2		34,663.4	<b>83,512.6</b>		697.5	<b>84,210.1</b>
% of Diesel	49	<1	10	<1		42			1	
Diesel Cost	\$101,794	\$51	\$20,727	\$259		\$87,195	<b>\$210,026</b>		\$1,755	<b>\$211,781</b>
% of Diesel (\$)	48	<1	10	<1		42			1	
Vehicle Miles	321,831	638,100	80,858	65,542	41,363	727,238	<b>1,874,932</b>	23,800	100,734	<b>1,999,466</b>
% of VMT	17	34	4	3	2	39				

Table 23 depicts the percentage of total fuel costs for each City department. The DPW fuel costs are 35% of the total fuel costs while only accounting for 17% of the total miles. As with other City vehicles, the hours used by the DPW vehicles and not the miles traveled will dictate maintenance schedules. These vehicles run for a considerable number of hours but do not necessarily travel a significant number of miles.

The KPD accounted for 30% of the total fuel costs and 34% of the total miles. Citibus, while accounting for 21% of total fuel costs, accounted for 39% of the total miles.

<sup>43</sup> Based on the same gas key being used for vehicles and equipment it was not possible to specifically separate fuel used for vehicles versus off-road equipment.

<sup>44</sup> Fuel Usage includes off-road equipment.

<sup>45</sup> Fuel usage for DPW includes gas and diesel off-road equipment (approx 32 pieces)- 13,886 hours

<sup>46</sup> Fuel usage for Parks & Rec includes 15 pieces gas and diesel off-road equipment

**Table 23: City of Kingston Vehicle Fuel Usage and Cost by Department**

City of Kingston Department	Gas (Gallons)	Gas Cost (\$)	Diesel (Gallons)	Diesel Cost (\$)	Total Costs (\$)	Vehicles Miles Traveled	% of Cost	% of Miles
DPW	18,124.5	\$43,677	40,735	\$101,794	\$145,471	321,831	35	17
KPD	52,232.3	\$125,750	22	\$51	\$125,801	638,100	30	34
Parks & Rec	7,603.6	\$18,035	103	\$259	\$18,294	65,542	4	3
KFD	3,785.9	\$9,109	7,990	\$20,727	\$29,836	80,858	7	4
City Hall	2,656.3	\$6,399			\$6,399	41,363	2	2
Citibus			34,663	\$87,195	\$87,195	727,238	21	39
<b>TOTAL</b>	<b>84,402.6</b>	<b>\$202,970</b>	<b>83,512.6</b>	<b>\$210,026</b>	<b>\$412,996</b>	<b>1,874,932</b>		
KHA	2,563.6	\$6,189			\$6,189	23,800		
KWD	9,997.9	\$24,043	698	\$1,755	\$25,798	100,734		
<b>TOTALS</b>	<b>96,964.1</b>	<b>\$233,202</b>	<b>84,210</b>	<b>\$211,781</b>	<b>\$444,983</b>	<b>1,999,466</b>		

**B. VEHICLE GHG EMISSIONS**

In 2010, the fuel used by the City government's 165 vehicles resulted in the release of an estimated 1,629 tonnes of CO<sub>2</sub>e.

Including KHA and KWD, the 184 vehicles resulted in the release of an estimated 1,750 tonnes of CO<sub>2</sub>e.

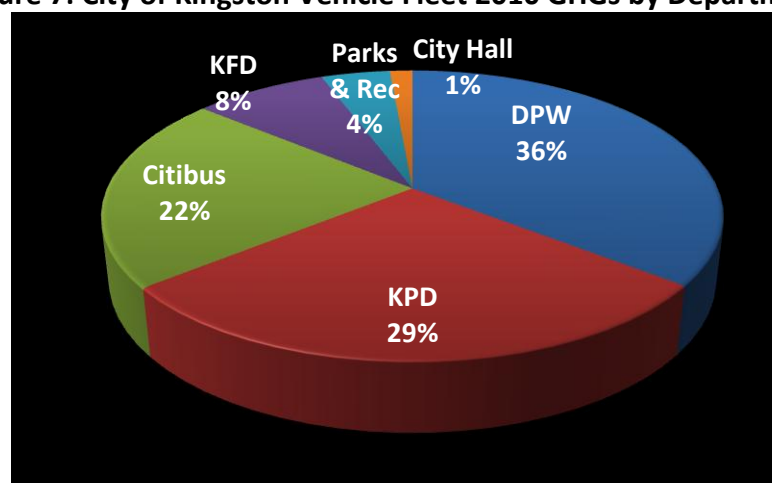
More than a third of the emissions were from DPW vehicles with the Kingston Police Department and Citibus responsible for 29% and 22% respectively as depicted in Table 24 and Figure 7.<sup>47</sup>

**Table 24: City of Kingston Vehicle GHG Emissions Summary**

Vehicle GHG Emissions Summary	CO <sub>2</sub> (tonnes)	N <sub>2</sub> O (kg)	CH <sub>4</sub> (kg)	CO <sub>2</sub> e (tonnes)	Energy (MMBtu)	Cost (\$)	% of Total CO <sub>2</sub> e
DPW	575	12	12	579	13,701	\$145,471	36
KPD	459	23	23	467	11,702	\$125,801	29
Citibus	354	3	4	355	20,962	\$87,195	22
KFD	134	2	1	135	3,047	\$29,836	8
Parks & Rec	68	5	6	70	2,273	\$18,294	4
City Hall	23	1	0	23	536	\$6,400	1
<b>TOTAL</b>	<b>1,613</b>	<b>46</b>	<b>46</b>	<b>1,629</b>	<b>52,221</b>	<b>\$412,997</b>	
KHA	23	0	0	23	541	\$6,189	
KWD	95	8	9	98	3,365	\$25,798	
<b>TOTALS</b>	<b>1,731</b>	<b>54</b>	<b>55</b>	<b>1,750</b>	<b>56,127</b>	<b>\$444,984</b>	

<sup>47</sup> Percentages exclude vehicle usage and cost by KHA and KWD.

**Figure 7: City of Kingston Vehicle Fleet 2010 GHGs by Department**



The GHG emissions created by the use of gasoline and diesel fuel by the 165 city operated vehicles is depicted in Table 25. Gasoline usage resulted in an estimated 777 tonnes of CO<sub>2</sub>e, 48% of vehicle related GHGs and 17% of city operations total GHG emissions. The usage of diesel fuel released an estimated 854 tonnes of CO<sub>2</sub>e, 52% of vehicle related GHG emissions and 19% of city operations overall GHG emissions.

**Table 25: Greenhouse Gas Emissions from Local Government Vehicle Fleet by Source<sup>48</sup>**

Source	Consumption (gal)	Metric Tons CO <sub>2</sub> e	% of Vehicle CO <sub>2</sub> e	% of City Total CO <sub>2</sub> e	Cost (\$)	% of Vehicle Fuel Cost	% of Total City Cost
Gasoline	84,402.6	777	48	17	\$202,970	49	13
Diesel	83,512.6	854	52	19	\$210,026	51	13
<b>TOTALS</b>	<b>167,915.2</b>	<b>1,631</b>		<b>36</b>	<b>\$412,996</b>		

With KHA and KWD vehicle fuel usage included, the 184 vehicles' use of gasoline produced 889 tonnes of CO<sub>2</sub>e and the use of diesel fuel produced an estimated 861 tonnes of CO<sub>2</sub>e, basically a 50/50 split.

Gasoline consumption accounts for approximately 13% of all City government operations GHG emissions and diesel 12%, resulting in vehicle fuel use accounting for approximately a quarter of all City government operations GHG emissions.

**Table 26: Greenhouse Gas Emissions from Vehicles by Source<sup>49</sup>**

Source	Consumption (gal)	Metric Tons CO <sub>2</sub> e	% of Vehicle CO <sub>2</sub> e	% of City Total CO <sub>2</sub> e	Cost (\$)	% of Vehicle Fuel Cost	% of Total City Cost
Gasoline	96,964.1	889	51	13	\$233,202	52	12
Diesel	84,210.1	861	49	12	\$211,731	48	11
<b>TOTALS</b>	<b>181,174.2</b>	<b>1,750</b>		<b>25</b>	<b>\$444,983</b>		<b>23</b>

<sup>48</sup> The figures in this table do not include gasoline used in employee commuting.

<sup>49</sup> The figures in this table do not include gasoline used in employee commuting.

## VI. GOVERNMENT SECTOR 2010 SUMMARIES

### A. TRANSIT FLEET - CITIBUS

The City of Kingston Citibus offers daily transit services in the City of Kingston, along with customized services to those who are seniors or have a disability. A seasonal trolley service is also offered from Memorial Day to Labor Day.

Citibus offers three bus routes, A, B and C operating Monday-Friday from 6:30am-7:30pm and on Saturdays from 9:30am-5:00pm.

In 2010, Citibus operated nine buses using 34,663.4 gallons of diesel fuel at a cost of \$87,195. The nine buses traveled 727,238 miles in 2010, averaging 20.98 miles per gallon.

#### CITIBUS GHG EMISSIONS

In 2010, Citibus operations resulted in the release of 355 tonnes of CO<sub>2</sub>e as depicted in Table 27. Most of the GHG emissions from the buses are attributed to the use of diesel fuel, 354 tonnes of CO<sub>2</sub>e, or more than 99% of the GHG emissions.

**Table 27: Citibus 2010 GHG Emissions**

Citibus GHG Emissions	CO <sub>2</sub> tonnes	N <sub>2</sub> O (kg)	CH <sub>4</sub> (kg)	CO <sub>2</sub> e (tonnes)	Energy (MMBtu)	Cost (\$)
Diesel Fuel Usage	354	0	0	354	4786	\$87,195
Vehicle Miles Traveled	0	3	4	1	16176	0
<b>TOTALS</b>	354	3	4	355	20,962	\$87,195

### B. WASTEWATER TREATMENT PLANT

In 2010 the City of Kingston WWTP served the city population of approximately 24,000 people as well as local commercial and industrial facilities.

#### WASTEWATER TREATMENT PLANT ENERGY SUMMARY

The total energy costs associated with the operation of the wastewater treatment plant (WWTP) and sewers in 2010 were \$335,992. The WWTP uses a significant amount of energy, primarily electricity. The WWTP total energy costs account for more than 21% of the City government's total energy costs (\$335,992 of \$1,590,415), second only to the operation of street lights and traffic signals. The plant's electricity usage accounts for almost 40%<sup>50</sup> of the government operations electricity, the largest percentage of government operations total electricity usage.

<sup>50</sup> (2,525,109 kWh of 6,461,721 kWh) Percentage based on City operations electricity usage, does not include KHA, KWH and Dietz Stadium.

## WASTEWATER TREATMENT PLANT GHG EMISSIONS

A separate GHG analysis of the plant is important as wastewater is rich in organic matter with a high concentration of nitrogen and carbon (along with other organic elements). As wastewater is collected, treated, and discharged, chemical processes in aerobic and anaerobic conditions lead to the creation and emission of two greenhouse gases: methane and nitrous oxide. The City of Kingston as an operator of a wastewater treatment facility, must therefore account for the emission of these gases. Therefore in addition to the GHG emissions produced from the use of electricity, natural gas and other fuels, this analysis also includes the GHG emissions associated with methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O) emissions that are produced during the processing and treatment of wastewater and sludge.

The operations of the wastewater treatment system as a whole contributed an estimated 1,329 tonnes of CO<sub>2</sub>e in 2010. Most of the emissions are from buildings and facilities. The use of electricity, natural gas and fuel oil resulted in the release of 921 tonnes of CO<sub>2</sub>e with electricity usage accounting for the largest contributor to GHG emissions as depicted in Table 28.

The plant's process emissions, methane and nitrous oxide, produce an estimated 281 tonnes of CO<sub>2</sub>e, 37 and 244 tonnes respectively. Vehicle use at the plant resulted in 127 tonnes of CO<sub>2</sub>e.

**Table 28: Wastewater Treatment Plant 2010 GHG Emissions Summary**

WWTP	CO <sub>2</sub> (tonnes)	N <sub>2</sub> O (kg)	CH <sub>4</sub> (kg)	CO <sub>2</sub> e (tonnes)	Energy (MMBtu)	Cost (\$)
WWTP Buildings and Facilities	915	10	32	921	11,135	\$303,141
Methane (CH <sub>4</sub> ) emissions from anaerobic digester	0	0	1,738	37	0	0
Process & Effluent-Nitrous Oxide(N <sub>2</sub> O) Emissions	0	789	0	244	0	0
Vehicles	<u>125</u>	<u>5</u>	<u>5</u>	<u>127</u>	<u>3,320</u>	<u>\$32,849</u>
<b>TOTALS</b>	<b>1,040</b>	<b>804</b>	<b>1,775</b>	<b>1,329</b>	<b>14,455</b>	<b>\$335,992</b>

Wastewater treatment facility operations account for 29% of the City operations GHG emissions of 4,587 tonnes of CO<sub>2</sub>e. Wastewater treatment plant emissions are 18% of the overall total emissions of 7,281<sup>51</sup> tonnes of CO<sub>2</sub>e that includes KHA, KWD, Dietz Stadium and employee commuting emissions.

For more detailed information on energy use, cost and greenhouse gas emissions from the wastewater treatment plant can be found in Appendix J.

### C. KINGSTON WATER DEPARTMENT

The Kingston Water Department operates two reservoirs, a pretreatment facility, a treatment plant and laboratory, a handful of pump stations, an administrative office and a maintenance garage.

The Kingston Water Department is governed by a Board of Water Commissioners. Each member is appointed to a five (5) year term by the Mayor. The Mayor is a voting member of the Board. While the Water Department is a financially and administratively independent department within the City of Kingston,

<sup>51</sup> GHG emissions total includes all City operations, KHA, KWD, Dietz and employee commuting.

it was determined that this department does fall under the ‘operational control’ of the City and is therefore included in this inventory. In addition, significant portions of the watershed are owned and managed by the City of Kingston and, in this way the City is able to exert direct control over the quality of this resource.

It is important to note, however, that not all of the Water Department facilities are located within the geographical boundaries of the City of Kingston. The Reservoirs and the treatment plant are located outside of the geo-political boundaries of the City of Kingston.

### KWD ENERGY USAGE AND COST

In 2010 the total energy related costs for the Kingston Water Department were \$97,034. More than half, 52% of these costs were attributed to electricity usage which was the primary energy related expenditure in 2010, with fuel costs, diesel and gas costs making up approximately 27% of the Water Department energy expenses.

### KWD GHG EMISSIONS

The total GHG emissions from the Kingston Water Department in 2010 were an estimated 300 metric tonnes of CO<sub>2</sub>e. Table 29 summarizes the GHG emissions for the City of Kingston Water Department. KWD buildings and facilities accounted for an estimated 202 tonnes of CO<sub>2</sub>e, two-thirds of total emissions, with KWD vehicle use accounted for an estimated 98 tonnes of CO<sub>2</sub>e, the remaining third.

**Table 29: Water Department 2010 GHG Emissions Summary**

Water Department GHG Emissions Summary	CO <sub>2</sub> (tonnes)	N <sub>2</sub> O (kg)	CH <sub>4</sub> (kg)	CO <sub>2</sub> e (tonnes)	Energy (MMBtu)	Cost (\$)	% of Total CO <sub>2</sub> e
Buildings and Facilities	201	1	12	202	2,640	\$71,237	67
Vehicles	95	8	9	98	3,365	\$25,798	33
<b>TOTALS</b>	<b>296</b>	<b>9</b>	<b>21</b>	<b>300</b>	<b>6,005</b>	<b>\$97,035</b>	

## **D. PUBLIC LIGHTING**

The City of Kingston provides outdoor lighting of many types, including street lights (streets, roadways, parking lots, and pedestrian areas), traffic signals, sidewalk lighting, holiday lighting, and park lighting. The majority of costs and greenhouse gas emissions associated with the operation of this infrastructure are due to electricity consumption. Data relating to electricity consumption for public lighting was obtained from Central Hudson.

In 2010, the City spent \$524,620 on public outdoor lighting. The electricity costs associated with public lighting accounted for the largest single portion of the City’s total energy bill, approximately 33%. Public lighting electricity consumption in 2010 accounted for 35%<sup>52</sup> of the total electricity usage and 52%<sup>53</sup> of the City’s electric bill.<sup>54</sup> The majority of the usage and cost for public lighting was for street lighting.

<sup>52</sup> (2,228,944 kWh of 6,461,721 kWh)

<sup>53</sup> (\$524,620 of \$1,012,384)

<sup>54</sup> Percentage based on city operations alone, does not include KHA, KWD and Dietz Stadium.

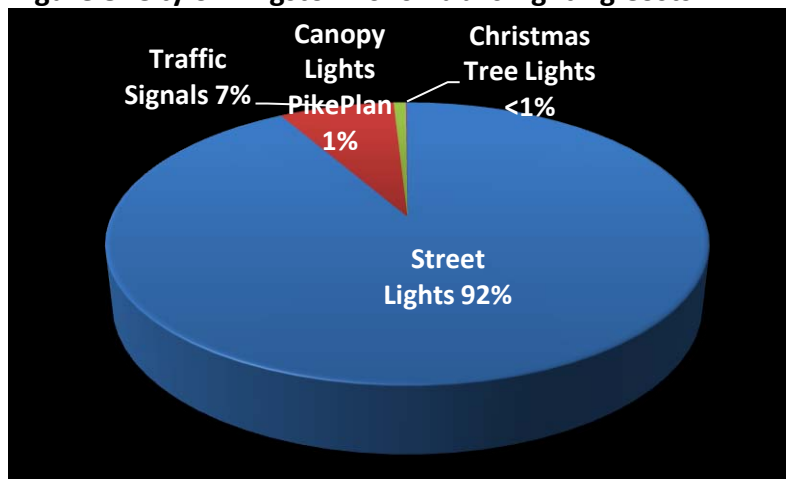
As is depicted in Table 30 and Figure 8 street lighting accounts for the majority of usage and costs associated with public lighting. In 2010, streets lights used 1,937,278 kWh (1,884,320+52,958) at a cost of \$481,008 (\$471,715+\$9,292), 92%. Traffic signals used 262,791kWh at a cost of \$38,941, 7%. Canopy lights and Christmas tree lights account for the remainder of usage and costs associated with public lighting.

Park lighting is depicted in Table 30 for illustrative purposes only. Park lighting has already been factored into the usage and cost of the Parks and Recreation Department and therefore is not considered here as part of the total public lighting usage and costs.

**Table 30: Public Lighting 2010 Energy Usage and Costs Summary**

City of Kingston Public Lighting Energy Usage and Cost	2010 Total Usage	2010 Total Energy Cost	% of Total Cost
Street lights-Primary	1,884,320	\$471,715	90
Street lights-Other	52,958	\$9,292	2
Traffic Signals	262,791	\$38,941	7
Canopy Lighting-Pike Plan	26,722	\$4,111	1
Christmas Tree Lights	<u>2,153</u>	<u>\$560</u>	<1
<b>TOTAL</b>	2,228,944	\$524,620	
Park Lighting	37,324	\$10,189	

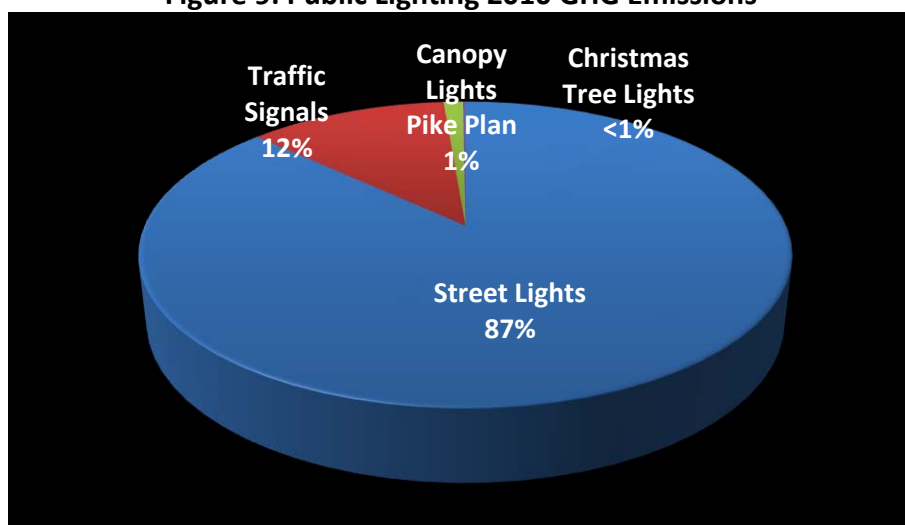
**Figure 8: City of Kingston 2010 Public Lighting Costs**



## PUBLIC LIGHTING GHG EMISSIONS

Electricity usage associated with public lighting in the City of Kingston produced an estimated 694 tonnes CO<sub>2</sub>e. As would be anticipated electricity usage associated with street lighting produces the greatest amount of GHG emissions with 603 tonnes CO<sub>2</sub>e or more than 87% of the total GHGs from public lighting. Electricity used for traffic signals produced 82 tonnes of CO<sub>2</sub>e, 12% of the total. The Pike Plan Canopy lights produced 8 tonnes of CO<sub>2</sub>e, with the Christmas tree lights emitting 1 tonne of CO<sub>2</sub>e.

Figure 9: Public Lighting 2010 GHG Emissions



More detail on public lighting in the City of Kingston is provided in Appendix L.

## E. MATERIALS MANAGEMENT/SOLID WASTE

The City of Kingston DPW provides solid waste collection to all of its residents and to some of its businesses and institutions. The DPW also is responsible for the curbside collection of recyclable commingled containers and mixed paper. Scrap metal, yard waste and brush are also collected separately at curbside. The City of Kingston DPW does not provide solid waste and recycling services to all generators with the City. Summary information on energy use and greenhouse gas emissions associated with the solid waste management can be found in this Local Government Report and the Community Report.

Solid waste management is analyzed separately due to the potential for landfills to produce methane, a greenhouse gas. The City of Kingston does not own or operate its own landfill however the City's operation of the transfer station and the fuel used by DPW refuse packers to collect and transport garbage and recyclable materials are part of the overall GHG emissions associated with solid waste management. The waste the DPW collects is transported to the Ulster County Resource Recovery Agency (UCCRA) and then trucked to a landfill in western New York.

The City government has control over the operation of the waste collection it performs but once the waste leaves the City the transportation and ultimate disposal of the waste is not within the City's jurisdiction. The transportation of waste to a landfill in western New York and the emissions resulting from decomposition of this waste are discussed in Section VII of the **Community Energy and Greenhouse Gas Emissions Inventory Report**, Appendix A.

Energy used at the UCRRA transfer station and materials recovery facility for Kingston managed materials was beyond the scope of this analysis.

## TRANSFER STATION ENERGY USAGE AND COST

The City of Kingston operates a municipal transfer station on Route 32 south where residents and businesses can deliver a variety of waste and recyclable material including tires and electronics. The electricity usage at the transfer station in 2010 was 24,880 kWh at a cost of \$3,702.

## REFUSE PACKERS

To collect waste and recyclables, in 2010 the City operated ten (10) refuse packers with model years ranging from 1987 to 2008. These 10 heavy duty diesel vehicles used an estimated 20,723 gallons of diesel fuel at a cost of \$51,834. These vehicles traveled an estimated 64,603 miles, an average of 6,460 per vehicle and were used an estimated 5,832 hours.

As with other City vehicles, the hours used by these vehicles and not the miles traveled will dictate maintenance schedules as refuse packers run for a considerable number of hours but do not necessarily travel a significant number of miles.

More detailed information on the City's refuse packers can be found in Appendix J.

## GHG EMISSIONS ASSOCIATED WITH LOCAL GOVERNMENT OPERATIONS 'WASTE' MANAGEMENT

In 2010 the electricity used at the solid waste transfer station resulted in the release of 8 tonnes of CO<sub>2</sub>e.

The diesel fuel used by refuse packers used to collect waste and recycling in 2010 emitted 212 tonnes of CO<sub>2</sub>e. GHG emissions from refuse packers in 2010 were almost 37% of the total GHGs emitted from all DPW vehicles.

There was an estimated 220 tonnes of CO<sub>2</sub>e resulting from local government solid waste collection and management.

This report includes the GHG emissions associated with the collection and management of solid waste by the City government. Greenhouse gas emissions information pertaining to the transportation of solid waste to a landfill and associated landfill emissions can be found in Section VII of the ***Community Energy and Greenhouse Gas Emissions Inventory Report***, Appendix A.

**Table 31: Solid Waste Management GHG Emissions**

Solid Waste Management Scope 1 & Scope 2 GHG Emissions	CO <sub>2</sub> (tonnes)	N <sub>2</sub> O (kg)	CH <sub>4</sub> (kg)	CO <sub>2</sub> e (tonnes)	Energy (MMBtu)	Cost (\$)
Solid Waste Transfer Station	8	0	0	8	85	\$3,702
Collection of Waste/Recycling Refuse Packers	212	0	0	212	4,298	\$51,903
<b>TOTALS</b>	<b>220</b>	<b>0</b>	<b>0</b>	<b>220</b>	<b>4,383</b>	<b>\$55,605</b>

## F. EMPLOYEE COMMUTE

An employee commuting survey was administered to all City employees as well as the KHA and KWD employees to get an idea of the amount of miles traveled and fuel used to commute to work for City of Kingston government. A complete copy of the survey and results can be found in Appendix I.

Based on survey results it is estimated that in 2010 the 406 city employees plus those of KHA and KWD drove 699,868 miles to get to and from work using 41,219 gallons of gasoline at a cost of \$119,904. This resulted in the generation of an estimated 370 tonnes of CO<sub>2</sub>e emissions.

When factored into the overall energy cost for City government operations the cost of commuting is approximately 6% of the total energy costs. When factored into the overall GHG emissions total, employee commuting accounts for approximately 5% of the total City government GHG emissions.

**Table 32: City of Kingston Employee Commute**

City of Kingston Sector	Gallons	Cost*	Miles Traveled (RT)	CO <sub>2</sub> e (tonnes)
Passenger Vehicles	20,214	\$58,801	371,566	**
Light Trucks	21,005	\$61,103	328,302	**
<b>TOTALS</b>	<b>41,219</b>	<b>\$119,904</b>	<b>699,868</b>	<b>370</b>

\*Ave price per gallon of gas for City Government in 2010 = \$2.909/gal

\*\* CACP 2009 Software does not give a breakdown of CO<sub>2</sub>e by vehicle type.

## VII. CONCLUSION

Government buildings and facilities present the greatest opportunity to reduce energy usage, cost and cut GHG emissions as is summarized in Table 33. Buildings and facilities accounted for 41% of energy costs and 49% of emissions. Second to buildings and facilities are vehicles. This report will help identify specific facilities to target to reduce energy costs and reduce GHG emissions. Public lighting, particularly the opportunity to upgrade street lights, also presents a significant opportunity to reduce energy costs and GHG emissions.

**Table 33: City of Kingston Energy Usage and Cost Summary**

City of Kingston Sector	2010 Total Energy Cost (\$)	% of Cost	CO <sub>2</sub> e (tonnes)	% of CO <sub>2</sub> e
Buildings & Facilities	\$652,793	41	2,264	49
Vehicles	\$325,801	20	1,274	28
Public Lighting	\$524,620	33	694	15
Transit Fleet	\$87,195	5	<u>355</u>	8
	<b>\$1,590,409</b>		<b>4,587</b>	
Kingston Housing Authority	\$268,389		1,982	
Kingston Water Department	\$97,034		300	
Dietz Stadium	\$19,564		<u>42</u>	
	<b>\$1,975,396</b>		<b>6,915</b>	
Employee Commute	\$119,904		<u>370</u>	
<b>TOTAL City Government Costs</b>	<b>\$2,095,300</b>		<b>7,285</b>	

This energy and GHG emissions baseline can be used to evaluate and set GHG emissions reduction targets for local government operations and the community and develop a Climate Action Plan. In selecting target reductions, discussed in the next section, it will be important to strike a balance between scientific necessity, ambition, and what is realistically achievable. By establishing a challenging yet feasible target, the City of Kingston can demonstrate its goal to do its part towards addressing GHG emissions. Energy and GHG reduction targets can be achieved through identifying and prioritizing the recommendations of the City's Climate Action Plan (CAP).

The CAP outlines recommended initiatives the City can take both within local government operations and the community that can reduce energy usage, save money and reduce greenhouse gas emissions resulting in a more economically and environmentally sustainable City.

## APPENDIX C. GREENHOUSE GAS EMISSIONS INVENTORY METHODOLOGY AND QUANTIFICATION

### WHAT IS A GHG INVENTORY AND WHY DO ONE

A greenhouse gas inventory is an accounting of the emissions generated by energy use. The burning of fossil fuels creates greenhouse gases. The type and amount of fossil fuel used to generate energy in the City of Kingston determines the type and quantity of emissions. The amount of energy used within the City of Kingston for residential, commercial, industrial and transportation purposes is translated into greenhouse gas emissions.

The electricity and natural gas as well as other fossil fuel usage were analyzed for the City of Kingston to understand the amount and types of energy used for heating and cooling, electrical generation and vehicle use. This energy use data was used to determine the greenhouse gas emissions associated with the use of fossil fuels.

A GHG Inventory, setting GHG reduction goals and implementing measures to reduce energy use and GHG emissions will help the City achieve the following: <sup>i</sup>

**Risk Management** - Voluntarily reporting GHG emissions could help the City of Kingston manage climate risk by documenting early actions to reduce GHG emissions. Such information may be accepted by future state or federal regulatory authorities.

**Addressing Inefficiencies** - Accounting for emissions can help the City of Kingston to gain better insight into the relationship between improving efficiency (reducing energy and waste) and reducing emissions, ultimately saving money and resources.

**Readiness for a Carbon Constrained Future** - Identifying emissions sources to develop a GHG profile and management strategies will prepare the City of Kingston to respond to the potential impact of new regulations.

**Recognition as an Environmental Leader** - Voluntarily reporting GHG emissions provides the City of Kingston with additional opportunities to recognize, publicize, and promote environmental stewardship.

**Stakeholder Education** - Assembling an annual GHG emissions inventory can help inform management, constituents, employees, and the public about the City of Kingston's GHG emissions profile.

### GREENHOUSE GAS EMISSIONS INVENTORY METHODOLOGY

The first step toward achieving tangible greenhouse gas emission reductions requires identifying baseline levels and sources of emissions in the community. The procedures developed by ICLEI, EPA and others provide guidance for local governments in quantifying greenhouse gas emissions from both their internal operations and from the whole community within their geopolitical boundaries. ICLEI has established a common GHG emissions inventory protocol for all local governments worldwide. <sup>ii</sup>

Methodologies developed by ICLEI, the USEPA, The Climate Registry and other acceptable protocols were used to inventory the City of Kingston's community and government operations emissions. Government operation GHG emissions are a subset of the total community GHG emissions. Standard processes of accounting for emissions have been developed to which this inventory adheres.

## **LOCAL GOVERNMENT OPERATIONS PROTOCOL**

The Local Government Operations Protocol (LGOP), developed by the California Air Resources Board and the California Climate Action Registry, ICLEI –Local Government for Sustainability and The Climate Registry, serves as the national standard for quantifying and reporting greenhouse emissions from local government operations. The City of Kingston's Climate Analyst used the LGOP to inventory GHG emissions from City of Kingston internal operations and activities

The LGOP is a tool for accounting and reporting GHG emissions across a local government's operations following internationally recognized GHG accounting and reporting principles. The purpose of the LGOP is to provide the principles, approach, methodology, and procedures needed to develop a local government operations greenhouse gas emissions inventory. Relevance, completeness, consistency, transparency and accuracy are fundamental principles set forth in the LGOP to help ensure that the GHG data is faithful, true and a fair account of a local government's GHG emissions.

The government operations inventory is a subset of the community inventory; for example, data on commercial energy use by the community includes energy consumed by municipal buildings, and community vehicle-miles-traveled estimates include miles driven by municipal fleet vehicles. The government operations inventory is in this way a subset of the community-scale inventory. By analyzing emissions in this manner, the City of Kingston's local government is enabled to understand its own impact within the community and lead by example to reduce its impact on climate change.

ICLEI is currently developing a Community Protocol which is similar to the LGOP. In future inventories, City of Kingston will use the new Community Protocol.

## **EMISSIONS INVENTORY BOUNDARIES**

### **COMMUNITY: GEOPOLITICAL BOUNDARY**

The City of Kingston's community inventory assesses emissions resulting from activities taking place within the City of Kingston's geopolitical boundary. Geopolitical boundary is defined as that "consisting of the physical area or region over which the City of Kingston local government has "jurisdictional authority." Activities that occur within this boundary can be, for the most part, controlled or influenced by the City of Kingston's policies and educational programs. Although the City of Kingston may have limited influence over the level of emissions from some activities, every effort has been made to compile a complete analysis of all activities that result in greenhouse gas emissions. The data generated for the City of Kingston are based on the sources of emissions within the City's geopolitical/organizational boundaries.

### **GOVERNMENT: OPERATIONAL BOUNDARIES**

According to the LGOP, a government can use two approaches to define its organizational boundary for reporting greenhouse gas emissions: 1) operational control - facilities, policies and activities that the City of

Kingston controls operationally; or 2) financial control - facilities, activities and operations that the City of Kingston controls financially.

It was determined that the 'operational control' approach would be used to conduct a GHG inventory for the City of Kingston. Therefore local government emissions will be based on the energy used by facilities, activities and vehicles that the City of Kingston has full authority over to introduce and implement its operating policies. In other words, if the City of Kingston has operational control over the facility, activity or vehicle the greenhouse gases produced by the energy used by such facilities, activities or vehicles are included in this GHG inventory.

Under the operational control approach, a local government accounts for 100 percent of emissions from these operations.

For the City of Kingston it was determined that the City has operational control over the sectors identified in Table 1.

**Table 1: City of Kingston Government Sectors**

<u>Sector</u>	<u>Sector Details</u>
Buildings and Facilities	City Hall, Police, Fire , Public Works, Rondout Dock Facilities, Esopus Flood Control Project, Parks and Recreation, Dietz Stadium Commission, Lighthouse, Kingston Housing Authority
Streetlights and Traffic Signals	Streetlights , Traffic Signal, Park Lighting , Pike Plan
Wastewater	Kingston Wastewater Treatment Facilities , Sewers , Pumps and Pump Houses
Water Deliver	Water Department Administration Building and Maintenance Garage Binnewater Reservoir, Pretreatment and Treatment Facilities Meter Stations, Pumps and Tanks
Vehicle Fleet	City owned and operated vehicles and equipments
Transit Fleet	Citibus

The City of Kingston like other municipalities is divided into a number of departments including some autonomous, self-supporting departments. Such is the case in the City of Kingston with the Kingston Water Department, the Kingston Housing Authority and the Dietz Stadium Commission. It should be emphasized that having operational control does not mean that a local government necessarily has authority to make all decisions concerning an operation.

These autonomous 'departments' are managed by their own boards. Considering that the Board is either in whole or in part appointed by the Mayor of the City of Kingston, local government officials are considered to have some level of oversight of the board therefore the local government is considered to have influence over the operational control of such departments. Therefore the GHG emissions associated with the Kingston Water Department, the Kingston Housing Authority and the Dietz Stadium Commission are a part of this GHG inventory.

## QUANTIFYING GREENHOUSE GAS EMISSIONS

### ENERGY AND GHG BASELINE

After considering the amount and types of data available for each of several recent years the calendar year 2010 was chosen as the baseline year for collection of energy data and a greenhouse gas emissions inventory. It was determined that 2010 was the year in which the most complete, consistent, and accurate set of energy use data was available for the community and for the City government operations. Energy usage data and GHG emissions should be inventoried on an annual basis subsequent to 2010.

Due to the fact that it is not feasible to directly measure emissions of CO<sub>2</sub> and other greenhouse gas emissions, the reported emissions are based on the energy usage data collected for 2010 using accepted methodologies and protocols outlined in the LGOP and by ICLEI—Local Government for Sustainability.

The City of Kingston began its baseline energy assessment in April 2011, however at that time was not a member of ICLEI. At that point it was unclear as to the methodology that would be used to determine GHG emissions. Therefore the procedures outlined in the LGOP were followed and data was collected and organized in a fashion that would be conducive to using the ICLEI GHG estimating software in anticipation that the City would become ICLEI members. In August 2011, the City was awarded a grant from the Clean Air Cool Plant Community Catalyst Fund that provided funding for an ICLEI membership. As an ICLEI member the City gained access to ICLEI tools and resources, particularly the GHG inventory software tool that calculates and tracks emissions and reductions of greenhouse gases and criteria air pollutants associated with electricity, fuel use, and waste disposal.

Once the City joined ICLEI, the ICLEI “Five Milestone” process, as outlined above, was formally recognized as the steps to the creation and implementation of a Climate Action Plan.

### QUANTIFICATION METHODS

Greenhouse gas emissions were quantified using calculation-based methodologies emissions using activity data and emission factors.

- The basic equation is used: Activity Data x Emission Factor = Emissions

Activity data refer to the relevant measurement of energy use or other greenhouse gas-generating processes such as metered annual electricity and natural gas consumption, fuel oil or propane consumption and annual vehicle miles traveled.

### CITY GOVERNMENT DATA COLLECTION

To collect electricity and natural gas data from City government buildings and facilities, it was determined that the best way was through the web portals made available on utility web sites. User accounts were set up on the Central Hudson and Hess web sites to gather usage and cost data for 168 electricity and natural gas accounts for City government operations. All utility account data were available for energy usage for calendar year 2010. However there is limited electricity and natural gas usage data available via utility web sites as some City accounts had 2007 data but some only as far back as mid- 2009. The most complete set of calendar year data that was available via these web portals was 2010. This methodology was simpler than

collecting the usage and cost data for 168 different accounts for an entire year from the paper copies of the utility invoices.

Street light and traffic signal data had to be obtained directly from Central Hudson as these sectors are currently not metered and utility bills only reflect the flat rate charged for these sectors. To determine electricity usage for streetlights Central Hudson estimates the number of hours the street lights will be on based on the number of hours of darkness each year. For traffic signals kWh used monthly are calculated based on the wattage of the signal, and input from the controller and associated equipment. New signals and old ones that are refurbished/replaced are metered.

Other energy data, such as fuel oil and propane gas usage and cost was gathered by reviewing invoices and other accounting systems and records maintained by City Staff.

Vehicle fuel usage and cost data was obtained primarily through working with individual departments such as the Kingston Police Department (KPD), the Kingston Fire Department (KFD), and the City of Kingston Department of Public Works (DPW). The bulk of vehicle fuel usage and cost data was obtained from the DPW fuel purchase records and the DPW garage maintenance records.

## **COMMUNITY DATA**

Access to and analysis of each residential, commercial and industrial utility bill in the City is not feasible. Therefore aggregate electricity and natural gas data for the residential, commercial and industrial sectors of the City of Kingston was obtained from Central Hudson. This data was acquired in June 2011 and represents the electricity and natural gas billed to these sectors in the City of Kingston for the calendar year 2010. This data is for the City of Kingston based on its 'political boundaries'. The aggregate data provided by Central Hudson represents all electric and natural gas accounts within City limits billed to the residential, commercial and industrial sectors. This data includes the Kingston city government electricity and natural gas accounts which were analyzed separately as discussed above. This data also includes street lighting along public roads and highways which is billed to the City as well as residential area lighting which is outdoor lighting on residential premises, such as a dusk to dawn light installed in a driveway.

Community heating fuel usage and cost was estimated using a number of sources as discussed below.

Residential heating fuel usage and cost data was obtained using the 2005-2009 American Community Survey (ACS) - U.S. Census Bureau<sup>iii</sup>, the State Energy Data System-U.S Energy Information Administration (EIA)<sup>iv</sup> and NYSERDA Energy Prices, Supplies, and Weather Data<sup>v</sup>. The most currently available EIA data for 2009 was used for estimated residential home fuel usage

Square footage of commercial space in the City of Kingston was unavailable therefore commercial heating fuel usage was estimated using the population of the City of Kingston as a proportion of the State population and estimating fuel usage based on the 'Commercial Sector Energy Consumption Estimates' of the State Energy Data System-U.S EIA.<sup>vi</sup> The most currently available EIA data for 2009 was used for estimated commercial heating fuel usage.

Industrial heating fuel usage was not included in the inventory.

Transportation or vehicle miles traveled (VMT) data was obtained from the Ulster County Transportation Council, the Metropolitan Planning Organization (MPO) for this area. Using the USDOT, FHWA Highway

Performance Monitoring System the UC Transportation Council I developed VMT specific numbers for the City of Kingston.

To convert the energy usage and other activity data into associated quantities of greenhouse gas emissions, known emission factors are used. Known emission factors for this analysis are primarily taken from the Emissions & Generation Resource Integrated Database or eGRID. eGRID is a comprehensive source of data on the environmental characteristics of almost all electric power generated in the United States. These environmental characteristics include air emissions for nitrogen oxides, sulfur dioxide, carbon dioxide, methane, and nitrous oxide; emissions rates; net generation; resource mix; and many other attributes.<sup>vii</sup>

Emissions factors are usually expressed in terms of emissions per unit of activity data (e.g. lbs CO<sub>2</sub>/kWh of electricity).

## **APPENDIX D. CLEAN AIR AND CLIMATE PROTECTION 2009 (CACP 2009) SOFTWARE**

To assist in the understanding of what energy usage activity data means in terms of GHG emissions, ICLEI in partnership with the National Association of Clean Air Agencies (NACAA) and the U.S. Environmental Protection Agency (EPA) developed software designed to determine GHG emissions by combining activity data (energy consumption, waste generation, etc.) with verified emission factors. This software, called the Clean Air and Climate Protection 2009 (CACP 2009) is compatible with the LGOP and is used by hundreds of local governments to measure greenhouse gas emissions. It is important to note that although the software provides governments with a sophisticated and useful tool, calculating emissions from energy use with precision is difficult. Calculating GHG emissions depends upon numerous assumptions, and it is limited by the quantity and quality of available data. With this in mind, it is useful to think of any specific number generated by the CACP 2009 software as an approximation of reality, rather than an exact value.

## APPENDIX E. EVALUATING GREENHOUSE GAS EMISSIONS: EMISSIONS TYPES AND SCOPE

### EMISSION TYPES

There are six internationally recognized greenhouse gases as listed in Table 1. The City of Kingston GHG inventory assesses carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>) and Nitrous oxide (N<sub>2</sub>O).

**Table 1: Greenhouse Gases**

Greenhouse Gas	Chemical Formula
Carbon Dioxide	CO <sub>2</sub>
Methane	CH <sub>4</sub>
Nitrous Oxide	N <sub>2</sub> O
Hydrofluorocarbons	Various HFCs
Perfluorocarbons	Various PFCs
Sulfur Hexafluoride	SF <sub>6</sub>

This assessment did not examine hydrofluorocarbons (HFC). The release of these gases is primarily from refrigerant leakage.<sup>55</sup> Information and data on refrigerants used by City buildings and facilities and by City vehicles was not available for this inventory. Any future assessment of city operation greenhouse gases should account for the use and leakage of these refrigerants.

The release of perfluorocarbons and sulfur hexafluoride are not germane to City government operations.

### GREENHOUSE GAS EMISSIONS BY SCOPE

For both the community and government operations, emissions sources are categorized relative to the geopolitical boundary of the City or the operational boundaries of the government. Emissions sources are categorized as direct or indirect emissions – Scope 1, Scope 2, or Scope 3. The prevention of double counting for major categories such as electricity use and waste disposal is one of the most important reasons for using the scopes framework for reporting greenhouse gas emissions at the local level.

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<sup>55</sup> Buildings and facilities that have refrigeration systems, such as air conditioners, chillers, and refrigerators as well as fire suppression systems that are likely to contain HFC compounds. Most on-road vehicles owned and operated by the City have air conditioning systems. HFCs or a refrigerant blend are the primary GHG of concern for motor vehicle air conditioners. Today, HFC-134a is the standard refrigerant used for mobile air conditioning systems. Unintentional releases of HFC gases occurs when HFC gases leak from these systems and when fire extinguishing equipment is deployed.

Whereas air conditioner refrigerant leakage may seem like a small source of greenhouse gas emissions, refrigerant compounds can result into significant climate impacts as some of these compounds have high global warming potential and therefore a relatively small amount emitted can result in significant emissions in terms of CO<sub>2</sub> equivalent. Refrigerant leaks are considered Scope 1 fugitive emissions.

## COMMUNITY EMISSIONS

There are three emissions scopes for which community emissions are categorized:

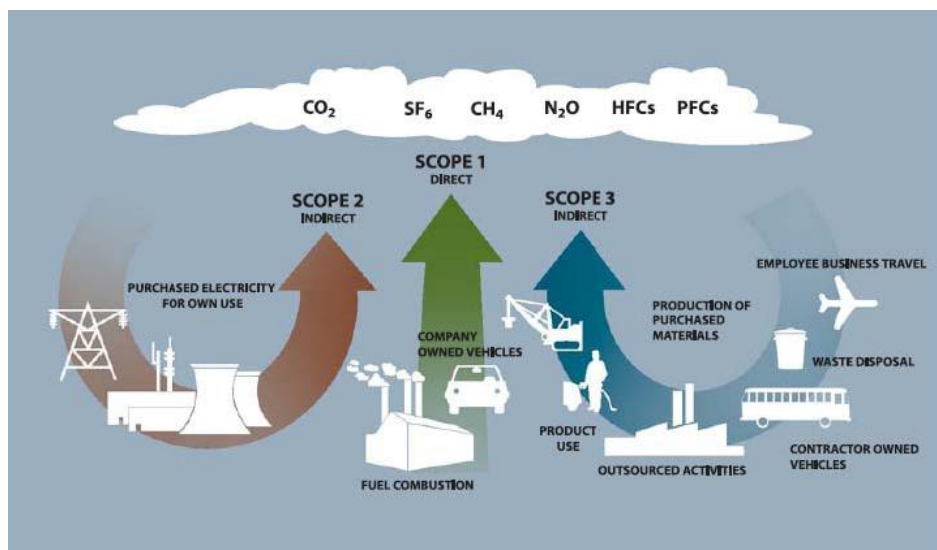
**Scope 1:** All direct emissions from sources located within the geopolitical boundary of the City. For example all emissions from the use of fuel oil for home heating. This includes mobile sources, that is emission from fuels used in vehicles.

**Scope 2:** Indirect emissions associated with the consumption of purchased or acquired electricity, steam, heating, and cooling. Scope 2 emissions occur as a result of activities that take place within the City, but that rely upon emissions-producing processes located outside of the City.

**Scope 3:** All other indirect or embodied emissions not covered in Scope 2 that occur as a result of activity within the City.

Scope 1 and Scope 2 sources are the most essential components of a community greenhouse gas analysis as these sources are typically the most significant in scale, and are most easily affected by local policy making. Scope 3 emissions related to the composition and transportation of solid waste are included in this inventory.

### **Emission Scopes**



## GOVERNMENT OPERATIONS EMISSIONS

Similar to the community framework, the City of Kingston government operations scopes are divided into three main categories:

**Scope 1:** Direct emissions from sources within the City's organizational boundaries that the local Government owns or controls. For example, emissions from natural gas fired burners at City buildings and mobile emissions from City owned vehicles.

**Scope 2:** Indirect emissions associated with the consumption of purchased or acquired electricity at city owned and operated buildings and facilities, including public lightings such as street lights and traffic signals.

**Scope 3:** All other indirect emissions not covered in Scope 2, such as emissions from transport-related activities in vehicles not owned or controlled by City government (e.g., employee commuting). The only Scope 3 emissions looked at for government operations are those generated by employee commuting.

As with the community inventory, Scope 1 and Scope 2 sources are the most essential components of a local government greenhouse gas analysis because these sources are usually significant in scale and are directly under the control of local governments. Local governments typically have indirect control over Scope 3 emissions. Information and data related to solid waste generated by government operations was not available to analyze as part of Scope 3 government operation related emissions.<sup>56</sup>

**GREENHOUSE GAS EMISSIONS BY SECTOR**

In addition to categorizing GHG emissions by scope, the inventory examines emissions by sector. Many local governments find a sector-based analysis more relevant to policy making and project management, as it assists in formulating sector-specific GHG reduction measures and climate action plan components. This inventory evaluates community and government emissions by the sectors.

**Table 2: Community and Government Sectors**

Community	Government
Residential	Buildings
Commercial/ Industrial	Streetlights
Transportation	Vehicle Fleet
Waste	Employee Commute
	Water / Sewage
	Waste

<sup>56</sup> Solid waste generated from government operations is included as Scope 3 because of the unique circumstances in which emissions are generated – emissions from waste are generated over time as the waste decomposes and not directly in the base year.

## CO<sub>2</sub> EQUIVALENTS AND GLOBAL WARMING POTENTIAL

Greenhouse gas emissions are commonly aggregated and reported in terms of equivalent carbon dioxide units, or CO<sub>2</sub>e. This standard is based on the Global Warming Potential (GWP) of each gas, which is a measure of the amount of warming a greenhouse gas may cause, measured against the amount of warming caused by carbon dioxide. Converting all emissions to equivalent carbon dioxide units allows for the consideration of different greenhouse gases in comparable terms. For example, methane (CH<sub>4</sub>) is twenty-one times more powerful than carbon dioxide (CO<sub>2</sub>) on a per weight basis in its capacity to trap heat, so one metric ton of methane emissions is equal to 21 metric tons of carbon dioxide equivalents.

**Table 1: Greenhouse Gases Global Warming Potential**

Greenhouse Gas	Chemical Formula	Global Warming Potential
Carbon Dioxide	CO <sub>2</sub>	1
Methane	CH <sub>4</sub>	21
Nitrous Oxide	N <sub>2</sub> O	310
Hydrofluorocarbons	Various HFCs	43-11,700
Perfluorocarbons	Various PFCs	6,500-9,000
Sulfur Hexafluoride	SF <sub>6</sub>	23,900

## APPENDIX F. FUEL MIX USED TO GENERATE CITY OF KINGSTON ELECTRICITY

The City of Kingston purchases electricity and natural gas from the Central Hudson Gas and Electric Corporation and the Hess Corporation under several different rate structures. The City has 168 active accounts with Central Hudson for delivery of electricity and natural gas. Through the Municipal Electric and Gas Alliance, in 2009 the supply of electricity and natural gas came from the Hess Corporation but is still delivered by Central Hudson. In 2011 the City had 91 active accounts with Hess for electricity and natural gas supply. These accounts are for city owned buildings and facilities as well public, street and traffic lighting.

The tables below outline the fuel sources used by the Hess Corporation and Central Hudson to generate electricity. Fuel sources are almost identical except the use of gas and wind power differ slightly.

Fossil fuels such as gas, coal and oil provide almost three-quarters of the fuel source for the community's electricity.

### FUEL SOURCES TO GENERATE YOUR ELECTRICITY

#### Hess Corporation Fuel Sources Used to Generate Electricity

Period Shown: January 1, 2008 - December 31, 2008 for the Hess Corporation<sup>viii</sup>

Fuel Source	Per Cent
Biomass	<1
Coal	23
Gas	43
Hydro	8
Nuclear	19
Oil	5
Solar	0
Solid Waste	<1
Wind	1

(Actual Total may vary slightly from 100% due to rounding)

#### Central Hudson Fuel Sources Used to Generate Electricity

Period Shown: January 1, 2008 - December 31, 2008 for Central Hudson Gas & Electric<sup>ix</sup>

Fuel Source	Per Cent
Biomass	<1
Coal	23
Gas	44
Hydro	8
Nuclear	19
Oil	5
Solar	0
Solid Waste	<1
Wind	2

(Actual Total may vary slightly from 100% due to rounding)

New York State has initiated or participates in programs on regional, state, and local levels that reduce greenhouse gas emissions and encourage energy independence, energy efficiency and renewable energy.

### **STATE AND REGIONAL CLIMATE CHANGE RELATED POLICIES**

In August of 2009, Governor David A. Paterson signed Executive Order 24 establishing the goal of reducing GHG emissions from all New York State sources to 80% below 1990 levels by 2050 (referred to as '80 by 50') and creating the New York State Climate Action Council (Council). The Council is made up of 13 state agency heads in addition to representatives from the Governor's Office. The purpose of the Council is to assist New York in identifying the best opportunities to mitigate and adapt to climate change, reduce costs associated with climate change activities, and foster economic growth in New York.

The Council prepared the New York State Climate Action Plan Interim Report with assistance from New York State Energy Research and Development Authority (NYSERDA), the Department of Environmental Conservation (NYS DEC), and other Council member-agency staff. The Council has approved a final New York State GHG emissions inventory and forecast, and the Climate Action Plan Interim Report.

The Council recognizes the challenges of climate action planning as "a unique challenge in policy planning." Climate action planning requires analysis of a usually long-term planning horizon, and involves many uncertainties such unknown future prices of conventional and alternative fuels and technologies. Based on this challenge the Interim report primarily analyzed policy options for the period from 2010 through 2030. The Final Climate Action Plan will include an analysis of whether the '80 by 50' goal can be achieved by implementing the policy options presented in the Interim Report. Additionally finding funding mechanisms will remain a challenge in the current economic reality.

### **NEW YORK STATE CLIMATE ACTION PLAN INTERIM REPORT**

This Report presents for consideration by decision makers, businesses and citizens the overarching goals and initial outcomes of New York's climate planning process:

- A long-term vision for a climate-resilient, low-carbon, clean energy future for New York
- The long-term 80 by 50 goal and a mid-term benchmark target of reducing GHG emissions by 40 % by the year 2030 ('40 by 30')
- A preliminary list of policy options that have the potential to dramatically reduce emissions and increase resiliency to a changing climate, while providing other benefits to New Yorkers in the near term
- Initial expert analysis on the relative costs of different GHG mitigation policy options
- Initial strategies to link climate and energy policy with economic development opportunities, in particular those associated with growing a clean energy economy.<sup>x</sup>

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<sup>57</sup> <http://www.nyclimatechange.us/background-alreadydoing.cfm>

## ENERGY PLANNING IN NEW YORK

In March 2008, Governor David A. Paterson issued Executive Order No. 2 directing the creation of a State Energy Plan stating that "...the development, implementation, and periodic review of a sensible comprehensive energy plan will enable the State to determine its future energy needs and facilitate a deliberate, efficient, and cost-effective means of meeting those needs."

In June 2008, New York State began a new statewide energy planning process. In December, 2009, the 2009 New York State Energy Plan was released.

The State Plan sets forth a vision for a robust and innovative clean energy economy that will stimulate investment, create jobs and meet the energy needs of New York residents and businesses over its 10-year planning horizon. A framework is provided to "reliably meet its future energy needs in a cost-effective and sustainable manner, establishes policy objectives to guide State agencies and authorities as they address energy related issues and sets forth strategies and recommendations to achieve these objectives." (p. xiii, 2009 State Energy Plan). One of these objectives is to "Support energy and transportation systems that enable the State to significantly reduce greenhouse gas (GHG) emissions, both to do the State's part in responding to the dangers posed by climate change and to position the State to compete in a national and global carbon constrained economy."

A law was passed in New York in September 2009 that establishes the State Energy Planning Board and calls on that Board to complete a State Energy Plan on or before March 15, 2013.

The New York State Energy Planning Board has developed a [Draft Scope for the 2013 State Energy Plan](#)<sup>58</sup> The topic areas to be developed in the 2013 State Energy Plan are based on and guided by the statutory requirements specified in Article 6 of the Energy Law.

## GREENHOUSE GAS INVENTORY AND REDUCTION

### THE REGIONAL GREENHOUSE GAS INITIATIVE (RGGI)

New York is one of ten Northeastern and Mid-Atlantic States participating in the RGGI cap and invest program. The New York CO<sub>2</sub> Budget Trading Program (6NYCRR Part 242) and the CO<sub>2</sub> Allowance Auction Program (21NYCRR Part 507) took effect January 1, 2009. Emissions of carbon dioxide from electric power generating facilities will be reduced ten percent by 2018. Auction proceeds support statewide investments in energy efficiency, renewable and clean energy, and innovative carbon abatement technologies, as guided by the RGGI Operating Plan.

### ADOPTION OF CALIFORNIA VEHICLE EMISSIONS STANDARDS

California is the only state that is not preempted by federal vehicle emissions standards and, as a result, is permitted to set stricter standards than those that apply to the nation as a whole. Once a rule has been adopted in California, other states seeking standards for a higher level of emissions controls are permitted to adopt such California standards as well. New York has adopted the most recent California standards, which would reduce greenhouse gas emissions from cars by 37 percent and from light trucks 24 percent by 2016.

<sup>58</sup> <http://www.nysenergyplan.com/scope.html>

## **REGIONAL LOW-CARBON FUEL STANDARD**

The Regional Low-Carbon Fuel Standard is a market-based, technologically neutral emissions-performance standard under development by 11 Northeast and Mid-Atlantic states (Connecticut, Delaware, Massachusetts, Maryland, Maine, New Hampshire, New Jersey, New York, Rhode Island, Vermont, and Pennsylvania) that will reduce the carbon intensity of transportation fuels sold in the region.

## **THE TRANSPORTATION AND CLIMATE INITIATIVE**

This initiative is a coordinated regional effort by 12 Northeast and Mid-Atlantic jurisdictions (Connecticut, Delaware, Massachusetts, Maryland, Maine, New Hampshire, New Jersey, New York, Rhode Island, Vermont, Pennsylvania, and the District of Columbia) to reduce transportation sector greenhouse gas emissions and further the development of a clean energy economy. The participating jurisdictions are working to reduce greenhouse gas emissions, minimize our transportation system's reliance on high-carbon fuels, promote sustainable growth, address the challenges of vehicle miles traveled, and help build the clean energy economy.

## **NYS DEC OFFICE OF CLIMATE CHANGE**

The charge of the Office of Climate Change is to lead the development of programs and policies that mitigate greenhouse gas emissions and help municipalities and individuals adapt to the effects of climate change. In addition to implementing RGGI, the Office is developing the full suite of responses needed for significant emissions reductions and for successful adaptation to changing temperatures, sea levels, precipitation and other climate factors.

## **NYS DEC CLIMATE SMART COMMUNITIES**

This program includes ten-point pledge for municipalities to reduce greenhouse gas emissions, prepare for climate change, and invest in green economies. Launched February 2009, the Climate Smart Communities Pledge has already been adopted by at least 85 New York communities.

## **THE CLIMATE REGISTRY**

The Climate Registry is a partnership of businesses, environmental organizations and states with standards for estimating and reporting greenhouse gas emissions (carbon dioxide (CO<sub>2</sub>), methane, nitrous oxide (N<sub>2</sub>O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF<sub>6</sub>)). Twenty-one New York public and private organizations have enrolled as Founding Reporters and committed to inventory and report their emissions under the Registry's protocol.

## **ENERGY EFFICIENCY AND RENEWABLE ENERGY**

### **45 BY 15**

Adopted in the 2009 State Energy Plan, this energy policy is designed to meet 45 percent of New York's electric energy needs from energy efficiency and renewable energy by the year 2015. Along with program requirements from the States energy authorities, this policy is implemented by two key programs:

### **RENEWABLE PORTFOLIO STANDARD (RPS)**

This program requires 30% of electricity in New York to be supplied from renewable energy sources by 2015 and provides financial incentives to support development of renewable energy sources. To date, the RPS has led to the development of over 1300 MW of renewable power including large-scale facilities and thousands of customer-sited renewable resources. New York is one of 27 states to use a RPS to drive a transition to renewable sources of electricity.

### **ENERGY EFFICIENCY PORTFOLIO STANDARD (EEPS)**

This program is designed to contribute to reducing energy demand 15% from forecasted levels by 2015, through energy efficiency. This program is expected to provide more than \$4 billion in benefits to customers, along with thousands of jobs to support energy efficiency programs, such as retrofitting outdated and inefficient residential, commercial and industrial properties and installing new energy efficient equipment. Additional energy efficiency gains are anticipated to contribute to the 15% reduction and also includes strengthening efficiency standards for appliances and buildings, and address energy efficiency opportunities for New York's largest energy consumer - State government.

### **SYSTEM BENEFITS CHARGE (SBC)**

The System Benefits Charge supports the implementation of a portfolio of energy efficiency and clean energy activities. The SBC program provides New York-based investment in research, development and demonstration of emerging energy technologies, supports business development of new companies that are providing innovative products and services, and provides support for accelerating the introduction into the market and use of energy efficiency and clean energy technologies. This program also provides targeted energy efficiency services for low-income customers.

## **GREEN BUILDINGS**

The Green Buildings Tax Credit Program provides state tax credits to owners and tenants of eligible buildings that meet certain energy and environmental performance standards. Large commercial and residential buildings that meet these standards will have lower environmental impacts than buildings that would otherwise meet a lower level of performance, based on existing building codes. The program is also designed to provide general information and foster contacts among building design teams and building owners to help new and rehabilitated commercial, industrial, and institutional buildings achieve higher levels of energy and environmental performance. In addition to the tax credit program, a new incentive program to foster interest in high-performance single-family residential buildings has also been initiated.

## **RENEWABLE ENERGY TASK FORCE**

Comprised of 20 private-sector and government representatives, the Renewable Energy Task Force issued a Report in February 2008, listing 16 specific policy and program recommendations which constitute a roadmap to significantly increase the use of renewable energy in New York. Recommendations include greater solar energy production, expanding the State's RPS, and business incentives to attract renewable energy producers and expand the State's "green collar" workforce. This Report has launched several successful initiatives, including the Vehicle Miles Traveled Task Force, a Renewable Fuels Roadmap and

Sustainable Biomass Feedstock Supply for New York, and other projects which will provide the foundation to advance the recommendations into sound energy and environment programs (NYSERDA Report 10-05, April, 2010).

## **NET METERING**

Net Metering allows electricity customers with qualified renewable energy systems including home-based solar and wind systems and farm-based waste digester systems to sell excess electricity generated by such facilities to the local utility. Several 2008 laws authorized expansion of the existing programs, increasing the maximum amount of energy that utilities are required to buy from host energy sites through net metering.

## **STATE OPERATIONS POLICIES**

Designed to affect State government operations and improve the energy and environmental performance of State assets and resources, several programs have been initiated and implemented through Executive Order (EO). These EO actions include:

### **GREEN AND CLEAN STATE BUILDINGS AND VEHICLES GUIDELINES (EO 111)**

EO 111 requires State buildings to reduce energy consumption by 35% of 1990 levels by 2010, and mandates that State agencies select ENERGY STAR qualified products. Construction and renovations must follow Leadership in Energy and Environmental Design (LEED) green building standards.

### **STATE GREEN PROCUREMENT AND AGENCY SUSTAINABILITY PROGRAM (EO 4)**

EO 4 promotes the State purchase of environmentally-friendly commodities, services and technologies, as well as agency sustainability and stewardship programs.

### **USE OF BIOFUELS AND ALTERNATIVE FUELED VEHICLES (EO 142)**

EO 142 requires State agencies to phase in renewable heating and transportation fuels. The State is working to assess the environmental, social, and health effects of biofuels and has developed a Renewable Fuels Roadmap that lays out a sound future for New York in this area.

## **CLIMATE CHANGE ADAPTATION**

### **NEW YORK STATE SEA LEVEL RISE TASK FORCE**

The Sea Level Rise Task Force was created by the State Legislature in 2007. The Task Force was charged with evaluating ways of protecting New York's remaining coastal ecosystems and natural habitats, increasing coastal community resilience in the face of sea level rise, and applying the best available science as to sea level rise and its anticipated impacts. The Task Force produced and released a report of recommendations on January 1, 2011, including recommendations for an action plan to protect coastal communities and natural resources from rising sea levels.

### **NYS INTERAGENCY LOCAL GOVERNMENT ADAPTATION WORKGROUP**

This ad hoc workgroup facilitates development of recommendations for local adaptation planning, decision-support tool development and cooperative management of pilot projects.

## **STATE WILDLIFE ACTION PLAN (SWAP) VULNERABILITY ASSESSMENTS**

These habitat type vulnerability assessments and assessments of threats to species of special concern identify potential actions for SWAP.

## APPENDIX H. CITY OF KINGSTON CLIMATE SMART AND GREEN JOBS COMMUNITY PLEDGE

WHEREAS, the City of Kingston understands that climate change poses a real and increasing threat to our local and global environments and is primarily exacerbated by the current burning of fossil fuels; and

WHEREAS, Kingston is desirous of investigating methods to address and reduce such threats; and

WHEREAS, we believe the scale of greenhouse gas (GHG) emissions reductions required for climate stabilization will require sustained and substantial efforts and that even if emissions were dramatically reduced today, communities would still be required to adapt to the effects of climate change for decades to come; and

WHEREAS, we believe that our timely response to climate change provides us with an unprecedented opportunity to save money, and to build livable, energy-independent and secure communities, vibrant innovation economies, healthy and safe schools, and resilient infrastructures; and

WHEREAS, there exists opportunities to take a comprehensive approach to implement policies and programs at the local government level to reduce greenhouse gas emissions, increase energy efficiencies, promote local job growth, increase economic activity and resiliency, improve quality of life, and promote social justice; and

WHEREAS, we believe that Kingston is in a position to set an example, for all of New York State, on how a small city can make a big difference, Kingston has a long-standing interest in attracting and retaining innovative businesses; and

WHEREAS, the effects of climate change will significantly impact our infrastructure, economy and livelihoods, disrupt our ecological communities, spread invasive species and exotic diseases, negatively impact our drinking water supplies and storm water and sewer treatment infrastructure, and pose health threats to our citizens; and

WHEREAS, the “green economy” of clean and efficient energy systems, high performance buildings, clean and efficient transportation, healthy materials and products, is an arena of emerging interest in New York State with job growth and training opportunities already emerging through the area’s solar, wind, geothermal and energy services companies, as well as other dynamic sectors; and

WHEREAS, we believe a local commitment to climate change will contribute substantially to other community objectives and competitively position the City of Kingston for funding through the American Recovery and Reinvestment Act, offering Energy-Efficiency Block Grants, and other applicable future federal grant opportunities, such as the pending American Clean Energy and Security Act of 2009, reducing energy cost and improving operational efficiency of aging infrastructure will lower Kingston’s government operating cost and save taxpayer dollars, in addition to lowering infrastructure and service costs, community-wide climate protection will also help to maintain property values by making communities desirable and attractive to new residents,

IT IS HEREBY RESOLVED that the City of Kingston, shall strive to reduce greenhouse gas emissions and adapt to a changing climate and does therefore designate the City of Kingston Conservation Advisory Council to establish a Climate Smart and Green Jobs Taskforce to review the issues and propose a plan of action.

Recommend to the Mayor a City of Kingston employee, with an environmental background, who will oversee climate change and green jobs initiatives, publicly report on progress in conjunction with a Climate Smart and Green Jobs Taskforce and the Conservation Advisory Council, and work cooperatively with similar task forces and organizations within Kingston and in neighboring communities to ensure that

efforts complement and reinforce one another. The Mayor shall designate a city employee to act in said capacity.

The task force shall be charged with investigating the following and making recommendations to the Common Council regarding same:

### **1. Pledge to combat climate change by becoming a Climate Smart Community**

Set goals, both short term and long term, to reduce GHG emissions and adapt to predicted climatic changes.

### **2. Set Goals, Inventory Emissions, Move to Action**

Gather data, inventory GHG emissions, and establish baselines for local government operations and community sectors. Develop quantifiable interim GHG emission targets consistent with emission reduction goals and annually propose a schedule and financing strategy to meet them. Encourage stakeholder and public input and develop an action plan.

### **3. Decrease Energy Demand for Local Government Operations**

Work with schools, hospitals, and city agencies, who will educate the public, in order to adopt and meet a goal of reducing electricity use by 15 percent from projected levels by or before 2015.

A. Existing Public Facilities. Inventory current building electricity usage and identify opportunities for conservation and efficiency retrofits. Obtain energy assessments from the New York State Energy Research and Development Authority (NYSERDA), the New York Power Authority, Central Hudson Gas and Electric Corporation or other professionals. Purchase energy efficient equipment and appliances, so as to meet current New York State ENERGY STAR standards; improve lighting, heating, and cooling efficiency; set thermostats for maximum energy conservation; decrease plug load from office equipment; and increase pump efficiency in water and wastewater systems.

B. New Public Buildings. Achieve, at least, a LEED Silver rating (U.S. Green Building Council Leadership in Energy and Environmental Design), or the equivalent, for all new local buildings.

C. Infrastructure. Incorporate energy efficient technologies and operations and maintenance practices into municipal street lighting, traffic signals, and water and wastewater treatment facilities.

D. Vehicle Fleet and Commuting. Improve the average fuel efficiency of local government fleet vehicles. Discourage vehicle idling and encourage bicycling, car-pooling, and public transit for employees. Add bike-racks to all city buses and paint bike lanes. Consider reducing the number of vehicles; converting fleet vehicles to sustainable alternative fuels; and using electric vehicles where possible. Establish a tele-commuting policy for city employees, where appropriate.

#### **4. Encourage Renewable Energy for Local Government Operations**

Supply as much of the local government's power, heat, and hot water needs as possible from solar, wind, and small hydro through purchase or direct generation.

#### **5. Realize Benefits of Recycling and Other Climate Smart Solid Waste Management Practices**

Expand the "reduce, reuse, recycle" approach to waste management in local government operations and in the whole community. Reduce the amount of solid waste generated—promote backyard composting, implement volume-based pricing and educate residents on how to prevent waste. Promote reuse and provide a space for drop-off or trade of reusable goods. Provide recycling receptacles in local government buildings and outdoor spaces, require duplex printing in government offices, compost food scraps and green waste, and adopt a comprehensive green purchasing program.

#### **6. Promote Climate Protection Through Community Land Use Planning**

Combat climate change by encouraging low-emissions development that is resilient to climatic changes. When updating land use policies, building codes or community plans, include provisions to combat climate change; reduce sprawl, preserve and protect open space, biodiversity, and water supplies; promote compact, transit-oriented, bikeable and walkable communities; promote infill development, minimize new development in floodplains; maintain or establish healthy community forests; and promote best forest management practices and encourage tree planting, especially along waterways and streets, to increase shading and to absorb carbon dioxide. Use the authority of the City's planning board to assure that new development projects reflect the community's desires for viable ecosystems and low carbon footprints.

#### **7. Plan for Adaptation to Unavoidable Climate Change**

Evaluate risks from unavoidable climate change, set adaptation goals and plan for adaptation. Identify climate change impacts (such as flooding, drought, and extreme temperatures) that could affect the community. Identify areas such as water supply and sewer infrastructures that may be at risk due to increased intensity of rainfall, turbidity and sedimentation, increased flash floods and increased droughts in late summer, sea-level rise, and other future changes in climate. Factor risks into long-term investments and decision-making. Execute climate change adaptation and preparedness measures through local government planning, development, and operation, giving priority to the highest risk areas.

#### **8. Green Innovation Strategy**

The Climate Smart and Green Jobs Taskforce. Engage the Conservation Advisory Council and local relevant industry associations, non-governmental associations, county, state, and local agencies community members and employers, churches, and unions to review the options and produce a concrete, actionable green innovation strategy (including budget, funding sources, and predicted return on investment) for implementation by appropriate city departments, with the support of partner agencies, with a goal of completion of 6 months. Identify key leaders in the community and consult, develop, reinvigorate, or realign partnerships with potential leaders and organizations such as: community organizations, unions, businesses, workforce development programs, schools, and advocates.

Identify Goals and Assess Opportunities. Ensure that overarching economic and environmental goals are integrated with job development. Identify opportunities to incorporate climate protection, sustainability and environmental goods and service industries into economic development plans. Consider how energy conservation programs or renewable energy development will provide opportunities for local job creation.

Create a Local Action Plan. Create demand for green-collar jobs with policies, investment, and incentives that expand the market for green products and services. Prepare a green-collar workforce by building on existing training programs that provide job seekers with “pathways out of poverty” and family-supporting, career-track jobs. Encourage workforce development training and school curricula that support the emerging green-collar sector, including renewable energy and energy efficiency, as well as climate smart solid waste management practices. Procure climate smart goods and services for local government operations and support modernizing of local and national electricity grids.

Evaluate, Leverage, and Grow. Track progress, quantify achievements, and build on partnerships and successes to enhance public support and develop new resources. The Climate Smart and Green Jobs Taskforce shall report to the Common Council and the general public, at least once a year on jobs created and retained, lessons learned, and progress made through the strategy toward creating a greener and more livable city.

## **9. Inform and Inspire the Public**

Lead by example. Highlight local government commitment to reducing energy use, saving tax dollars, and adapting to changing conditions. Demonstrate the benefits of energy savings, energy efficiency, and renewable energy projects by communicating community climate goals and progress to constituents through various means.

## **10. Commit to an Evolving Process**

Acknowledge that research and policy on climate protection are constantly improving and evolving. Be willing to consider new ideas and commit to update plans and policies as needed. Compare successes, cooperate and collaborate with neighboring communities to redirect less effective actions and amplify positive results.

## APPENDIX I. CITY OF KINGSTON EMPLOYEE COMMUTING SURVEY

October 2011

The purpose of this survey is to gather information on your commute to work so we can evaluate transportation options that can reduce greenhouse gas emissions and minimize our impact on the environment. Unless otherwise indicated, all questions refer to a ONE-WAY commute TO WORK only. Please do not include any traveling you do during work hours (meetings, site visits, etc.). Please do not include any commuting or traveling done in a city assigned or city fleet vehicle as those emissions are being counted separately.

This 4-page survey should only take about 10 minutes to complete.

**The responses provided are completely confidential. Information and data collected will not be reported for any individual who responds to the survey.**

Please answer as accurately as you can. Thank you in advance for your cooperation and assistance.

*Your participation is greatly appreciated!*

### 1. Workplace

What Department do you work for?

If your work location Zip Code is Different than 12401, please indicate it here.

### 2. Background Information

What city/town do you live in?

What is your home ZIP Code?

How many miles do you live from your place of work? (please enter a whole number)

How many minutes does your commute to work typically take? (please enter a whole number)

In a typical week, how much money do you spend on your ROUND TRIP commute? (transit fees, gas, tolls, etc. - please enter a number)

### 3. General Vehicle Information

What year is your vehicle? (please enter a four digit year)

What is the make and model of your vehicle? (Examples: "Toyota Prius," "Dodge Dakota").

What type of fuel does your vehicle use (Gas, Diesel, Biodiesel B20, Biodiesel B99 or B100, Electricity, Compressed Natural Gas)? If other, please specify.

What is the average fuel efficiency rating of your vehicle (mpg)? It is OK to estimate or guess/

If you drive to work, what type of vehicle do you usually drive? Please choose from the following:

Passenger Car

Light Truck/SUV/Pick-Up/Van

Heavy Truck

Motorcycle/Scooter

### Employment Information

Do you typically travel to work between 6-9 am Monday-Friday? (Yes/No – if no, please specify what time of day you commute)

Are you a full time employee or part time employee? (Full/Part)

If you are a part-time employee, what is the average number of days you work per week? (please enter a number)

## 2010 Daily Commute

Approximately how many days did you travel to work in 2010?

To determine days traveled to work in 2010 please multiply the number days per week you traveled to work by the number of weeks worked in 2010. (please enter a number)

\_\_\_\_ days traveled to work per week X \_\_\_\_ weeks traveled to work in 2010

*52 = worked every week. Please subtract vacation and sick time, leave, time and any other time during the year that you didn't travel to work for the City.*

In 2010, how many MILES per day did you typically drive TO WORK ONLY? (please enter a number)

Approximately how many days did you telecommute (work at home) in 2010, not traveling for work (please enter a number)

## How you got to work

Based on the following modes of transportation, please estimate the percent of travel to and from work last year. If you drive to work alone in your car every day, please put 100 in the first box and go to the question 7. The numbers below should add up to 100%.

Percent of Travel

Drive Alone	
Carpool	
Bus	
Motorcycle	
Scooter	
Bicycle	
Walk	
Other(please specify)	

## Commuter Preference Information

If you usually drive to work alone, would you consider taking any of the following transportation modes? (Please check (v) all that apply)

- \_\_\_\_ Carpooling
- \_\_\_\_ Vanpooling
- \_\_\_\_ Public Transportation
- \_\_\_\_ Bicycling
- \_\_\_\_ Walking
- \_\_\_\_ Telecommute
- \_\_\_\_ Other (please specify)

If you usually drive to work alone, why don't you carpool or vanpool? (Please check (v) all that apply)

- \_\_\_\_ Other people do not match my schedule or route
- \_\_\_\_ Difficult to find others to carpool/vanpool
- \_\_\_\_ Work late or irregular hours
- \_\_\_\_ May not be able to get home quickly in an emergency
- \_\_\_\_ Like the privacy when I'm in my own car

- ☐ Dislike being dependent on others
- ☐ Need my car on the job
- ☐ Need to make stops on the way to work or home
- ☐ I don't know enough about carpooling or vanpooling
- ☐ Never considered carpooling or vanpooling
- ☐ Other (please specify)

If you usually drive to work alone, why don't you use public transit? (Please check (v) all that apply)

- ☐ Transit service doesn't match my route or schedule
- ☐ It costs too much
- ☐ It takes too long
- ☐ It is not safe or easy to walk to work from the transit stop
- ☐ Not enough parking at the transit stop from which I'd depart
- ☐ It is too far to walk to work from the transit stop
- ☐ I work late or irregular hours
- ☐ May not be able to get home quickly during an emergency
- ☐ Like the privacy when I'm in my own car
- ☐ Need my car on the job
- ☐ Need to make stops on the way to work or home
- ☐ I don't know enough about taking transit
- ☐ Never considered using public transit
- ☐ Other (please specify)

If you usually drive to work alone, why don't you bike or walk? (Please check (v) all that apply)

- ☐ I live too far away
- ☐ There isn't a safe or easy route for walking or biking
- ☐ Weather
- ☐ No place at work to store bikes safely
- ☐ It's not easy to look good and feel comfortable for work after walking or biking
- ☐ Workplace does not have adequate facilities for showering/changing
- ☐ May not be able to get home quickly in an emergency
- ☐ Need to make stops on the way to work or home
- ☐ Never considered walking or biking to work
- ☐ Other

If you have other concerns or issues related to your commute, or if something we should know about were not captured in any survey questions, please describe.

### **Background**

As part of international, national, regional and local efforts to address climate change, the City of Kingston is conducting a greenhouse gas inventory and developing a Climate Action Plan based on the ten principles of the *Kingston Climate Smart and Green Jobs Community Pledge*. We will be estimating the greenhouse gas emissions produced in the community including city operations. The ultimate goal is to supplement current efforts to improve efficiency in municipal operations, reduce energy costs for the city, save taxpayer dollars and reduce emissions of greenhouse gases that will result in a cleaner, healthier community. The Climate Action plan will be consistent with other local efforts that seek to improve the quality of life in Kingston and make government operations as efficient as possible.

## EMPLOYEE COMMUTING SURVEY SUMMARY OF RESULTS

51 total responses, 12.56 % of 406 employees

23 Employees Commute by Light Trucks - 20,638 miles traveled.

Based on 12.56% response, extrapolate 23 is 12.56% of 183 vehicles. TOTAL -183 Light Trucks

26 Employees Commute by Passenger cars - 23,335 miles traveled

Based on 12.56% response, extrapolate 26 is 12.56% of 207 vehicles

1 Employee Commutes by Bus

Based on 12.56%, extrapolate, 1 is 12.56% of 8, 8 people take the bus

1 Employee Commutes by Walking

Based on 12.56%, extrapolate, 1 is 12.56% of 8, 8 people walk to work

42 respondents drive alone 100% of the times

Extrapolation for Total VMT (Based on 12.56% response rate)

49 respondents with vehicle type

### LIGHT TRUCKS

23 light trucks with 20,638 miles traveled = average 897 miles per vehicle one way

183 Light trucks x 897 miles traveled per vehicle = 164,151 miles traveled for Light Trucks one way

164,151 miles x 2 = 328,302 traveled ROUND TRIP for Light Trucks

### PASSENGER VEHICLES

26 passenger cars 23,335 miles traveled, average 897.5 miles per vehicle one way

26 is 12.56% of 207 vehicles

207 passenger vehicles X 897.5 miles per vehicle = 185,783 miles for Passenger cars one way

185,783 miles x 2 = 371,566 miles ROUND TRIP for Passenger cars

### Extrapolation for Gas Consumption

(Used same methodology as above to estimate fuel used.)

### LIGHT TRUCKS

19 Light Trucks provided fuel efficiency.

Determined average gallons of gas consumed per LT by using MPG to calculate the number of gallons used per mile. For example, if vehicle gets 12 mpg, divide 12 into one, result is vehicle uses 0.0833 gallon per mile. Every mile driven by this vehicle it is consuming 0.0833 gallon of gas.

Gallons used per mile were multiplied by miles traveled to work each year (one way). For example if this same vehicle traveled 520 miles to work every year (one-way)  $520 \times 0.833 = 43.44$  gallons of gas consumed, multiplied by 2 for the round trip = 86.67 gallons per year.

The total gallon consumed for the 19 light trucks in 2010 was 1,090.4 (one way) and 2,180.8 (round trip) which is an average of 114.78 gallons per light truck.

183 Light trucks x 114.78 gallons per light truck ROUND TRIP = 21,004.74 total gallons of gas light trucks ROUND TRIP

Ave price per gallons of gas 2010 = \$2.909

Estimated Cost = 21,004.74 total gallons of gas x \$2.909 = \$61,102.79

Data input to CACP 2009, 21,005 gallons, \$61,103.

### PASSENGER VEHICLES

Fuel efficiency was provided for 20 passenger vehicles

Using same methodology as above.

The total gallons of gas consumed for the 20 passenger cars in 2010 was 976.49 (one way), 1,952.98 (round trip) which is an average of 97.65 gallons per passenger vehicle.

207 passenger vehicles x 97.65 gallons per passenger vehicle = 20,213.55 total gallons of gas passenger vehicles.

Ave price per gallons of gas 2010 = 2.909

Estimated Cost = 20,213.55 total gallons of gas x \$2.909 = \$58,801.22

Data input to CACP 2009, 20,214 gallons, \$58,801.00

### TOTAL GALLONS

21,005 + 20,214 = 41,219

### TOTAL COST

\$61,103.00 + \$58,801.00 = \$119,904.00

41,219 gallons x \$2.909 = \$119,906 Ave price per gallons of gas 2010 = 2.909

## APPENDIX J. CITY OF KINGSTON WASTEWATER TREATMENT PLANT

A separate GHG analysis of the plant is important as wastewater is rich in organic matter with a high concentration of nitrogen and carbon (along with other organic elements). As wastewater is collected, treated, and discharged, chemical processes in aerobic and anaerobic conditions lead to the creation and emission of two greenhouse gases: methane and nitrous oxide. The City of Kingston as an operator of a wastewater treatment facility, must therefore account for the emission of these gases. Therefore in addition to the GHG emissions produced from the use of electricity, natural gas and other fuels, this analysis also includes the GHG emissions associated with methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O) emissions that are produced during the processing and treatment of wastewater and sludge.

The City of Kingston WWTP serves the city population of approximately 24,000 people as well as local commercial and industrial facilities.

### WWTP ENERGY SUMMARY

The total energy costs associated with the operation of the wastewater treatment plant (WWTP) and sewers in 2010 were \$335,992. The WWTP used a significant amount of energy, primarily electricity. The WWTP total energy costs accounted for more than 21% of the City government's total energy costs (\$335,992 of \$1,590,415), second only to the operation of street lights and traffic signals. The plant's electricity usage accounted for almost 40%<sup>59</sup> of the government operations electricity, the largest percentage of government operations total electricity usage.

In 2010 the wastewater treatment facility (buildings, pumps and CSO stations) was the largest single user of the City of Kingston's government operations electricity consuming 2,525,109 kWh. The cost for the main plant and the annex was \$225,958 and including pumps and CSO stations the total electricity costs for wastewater and sewer was \$268,206. The electricity costs at the plant alone accounted for approximately 17% of the City's total energy costs, and approximately 26% the governments overall electricity bill of \$1,012,384. The plant's electricity usage accounts for almost 40%<sup>60</sup> of the government operations electricity, the largest percentage of the governments total electricity usage.

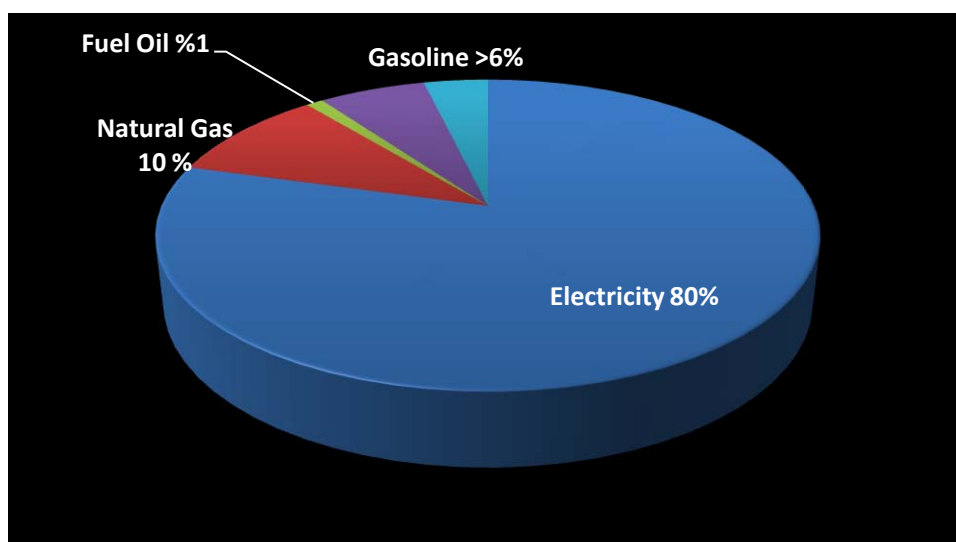
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<sup>59</sup> (2,525,109 kWh of 6,461,721 kWh) Percentage based on City operations electricity usage, does not includes KHA, KWH and Dietz Stadium.

<sup>60</sup> (2,525,109 kWh of 6,461,721 kWh) Percentage based on City operations electricity usage, does not includes KHA, KWH and Dietz Stadium.

**Table 1: WWTP Energy Usage and Cost Summary**

City of Kingston WWTP Energy Usage and Cost	2010 Total Usage	2010 Total Energy Cost	% of Total Cost
Electricity (kWh)	2,525,109	\$268,207	80
Natural Usage (Ccf)	23,386	\$32,730	10
Fuel Oil (Gal)	876.1	\$2,206	<1
Propane (Gal)	0	0	0
Vehicle Fuel Gas (Gal)	8,517.7	\$20,543	6
Vehicle Fuel Diesel (Gal)	4,958.3	\$12,306	4
<b>TOTAL</b>		<b>\$335,992</b>	

**Figure 1: WWTP 2010 Energy Costs**

## WWTP GHG EMISSIONS

The operations of the wastewater treatment system as a whole contributed an estimated 1,329 tonnes of CO<sub>2</sub>e. Most of the emissions are from buildings and facilities. The use of electricity, natural gas and fuel oil resulted in the release of an estimated 921 tonnes of CO<sub>2</sub>e with electricity usage accounting for the largest contributor to GHG emissions as depicted in Table 2 and Figure 2.

The plant's process emissions, methane and nitrous oxide, produced an estimated 281 tonnes of CO<sub>2</sub>e, 37 and 244 tonnes respectively. Vehicle use at the plant resulted in 127 tonnes of CO<sub>2</sub>e.

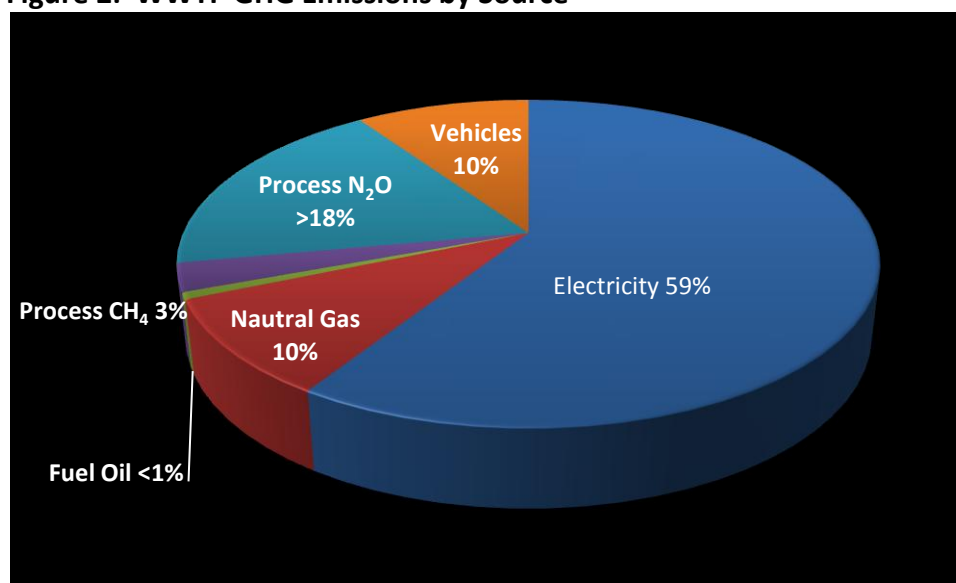
Wastewater treatment facility operations accounted for 29% of the City operations GHG emissions of 4,587 tonnes of CO<sub>2</sub>e. Wastewater treatment plant emissions are 18% of the overall total emissions of 7,281<sup>61</sup> tonnes of CO<sub>2</sub>e that includes KHA, KWD, Dietz Stadium and employee commuting emissions.

<sup>61</sup> GHG emissions total includes all City operations, KHA, KWD, Dietz and employee commuting.

**Table 2: WWTP GHG Emissions Summary**

WWTP GHG Emissions Summary	CO <sub>2</sub> (tonnes)	N <sub>2</sub> O (kg)	CH <sub>4</sub> (kg)	CO <sub>2e</sub> (tonnes)	Energy (MMBtu)	Cost (\$)	% of CO <sub>2e</sub>
Buildings and Facilities Scope 2 Electricity	780	10	18	785	8,619	\$268,205	59
Buildings and Facilities Scope 1 Natural Gas	126	0	13	127	2,395	\$24,220	10
Fuel Oil (#1 2 4)	9	0	1	9	121	\$2,206	1
Methane (CH <sub>4</sub> ) emissions from anaerobic digester	0	0	1,738	37	0	0	3
Process & Effluent-Nitrous Oxide(N <sub>2</sub> O) Emissions	0	789	0	244	0	0	18
Vehicles	<u>125</u>	<u>5</u>	<u>5</u>	<u>127</u>	<u>3,320</u>	<u>\$32,849</u>	10
<b>TOTALS</b>	<b>1,040</b>	<b>804</b>	<b>1,775</b>	<b>1,329</b>	<b>14,455</b>	<b>\$327,480</b>	

**Figure 2: WWTP GHG Emissions by Source**



## WWTP BUILDINGS AND FACILITIES

The WWTP buildings and facilities are the primary users of electricity, accounting for 2,255,051 kWh or more than 89% of the total electricity usage WWTP operations, whereas pump stations and CSOs accounted for 270,058 kWh or about 11% of the usage. The main WWTP building at 91 East Strand was the primary user of electricity, consuming 2,233,440 kWh in 2010. Several of the pump stations were significant users of electricity, including the siphon 454 Wilbur Ave/South Wall, East Strand/Broadway CSO, Harding Ave and Delaware Ave pump stations.

**Table 3: WWTP 2010 Electricity Usage and Cost**

City of Kingston WWTP & Sewer Electricity Usage & Cost Buildings	2010 Total Electricity Usage CH (kWh)	2010 Total Amount Billed CH (\$)	2010 Total Amount Billed Hess (\$)	Total Cost (\$)
91 E Strand St Bldg 17	2,233,440	\$56,593	\$166,425	\$223,018
394-458 Wilbur Ave	19,891	\$459	\$1,708	\$2,166
Wilbur Ave (Sewer Annex)	1,720	\$395	\$202	\$596
Wilbur Ave (Electric)	0	\$380	0	\$380
<b>TOTALS - BUILDINGS</b>	<b>2,255,051</b>	<b>\$57,825</b>	<b>\$168,335</b>	<b>\$226,160</b>
<b>Electricity Usage &amp; Cost Pumps and CSOs</b>				
Siphon Pump Sta 454 Wilbur Ave/South Wall Pump Sta	53,501	\$3,397	\$4,295	\$7,692
E Strand/Bway-CSO Sta (Broadway Strand Pump Sta)	32,936	\$1,819	\$2,241	\$4,060
Harding Ave Pump Station	28,812	\$1,815	\$2,455	\$4,271
Delaware Ave Sew Pump Sta	23,251	\$1,804	\$1,967	\$3,772
Summer St Pump Sta	19,879	\$545	\$1,246	\$1,790
Wilbur Ave-CSO Sta Sewer Overflow	17,777	\$1,243	\$1,515	\$2,757
Converse St Frog Alley Pump Station	17,665	\$1,677	\$1,335	\$3,012
San Dept Stony Run Apts Hurley Ave Pump Sta	15,383	\$468	\$1,280	\$1,749
E Strand/Bway-CSO Sta KNG Wastewater Plant	13,751	\$1,251	\$928	\$2,179
Hunter & Abeel STS#3 (Hunter St Pump Sta)	13,656	\$1,663	\$1,113	\$2,776
Pump Sta Clifton Ave	11,040	\$399	\$917	\$1,316
Wilbur & Abeel STS#1 (Wilbur Pump Sta)	4,896	\$388	\$424	\$812
E Chester St Pump St	4,270	\$397	\$366	\$763
Pumping Sta Kingston St Pump Sta	3,893	\$395	\$332	\$726
Tammany St Pump St	2,309	\$593		\$593
North St Pump Sta	1,503	\$376	\$127	\$503
Fourth Ave Pump Sta	1,500	\$515		\$515
373 Abeel St (DeWitt St Pump Sta)	1,272	\$487		\$487
Abeel St/Dunn St Pump Sta	1,200	\$483		\$483
1 Broadway Pump Sta	680	\$439		\$439
Valley St Pump Sta	530	\$372	\$45	\$417
West Strand Park Pump Sta	223	\$534		\$534
Abeel St Pump	131	\$399		\$399
Pump Sta Clifton Ave				\$0
<b>TOTALS PUMPS &amp; CSOs</b>	<b>270,058</b>			<b>\$42,046</b>
<b>TOTALS</b>	<b>2,525,109</b>			<b>\$268,206</b>

## WWTP SCOPE 2 BUILDING & FACILITIES GHG EMISSION (PURCHASED ELECTRICITY)

Purchased electricity at WWTP buildings and facilities resulted in an estimated 785 tonnes of CO<sub>2</sub>e or 60% of the overall emissions from the WWTP. As expected the main WWTP building at 91 E Strand was responsible for the bulk of emissions; an estimated 696 tonnes of CO<sub>2</sub>e. It is important to note that the second and third largest producers of GHG emissions from the use of electricity are the siphon 454 Wilbur Ave/South Wall and East Strand/Broadway CSO (Broadway Strand) pump stations.

**Table 4: WWTP Buildings & Facilities Scope 2 Purchased Electricity GHG Emissions**

WWTP Buildings & Facilities Scope 2 Purchased Electricity GHG Emissions	CO <sub>2</sub> tonnes	N <sub>2</sub> O (kg)	CH <sub>4</sub> (kg)	Equiv CO <sub>2</sub> (tonnes)	Energy (MMBtu)	Cost (\$)
WWTP 91 E Strand St Bldg 17	692	10	18	696	7623	\$223,018
Siphon Pump Station 454 Wilbur Ave/South Wall Pump	17	0	0	17	183	\$7692
Strand/Bway-CSO Sta (Broadway Strand Pump Sta)	10	0	0	10	112	\$4060
Harding Ave Pump Station	9	0	0	9	98	\$4271
Delaware Ave Sew Pump Sta	7	0	0	7	79	\$3772
Wilbur Ave-CSO Sta Sewer Overflow	6	0	0	6	61	\$2757
394-458 Wilbur Ave Electric	6	0	0	6	68	\$2166
Converse St Frog Alley Pump Station	5	0	0	6	60	\$3012
Summer St Pump Sta	6	0	0	6	68	\$1790
San Dept Stony Run Apts Hurley Ave Pump Sta	5	0	0	5	53	\$1749
Hunter & Abeel STS#3 (Hunter St Pump Sta)	4	0	0	4	47	\$2776
E. Strand/Bway-CSO Sta	4	0	0	4	47	\$2179
Pump Sta Clifton Ave	3	0	0	3	38	\$1316
Wilbur & Abeel STS#1 (Wilbur Pump Sta)	2	0	0	2	17	\$812
E Chester St Pump St	1	0	0	1	15	\$763
Kingston St Pump Sta	1	0	0	1	13	\$726
Tammany St Pump St	1	0	0	1	8	\$593
Wilbur Ave Electric(Sewer Annex)	1	0	0	1	6	\$596
Valley St Pump Sta	0	0	0	0	2	\$417
1 Broadway Pump Sta	0	0	0	0	2	\$439
Abeel St Pump	0	0	0	0	0	\$399
Abeel St/Dunn St Pump Sta	0	0	0	0	4	\$483
DeWitt St Pump Sta-373 Abeel St	0	0	0	0	4	\$487
Fourth Ave Pump Sta	0	0	0	0	5	\$515
North St Pump Sta	0	0	0	0	5	\$503
West Strand Park Pump Sta	0	0	0	0	1	\$534
Wilbur Ave	0	0	0	0	0	\$380
<b>TOTALS</b>	<b>780</b>	<b>10</b>	<b>18</b>	<b>785</b>	<b>8619</b>	<b>\$268,205</b>

## WWTP NATURAL GAS

Natural gas usage was not as significant as the electricity usage with WWTP and sewers accounted for about 6% of the city's total natural gas usage and about 10% of the total cost.<sup>62</sup> The primary consumer of natural gas at the WWTP was the use of natural gas for the sludge pelletizer.

**Table 5: WWTP 2010 Natural Gas Usage and Cost**

City of Kingston WWTP 2010 Natural Gas Usage & Cost	2010 Total Gas Usage CH (CCF)	2010 Total Gas Usage (Therms)	2010 Total Amount Billed -CH (\$)	2010 Totals Amount Billed - Hess (\$)	Total Cost (\$)
85 E Strand St Bldg 13 (Aslan Pelletizer)	11436	11711	\$4,433	\$10,683	\$15,116
91 E Strand St*	7471	7650	\$3,100	\$6,776	\$9,875
85 E Strand	2277	2331.648	\$1,275	\$1,734	\$3,010
91 E Strand	1016	1040	\$936	\$944	\$1,880
Wilbur Ave	1133	1160	\$905	\$1,142	\$2,047
Pump Sta Clifton Ave	45	46	\$404	\$8	\$412
Harding Ave Pump Station	<u>8</u>	<u>8</u>	<u>\$384</u>	<u>\$6</u>	<u>\$390</u>
<b>TOTALS</b>	<b>23,386</b>	<b>2,947</b>	<b>\$11,436</b>	<b>\$21,293</b>	<b>\$32,730</b>

## WWTP SCOPE 1 BUILDING & FACILITIES GHG EMISSION (NATURAL GAS)

The use of natural gas for the operation of WWTP and sewers resulted in GHG emissions of an estimated 127 tonnes of CO<sub>2</sub>e, with the pelletizer contributing approximately half of the GHG emissions.

**Table 6: WWTP Buildings & Facilities Scope 1 Station Combustion GHG Emissions from Natural Gas Usage**

WWTP Buildings & Facilities Scope 1 2010 GHG Emissions Natural Gas	CO <sub>2</sub> tonnes	N <sub>2</sub> O (kg)	CH <sub>4</sub> (kg)	Equiv CO <sub>2</sub> (tonnes)	Energy (MMBtu)	Cost (\$)
WWTP 85 E Strand St Bldg 13 Aslan Pelletizer	62	0	6	62	1171	\$15116
WWTP 91 E Strand St	40	0	4	41	765	\$9,875
WWTP 85 E Strand	12	0	1	12	233	\$3,010
Wilbur Ave (Sewer Annex)	6	0	1	6	116	\$2,047
WWTP 91 E Strand St-2 Gas	6	0	1	6	104	\$1,880
Harding Ave Pump Station	0	0	0	0	1	\$390
Pump Sta Clifton Ave	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>5</u>	<u>\$412</u>
<b>TOTALS</b>	<b>126</b>	<b>0</b>	<b>13</b>	<b>127</b>	<b>2395</b>	<b>\$32,730</b>

<sup>62</sup> This includes KHA natural gas usage which is the most significant user of natural gas of City sectors analyzed. Not including KHA natural gas usage, WWTP natural gas usage and cost accounts for about 19% of the City's total.

## WWTP FUEL OIL

In 2010, the WWTP used 876.1 gallons of fuel oil at a cost of \$2,206. Fuel oil use resulted in GHG emissions of an estimated 9 tonnes of CO<sub>2</sub>e.

**Table 7: WWTP 2010 Fuel Oil Usage and Cost**

City of Kingston 2010 WWTP Fuel Oil Usage & Cost	Quantity (Gallons)	Ave Price Per Gallon 2010	2010 Total Cost
WWTP 91 E. Strand	876.1	2.49435	\$2,206.38

**Table 8: WWTP Buildings & Facilities Scope 1 GHG Emissions Fuel Oil**

WWTP Buildings & Facilities 2010 Scope 1 GHG Emissions Fuel Oil	CO <sub>2</sub> tonnes	N <sub>2</sub> O (kg)	CH <sub>4</sub> (kg)	Equiv CO <sub>2</sub> (tonnes)	Energy (MMBtu)	Cost (\$)
WWTP Fuel Oil (#1 2 4) 91 E. Strand	9	0	1	9	121	\$2,206

## WWTP TREATMENT, EFFLUENT AND DIGESTER EMISSIONS

Wastewater treatment involves a unique set of process that can create fugitive GHGs emissions. Wastewater is collected and treated to remove soluble organic matter, suspended solids, pathogenic organisms, and chemical contaminants. At the City of Kingston Wastewater Treatment Plant (WWTP) soluble organic matter is removed using anaerobic biological processes in which microorganisms consume the organic matter and the resulting biosolids (sludge) are removed from the effluent prior to discharge to the receiving water. The WWTP uses a nitrification/denitrification process in its treatment of the wastewater.

Anaerobic conditions lead to the production of CH<sub>4</sub> (methane). The generation of N<sub>2</sub>O (nitrous oxide) is also a result from the treatment of domestic wastewater during both nitrification and denitrification of the nitrogen present, usually in the form of urea, ammonia, and proteins.<sup>63</sup>

As depicted in Table 9, 0.863 tonnes of N<sub>2</sub>O and 1.916 tonnes of CH<sub>4</sub> were produced by Kingston WWTP processes and by the gases released by WWTP digester. The N<sub>2</sub>O and CH<sub>4</sub> emissions resulted in the total GHG emissions of an estimated 281 tonnes of CO<sub>2</sub>e.

<sup>63</sup> Local Government Operations Protocol, Version 1.1 May 2010, p. 106

**Table 9: WWTP Treatment, Effluent and Digester Emissions GHG Emissions**

WWTP Treatment, Effluent and Digester GHG Emissions	N <sub>2</sub> O (tonnes)	N <sub>2</sub> O (kg)	CH <sub>4</sub> (tonnes)	CH <sub>4</sub> (kg)	CO <sub>2e</sub> (tonnes)
N <sub>2</sub> O Process Emissions from Treatment and Effluent Discharge	0.8693	789	0	0	244
CH <sub>4</sub> emissions from anaerobic digester	0	0	1.916	1738	37
<b>TOTALS</b>	<b>0.8693</b>	<b>789</b>	<b>1.916</b>	<b>1738</b>	<b>281</b>

Process Emissions from the WWTP - Metric Tons of N<sub>2</sub>O = 0.2100

Process Emissions from Effluent Discharge - Metric Tons of N<sub>2</sub>O = 0.6593

Total N<sub>2</sub>O emissions from WWTP = 0.8693

CH<sub>4</sub> emissions from anaerobic digester = 1.916 Metric Tons of CH<sub>4</sub>

## WWTP VEHICLES

In 2010 the WWTP, had a total of 17 vehicles and 6 pieces of equipment. To power these vehicles and equipment in 2010, the WWTP used 8,517.70 gallons of gasoline (47% of DPW total of 18,124.5 gallons) at a cost of \$20,543 (47% of DPW total of \$43,644). In 2010 the WWTP used 4,958 gallons of diesel fuel (12% of DPW total of 40,735 gallons) at a cost of \$12,306 (12% of DPW total of \$101,891) for a total fuel cost of \$32,849 (\$145,535). Diesel fuel costs accounted for more than 70% of the total DPW fuel costs in 2010.

WWTP has 13 heavy duty trucks that accounted 5,125.8 gallons of gas at a cost of \$12,363 with an estimated 39,082 vehicle miles traveled and 7 heavy duty diesel vehicles, using 3938.9 gallons of diesel at a cost of \$9,776 with an estimated 19,593 vehicle miles traveled and estimated hours used of 2,343.

The 4 WWTP gasoline light trucks accounted for 3,367 gallons of gas at a cost of \$8,120 with an estimated 14,941 vehicle miles traveled.

Vehicles miles traveled by WWTP in 2010 were estimated to be 73,616 miles. Like other City vehicles maintenance of these vehicles is based on hours used not miles traveled.

The average price per gallon paid for gas in 2010 was 2.4119 and the average price per gallon paid for diesel was 2.4818.

**Table 10: WWTP Vehicles Usage and Cost by Vehicle Type**

WWTP Vehicles Vehicle Type	Total Number of Vehicles	No of Gas Vehicles	Gas (Gallons)	Gas Cost (\$)	No. of Diesel Vehicles	Diesel (Gal)	Diesel Cost (\$)	Total Cost (\$)
Heavy Duty	13	6	5,125.80	\$12,363	7	3,938.90	\$9,776	\$22,138
Light Truck	4	4	3,366.90	\$8,120	0	0	0	\$8,120
Passenger	0	0	0	0	0	0	0	0
Off-Road		2	<u>25</u>	<u>\$60</u>	4	<u>1,019.40</u>	<u>\$2,530</u>	<u>\$2,590</u>
<b>TOTALS</b>	<b>17</b>		<b>8,517.70</b>	<b>\$20,543</b>		<b>4,958</b>	<b>\$12,306</b>	<b>\$32,849</b>

## WWTP VEHICLE GHG EMISSIONS

The vehicles used by the WWTP resulted in total GHG emissions of an estimated 127 tonnes of CO<sub>2</sub>e, with vehicle fuel usage accounting for the majority; 125 tonnes of CO<sub>2</sub>e.

**Table 11: WWTP Vehicle & Equipment GHG Emissions**

WWTP Vehicles GHG Emissions	CO <sub>2</sub> tonnes	N <sub>2</sub> O (kg)	CH <sub>4</sub> (kg)	Equiv CO <sub>2</sub> (tonnes)	Energy (MMBtu)	Cost (\$)
Fuel Usage	125	0	0	125	1749	-
Vehicle Miles Traveled	<u>0</u>	<u>5</u>	<u>5</u>	<u>2</u>	<u>1571</u>	-
<b>TOTALS</b>	<b>125</b>	<b>5</b>	<b>5</b>	<b>127</b>	<b>3320</b>	<b>\$32,849</b>

## **APPENDIX K. SUMMARY OF FLEX TECH STUDY (WENDEL ENERGY) AND ENERGY IMPROVEMENTS AT KINGSTON WASTEWATER TREATMENT PLANT**

Through a NYSERDA Flex Tech study in 2007 the City of Kingston completed an energy audit of 24 City of Kingston-owned buildings (covering 190,434 sq ft) including City Hall, the police station, various fire stations, neighborhood and community centers, city maintenance facilities and the wastewater treatment plant. The audit identified and evaluated potential energy conservation measures (ECMs) that the City could implement to reduce annual energy costs and operating expenses.

As a result of the audit the City entered into an energy performance contract with Wendel Duchscherer, Architects and Engineers, to implement several of the ECMs. Prior to the improvements the 24 facilities evaluated had an annual energy use of 3,824,162 kWh, at a cost of \$600,305. With the recommended improvements Wendel guaranteed an annual energy savings of 1,099,906 kWh, and an annual cost savings of \$148,396. The ECMs undertaken included lighting and lighting control upgrades, building envelope improvements, some HVAC upgrades as well as equipment improvements to the wastewater treatment plant.

The total capital cost of the energy project was \$3,970,730. The city spent about \$2.1 million on the energy upgrade, primarily lighting upgrades with some building envelope and HVAC upgrades. The City obtaining a reduced interest loan through the NYSERDA Energy Smart Low Interest Loan Program and other incentives to help fund the recommended measures.

A 2009 follow-up 'Baseline Implementation Report' done by L&S Energy Services, demonstrated that the City had reduced its electricity use by 14% and total energy costs by \$72,813 in 10 of the 24 buildings. This study also identified other energy efficiency improvements the city could make in the future which will be built into the Climate Action Plan.

For the calendar year 2010 Wendel conducted a Measurement and Verification (M&V) study to determine if the guaranteed energy savings of 1,099,906 kWh, 2,999 mmBtu (fossil fuel) and an annual cost savings of \$148,396 were being realized. The M&V report found that the annual electric savings was 1,239,173.9 kWh with an annual cost savings of \$189,887, \$41,520 more than anticipated. It is important to note that the energy savings are identified as energy costs that are 'avoided' by the improvements. In other words if the City had not done these improvements their energy bill in 2010 would have been \$189,887 more than it was.

### **SUMMARY OF ENERGY UPGRADES, CITY OF KINGSTON WASTEWATER TREATMENT PLANT**

Wastewater treatment plant (WWTP) improvements included upgrades to the ultraviolet disinfection system, the sludge pump and motor, the solids handling system, the odor control system, the digester mixing system, the belt press, motor upgrades for the return activated sludge pumps, bar screen upgrades as well as lighting and lighting control upgrades. The costs of WWTP upgrades accounted for 70% of the total cost of all upgrades or \$2,790,694. For the WWTP, Wendel guaranteed an annual energy savings of 852,800.8 kWh and an annual cost savings of \$85,403. The WWTP upgrades accounted for 78% of total energy savings and 58% of total annual cost savings of all upgrades made at city facilities.

**Table 1. City of Kingston Wastewater Treatment Plant Upgrades as Compared to All Energy Upgrades**

WWTP Upgrades Compared to Total Upgrades	Total Cost of Upgrade	Estimated Annual Electricity Savings (CEA) kWh	2010 Electrical Savings (kWh)	Difference Electricity Savings (kWh)	Estimated Annual Cost Savings (\$)	2010 Cost Savings (\$)	Difference Cost (\$)
WWTP UPGRADES	\$2,790,694	852,800.80	946,518.1	93,717.30	85,403.00	\$113,964	\$28,560
ALL UPGRADES	\$3,970,730	1,099,676.7	1,239,173.90	139,497.20	\$148,367	\$189,887	\$41,520
WWTP% of Total	70	78	76	67	58	60	69

## RESULTS

A follow-up study was done in 2010 to measure and verify (M&V) the guaranteed energy savings. The M&V report found that all city facility upgrades resulted in an annual electric savings of 1,239,173.9 kWh with an annual cost savings of \$189,887; 139,497.2 kWh and \$41,520 more than anticipated.

According to the Wendel M&V Report, in 2010 the WWTP upgrades as listed in Table 2 resulted in annual electric savings of 946,518.1 kWh with an annual cost savings of \$113,964. The energy savings were 93,717.3 kWh greater than what was guaranteed primarily due to the upgrades to the ultraviolet disinfection system. Annual energy cost savings were \$28,561 more than anticipated.

It is important to note that the energy and cost savings are identified as energy usage and costs that were 'avoided' based on the energy improvements that were made. In other words, according to the Wendell 2010 M&V Report, by making the energy upgrades through City facilities, the City avoided \$189,887 of energy costs in 2010. The 946,518.1 kWh of electricity 'saved' at the WWTP was more than three-quarter of the total energy savings with the \$113,964 of avoided electricity costs, 60% of the total cost savings.

## GHG EMISSIONS AVOIDED

The overall energy improvements done as a result of the FlexTech Study and Energy Performance Contract resulted in a total 386 tonnes CO<sub>2</sub>e<sup>64</sup> not being emitted from City of Kingston facilities in 2010. The GHG emissions avoided from these improvement is equal to the CO<sub>2</sub> emissions from the consumption of 810 barrels of oil, the *electricity* use of 43.4 homes for one year or the carbon sequestered by 74.3 acres of pine or fir forests.<sup>65</sup>

The energy improvements at the WWTP resulted in 295 tonnes CO<sub>2</sub>e<sup>66</sup> not being emitted from this facility, more than 76% of total tonnes CO<sub>2</sub>e avoided. The GHG emissions avoided from the WWTP improvement is equal to the CO<sub>2</sub> emissions from the consumption of 622 barrels of oil, the *electricity* use of 33.4 homes for one year or the carbon sequestered by 57.1 acres of pine or fir forests.<sup>67</sup>

<sup>64</sup> GHG emissions generated using ICLEI's Clean Air and Climate Protection 2009 Software.

<sup>65</sup> EPA GHG Equivalency Calculator <http://www.epa.gov/cleanenergy/energy-resources/calculator.html>

<sup>66</sup> GHG emissions generated using ICLEI's Clean Air and Climate Protection 2009 Software.

<sup>67</sup> EPA GHG Equivalency Calculator <http://www.epa.gov/cleanenergy/energy-resources/calculator.html>

**Table 2. Energy Upgrades at City of Kingston Wastewater Treatment Plant**

WWTP Energy Upgrades	Total Cost of Upgrade	Estimated Annual Electricity Savings (CEA) <sup>68</sup> kWh	2010 Electrical Savings (kWh) <sup>69</sup>	Difference Electricity Savings (kWh)	Estimated Annual Savings (\$)	2010 Cost Savings (\$)	Difference Cost Savings (\$)
Lighting and Lighting Controls	\$71,554	55,095.40	70,096.00	15,000.60	\$4,413	\$7,867	\$3,454.00
Ultraviolet Disinfection System	\$753,072	222,749.3	300,643.20	77,893.90	\$21,921	\$24,319	\$2,398
Sludge Pump and Motor	\$139,896	11,270.3	11,270.30	0.00	\$1,314	\$1,353	\$39
Solids Handling System	\$558,192	113,032.3	113,855.1	822.8	\$12,657	\$13,517	\$859
Odor Control System	\$389,322	0.0	0	0	\$0	\$0	\$0
Digester Mixing System	\$427,789	440,113.2	440,113.20	0.00	\$44,060	\$45,382	\$1,322
Motor Upgrades for Return Activated Sludge Pumps	\$24,360	10,540.3	10,540.30	0.00	\$1,038	\$1,069	\$31
Belt Press	\$85,469	0.0	0.00	0.00	\$0	\$20,457	\$20,457
Bar Screens	<u>\$341,040</u>	<u>0.0</u>	<u>0.00</u>	<u>0.00</u>	<u>\$0</u>	<u>\$0</u>	<u>\$0</u>
TOTALS	\$2,790,694	852,800.80	946,518.1	93,717.30	\$85,403.00	\$113,964	\$28,560

<sup>68</sup> 2005-2006 Comprehensive Energy Audit done as part of NYSDERDA FlexTech Study.

<sup>69</sup> Based on Wendel Measurement & Verification Report, January 1, 2010-December 31, 2010, February 22, 2011

## APPENDIX L. CITY OF KINGSTON OUTDOOR PUBLIC LIGHTING

The City of Kingston provides outdoor lighting of many types, including street lights (streets, roadways, parking lots, and pedestrian areas), traffic signals, sidewalk lighting, holiday lighting, and park lighting. The majority of costs and greenhouse gas emissions associated with the operation of this infrastructure are due to electricity consumption. Data relating to electricity consumption for public lighting was obtained from Central Hudson. All public lighting - street lights and traffic signals - fall under the purview of the Department of Public Works.

### PUBLIC LIGHTING USAGE AND COSTS

In 2010, the City spent \$524,620 on outdoor public lighting. The electricity costs associated with public lighting accounted for the largest single portion of the City's total energy bill, approximately 33%. Public lighting electricity consumption in 2010 accounted for 35%<sup>70</sup> of the total electricity usage and 52%<sup>71</sup> of the City's electric bill.<sup>72</sup> The majority of the usage and cost for public lighting was for street lighting discussed in more detail below.

**Table 1: Public Lighting as a Percentage of City Totals**

	Total Electricity Usage (kWh)	% of Total Electric Usage	Cost of Electricity	% of Electricity Cost	Total Energy Costs	% of Total Energy Costs
Public Lighting	2,228,944	35	\$524,620	52	\$524,620	33
<b>City Totals*</b>	<b>6,461,721</b>		<b>\$1,012,384</b>		<b>\$1,590,411</b>	

\*Does not include usage and costs of KHA, KWD and Dietz Stadium

Street lighting accounted for the majority of usage and costs associated with public lighting. In 2010, streets lights used 1,937,278 kWh (1,884,320+52,958) at a cost of \$481,008 (\$471,715+\$9,292), 92%. Traffic signals used 262,791kWh at a cost of \$38,941, 7%. Canopy lights and Christmas tree lights accounted for the remainder of usage and costs associated with public lighting.

Park lighting is depicted in Table 1 for illustrative purposes only. Park lighting has already been factored into the usage and cost of the Parks and Recreation Department and therefore is not considered here as part of the total public lighting usage and costs. In 2010 a total of 37,324kWh of electricity was used at a cost of \$10,189 to operate Park lighting.

<sup>70</sup> (2,228,944 kWh of 6,461,721 kWh)

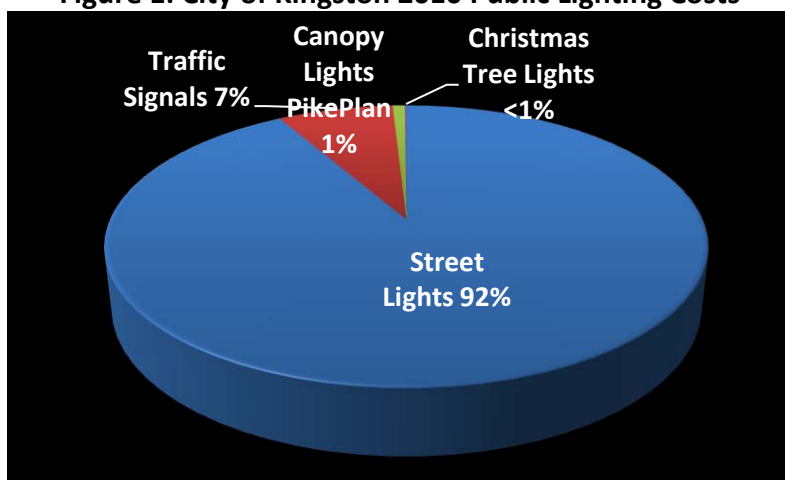
<sup>71</sup> (\$524,620 of \$1,012,384)

<sup>72</sup> Percentage based on city operations alone, does not include KHA, KWD and Dietz Stadium.

**Table 2: Public Lighting 2010 Energy Usage and Costs Summary**

City of Kingston Public Lighting Energy Usage and Cost	2010 Total Usage	2010 Total Energy Cost	% of Total Cost
Street lights-Primary	1,884,320	\$471,715	90
Street lights-Other	52,958	\$9,292	2
Traffic Signals	262,791	\$38,941	7
Canopy Lighting-Pike Plan	26,722	\$4,111	1
Christmas Tree Lights	<u>2,153</u>	<u>\$560</u>	<1
<b>TOTAL</b>	2,228,944	\$524,620	
Park Lighting	37,324	\$10,189	

**Figure 1: City of Kingston 2010 Public Lighting Costs**



## GHG EMISSION-PUBLIC LIGHTING

Electricity usage associated with public lighting in the City of Kingston produced an estimated 694 tonnes CO<sub>2</sub>e. As would be anticipated electricity usage associated with street lighting produces the greatest amount of GHG emissions with an estimated 603 tonnes CO<sub>2</sub>e or 87% of the total GHGs from public lighting. Electricity used for traffic signals produced an estimated 82 tonnes of CO<sub>2</sub>e, 12% of the total. The Pike Plan Canopy lights produced an estimated 8 tonnes of CO<sub>2</sub>e, with the Christmas tree lights emitting 1 tonne of CO<sub>2</sub>e.

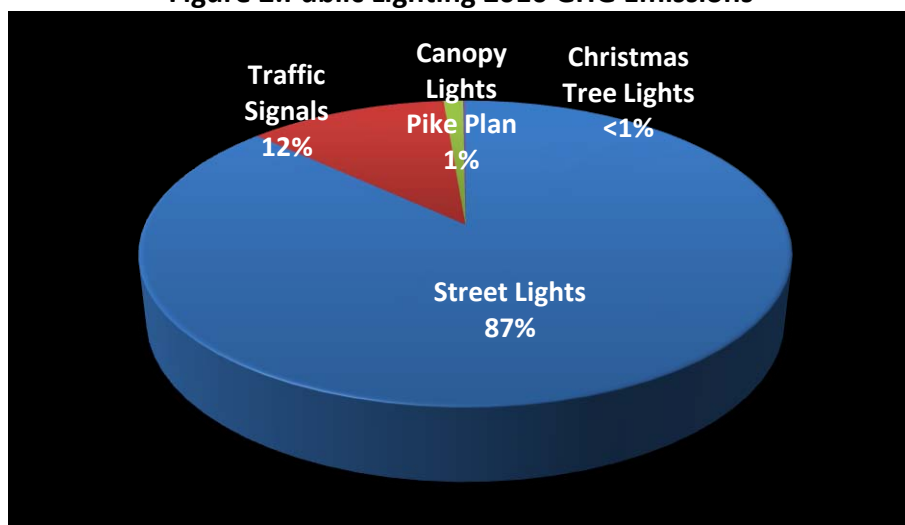
Overall outdoor public accounts for approximately 15% of the City operations GHG emissions.<sup>73</sup>

<sup>73</sup> 694 tonnes of CO<sub>2</sub>e of 4,587 total tonnes of CO<sub>2</sub>e. Does not include KHA, KWD, Dietz Stadium and employee commuting. Including GHG emissions from KHA, KWD, Dietz Stadium and employee commuting, outdoor public lighting is 10% of overall total (694 tonnes of CO<sub>2</sub>e of 7,281 total tonnes of CO<sub>2</sub>e).

**Table 3: Public Lighting GHG Emissions Summary**

Public Lighting GHG Emissions Summary	CO <sub>2</sub> (tonnes)	N <sub>2</sub> O (kg)	CH <sub>4</sub> (kg)	CO <sub>2</sub> e (tonnes)	Energy (MMBtu)	Cost (\$)	% of Total CO <sub>2</sub> e
Street Lights Primary	584	8	15	587	6431	\$471,715	85
Traffic Signals	81	1	2	82	897	\$38,941	12
Street Lights Other	16	0	0	16	181	\$9,292	2
Canopy Light Pike Plan	8	0	0	8	91	\$4,111	1
XMAS Tree Lights Henry St	<u>1</u>	<u>0</u>	<u>0</u>	<u>1</u>	<u>7</u>	<u>\$560</u>	<1
<b>TOTALS</b>	<b>690</b>	<b>9</b>	<b>17</b>	<b>694</b>	<b>7607</b>	<b>\$524,620</b>	
Park Lighting	12	0	0	12	127	\$10,189	

**Figure 2: Public Lighting 2010 GHG Emissions**



## STREET LIGHTS

The majority of electric usage and cost related to public lighting was for street lighting. Central Hudson street lighting lamp service for the City of Kingston is primarily accounted for through one bill which summarizes the usage and cost for 2,421 City streets lights<sup>74</sup>. A detailed breakdown of the street lamps is can be found in Table 8.

For 2010, these street lights used 1,884,320 kWh at a cost of \$471,715.46, accounting for 98% of cost of all street lights. Other individual street lighting accounts make up the remaining 2% of the street lighting usage of 52,958 kWh at a cost of \$9,292.54. All accounts used a total of 1,937,278 kWh (1,884,320+52,958) at a cost of \$481,008.

<sup>74</sup> As of July 2011 Central Hudson Bill

Street lights used a total of 1,937,278 kWh, 30% of the City governments total electricity usage (6,461,721kWh<sup>75</sup>) at a cost of \$481,008, which is almost 48% of the City's 2010 total electric bill of \$1,012,384. Electricity usage by street lighting is the second only to the electric usage by wastewater treatment facilities. The electricity usage for streetlights is not metered like other facilities. Usage, kWh, is calculated based on estimation of the number of hours the street lights will be on based on the number of hours of darkness each year. The street lights are controlled by a photocell that is attached to each light. It is unknown at this time if all photocells are working. The City is billed based on 4,000 hours of operation a year, as that is, on average, the number of darkness.

**Table 4: Street Lighting 2010 Electricity Usage and Cost**

City of Kingston DPW Electricity Usage & Cost	2010 Total Electricity Usage CH (kWh)	2010 Total Amount Billed CH (\$)	Total Cost (\$)
City Street Lights-Primary	1,884,320	\$471,715	
DPW-West Strand (Lower Broadway street light)	29,617	\$1,674	\$2,535
Cornell St Light	11,136	\$1,834	
Livingston St Street Light	6,256	\$849	
Thomas St Street Light	4,972	\$394	\$418
133 Mary's Ave Street Light	475	\$420	
72 Mary's Ave Street Light	248	\$395	
Thomas St/Cornell St Street Light	133	\$386	
Cornell St (Area Street Light)	121	\$386	
<b>TOTALS</b>	1,937,278	\$478,055	\$2,953
<b>TOTAL COST</b>			\$481,008

**Table 5: Street Lighting Energy Usage and Cost Summary**

City of Kingston Public Lighting Energy Usage and Cost	2010 Total Usage	2010 Total Energy Cost
Streetlights-Primary	1,884,320	\$471,715
Streetlights-Other	52,958	\$9,292
	1,937,278	\$481,008

## **STREET LIGHTING BREAKDOWN**

The efficiency of a street lamp is measured in lumens per watt. A lumen is a unit for measuring the amount of light; a watt is a unit for measuring the amount of electrical energy used. The street lamp that provides the most lumens per watt is the most efficient lamp.<sup>76</sup> Table 5 below depicts the lighting efficiency of some of the commonly used street lamps.

<sup>75</sup> Usage and costs numbers do not include KHA, KWD and Dietz Stadium.

<sup>76</sup> International Dark-Sky Association (IDA) — Information Sheet #52,  
[http://www.darksky.org/index.php?option=com\\_content&view=article&id=570](http://www.darksky.org/index.php?option=com_content&view=article&id=570)

**Table 6: Lamp Efficiency<sup>77</sup>**

Type of Lamp	Lumens per watt	Average Lamp Life (Hours)
Incandescent	8 - 25	1000 - 2000
Mercury Vapor	13 - 48	12000 - 24000+
Fluorescent	33 - 77	10000 - 24000
Metal Halide	60 - 100	10000 - 15000
High Pressure Sodium	45 - 110	12000 - 24000
Low Pressure Sodium	80 - 180	10000 - 18000

A bad fixture could be wasting more than 50 percent of the lamp's light.<sup>78</sup>

A summary of lamp type used in the City of Kingston street lights is depicted in Table 7. This inventory is based on the July 2011 Central Hudson bill for primary street lighting account.

In July 2011 Central Hudson street lighting lamp service was provided for a total of 2,421 lamps. The majority of these lamps, 1995 or 84% are owned and maintained by Central Hudson. The City owns about 14% (335) of the lamps that are maintained by Central Hudson, and the remainder, 91 lamps, a little less than 4% are owned and maintained by the City.

**Table 7: Street Lighting Lamp Type and kWh - City of Kingston 2010\***

Lamp Type	Total # of Lamps	% of Total	Central Hudson Owned and Maintained	City Owned/Central Hudson Maintained	City Owned and Maintained	Total Annual kWh*	% of Total kWh
Incandescent	6	<1		5	1	9,308	<1
Mercury Vapor	701	29	660	40		628,196	33
Sodium Vapor	1,493	62	1,161	290	42	1,111,336	59
Metal Halide	106	4	59		47	107,664	6
Induction	<u>115</u>	5	<u>115</u>			<u>39,100</u>	2
<b>TOTALS</b>	<b>2,421</b>		<b>1,995</b>	<b>335</b>	<b>90</b>	<b>1,895,604</b>	

\*July 2010

<sup>77</sup> Ibid.

<sup>78</sup> Ibid.

**Table 8: City of Kingston Central Hudson Street Lighting Lamp Service**

July 2011	Central Hudson Street Lighting Lamp Service									
Size Lamp (Lumens)	Totals # of Lamps	Central Hudson Own & Main- tained	City Own/ CH Main- tained	City Own & Main- tained	Lamp Lumens	Lamp Watts	Fixture Wattage	Annual kWh*	Total Annual kWh *	Average kWh per month
1000 Incandescent	1		1		1,000	92	92	368	368	30.66667
4000 Incandescent	2		2		4,000	295	295	1,180	2,360	196.6667
6000 Incandescent	1			1	6,000	405	405	1,620	1,620	135
10000 Incandescent	2		2		10,000	620	620	2,480	4,960	413.3333
7000 Mercury Vapor	656	637	19		7,000	175	208	832	545,792	45482.67
11000 Mercury Vapor	11		10	1	1,100	250	296	1,184	13,024	1085.333
20000 Mercury Vapor	31	23	8		20,000	400	455	1,820	56,420	4701.667
60000 Mercury Vapor	3		3		60,000	1,000	1,080	4,320	12,960	1080
5800 Sodium Vapor	596	583	4	9	5,800	70	86	344	205,024	17085.33
9500 Sodium Vapor	7			7	9,500	100	146	584	4,088	340.6667
16000 Sodium Vapor	468	429	30	9	16,000	150	180	720	336,960	28080
27000 Sodium Vapor	375	133	225	17	27,000	250	316	1,264	474,000	39500
50000 Sodium Vapor	45	14	31		50,000	400	496	1,984	89,280	7440
8500 Metal Halide	18			18	8,500	100	130	520	9,360	780
14000 Metal Halide	29			29	1,000	175	205	820	23,780	1981.667
20500 Metal Halide	16	16			20,500	250	300	1,200	19,200	1600
36000 Metal Halide	8	8			36,000	400	464	1,856	14,848	1237.333
20500 Metal Halide Cutoff Rectangular CR	12	12			20,500	175	205	820	9,840	820
14001 Metal Halide Acorn Design (AD)	11	11			14,001	175	205	820	9,020	751.6667
20500 Metal Halide Highway Setback (HS)	1	1			20,500	250	300	1,200	1,200	100
36000 Metal Halide HS	11	11			36,000	400	464	1,856	20,416	1701.333
27000 Sodium Vapor HS	1	1			27,000	250	316	1,264	1,264	105.3333
16000 Sod Vapor HS	1	1			16,000	150	180	720	720	60
6000 Induction	115	115			6,000	85	86	340	39,100	3258.333
<b>TOTAL</b>	2421	1995	335	91						

Sodium vapor fixtures are the most commonly used lamps overall in City street lights, with a total of 1,493 of the 2,421 or 62% lamps being sodium vapor. However the 7000 Mercury Vapor lamp is the most widely used individual lamp in the city with a total of 656 of this lamp type. The majority of the mercury vapor lamps, 660 or 94% are owned and maintained by Central Hudson. Mercury vapor is the oldest type of high-intensity discharge (HID) lighting.<sup>79</sup>

Mercury vapor lamps are not efficient lamps, second only to incandescent in the lowest of efficiency ratings. It is good however that lowest possible wattage is being used for this application.

<sup>79</sup> Mercury Vapor Lighting by Alex Wilson Dec 16 2008  
<http://www.greenbuildingadvisor.com/blogs/dept/energy-solutions/mercury-vapor-lighting>

Additionally, the majority, 59%, of total annual kWh is also attributed to sodium vapor lamps, however mercury vapor lamps still account for more than 33% of the total annual kWh.

The example below, as illustrated by the International Dark-Sky Association, compares a 175 watt mercury (these are generally found in poor fixtures) to a 100 watt HPS and a 55 watt LPS lamp.

All of these lamps are outputting about 8,000 lumens and are wattages that would commonly be used for residential street lighting. This comparison assumes 4,100 burning hours per year, from dusk to dawn, and 8 cents (U.S.A.) cost per kilowatt-hour of use (KWH).<sup>80</sup> The total wattage of the system includes the wattage used by the lamp and the ballast together. The potential savings with more efficient lamps is clearly illustrated.

**Table 9: Lamp Type and Wattage**

Lamp Type	Lamp Wattage	Total Wattage	KWH Use/Yr	Oper \$/Yr	100 Lamps	10000 Lamps
Mercury	175	208	853	\$68.22	\$6822	\$682,200
HPS	100	130	533	42.64	4264	426,400
LPS	55	80	328	26.24	2624	262,400

\*Assume that a well designed fixture is being used in these cases, so that the light output by the lamp is not wasted by an inefficient fixture. A bad fixture could be wasting more than 50 percent of the lamp's light.

If an older light such as an incandescent or mercury vapor needs to be replaced, Central Hudson replaces it with an equivalently sized high pressure sodium light. Central Hudson does not increase the wattage of a street light without a written request from the City.<sup>81</sup>

Central Hudson is supposed to be upgrading at least 5% of the street lamps annually.

## STREET LIGHTING GHG EMISSIONS

In 2010, the electricity used by City of Kingston street lights resulted in the release of GHG emissions of 603 tonnes of CO<sub>2</sub>e. Street lighting accounts for 87% of the GHGs emitted by public lighting.

Street lighting is 13% of total government operations GHG emissions.<sup>82</sup>

<sup>80</sup> Central Hudson assumes 4,000 burning hours per year and in 2010 the City of Kingston paid 25 cents per kilowatt-hour of use (KWH).

<sup>81</sup> Email from Sam Rosenberry, Central Hudson August 1, 2011.

<sup>82</sup> 603 tonnes of CO<sub>2</sub>e of 4,587 total tonnes of CO<sub>2</sub>e. Does not include KHA, KWD, Dietz Stadium and employee commuting. Including GHG emissions from KHA, KWD, Dietz Stadium and employee commuting, outdoor public lighting is 8% of overall total (603 tonnes of CO<sub>2</sub>e of 7,281 tonnes of CO<sub>2</sub>e).

**Table 10 : Street Light GHG Emissions Summary**

Street Lights GHG Emissions Summary	CO <sub>2</sub> tonnes	N <sub>2</sub> O (kg)	CH <sub>4</sub> (kg)	CO <sub>2</sub> e (tonnes)	Energy (MMBtu)	Cost (\$)
Street Lights Primary	584	8	15	587	6431	\$471,715
Street Lights Other	16	0	0	16	181	\$9,292
<b>TOTALS</b>	<b>600</b>	<b>8</b>	<b>15</b>	<b>603</b>	<b>6612</b>	<b>\$481,007</b>

## TRAFFIC SIGNALS

Traffic signals in the City of Kingston account for the usage of 262,791 kWh of electricity at a total cost of \$38,941.

The City has three primary traffic signal accounts with Central Hudson. These accounts cover electricity for 75 traffic signals, the majority of the traffic signals in the City. These 75 traffic lights account for more than 99% of the total usage and 97% of the total cost for traffic signals in 2010.

**Table 11: City of Kingston Traffic Signals 2010 Electricity Usage and Cost**

Traffic Signals Usage and Cost 2010	Annual Electricity Usage (CH)  kWh	Billed Amount Electricity (CH)  \$
28 Traffic Signals	106,920	\$15,592
21 Traffic Signals	89,904	\$13,111
26 Traffic Signals	63,444	\$9,252
Kingston Business Park Route 32 Traffic Light	1,494	\$513
Kingston Business Park Delaware Traffic Signal	<u>1,029</u>	<u>\$473</u>
<b>TOTALS</b>	262,791	\$38,941

The 2010 electricity usage associated with City of Kingston traffic signals is responsible for the emissions of 83 tonnes of CO<sub>2</sub>e. Traffic signals accounts for almost 12% of the GHGs emitted by public lighting.

Traffic signals account for less than 2% of the City government total GHG emissions (82 tonnes of CO<sub>2</sub>e of 4,587 total tonnes of CO<sub>2</sub>e). Does not include (1% (82 of 7281)

**Table 12: Traffic Signal GHG Emissions**

Traffic Signal GHG Emissions Summary	CO <sub>2</sub> tonnes	N <sub>2</sub> O (kg)	CH <sub>4</sub> (kg)	CO <sub>2</sub> e (tonnes)	Energy (MMBtu)	Cost (\$)
Traffic Signals	81	1	2	82	897	\$38,941

## OTHER PUBLIC LIGHTING

Other public lighting includes park lights, the canopy lighting for the Pike Plan and Christmas tree lights.

Three lighting electricity accounts for West Strand Park, Kingston Point Beach and Block Park used 37,324 kWh of electricity in 2010 at a cost of \$10,189. The Pike Plan canopy lights used 27,722 kWh at a cost of 4,111 while to light the Christmas tree on Henry Street uses 2,153 kWh at a cost of \$560.

**Table 13: City of Kingston –2010 Public Lighting-Parks, Pike Plan, Christmas Tree**

	Annual Electricity Usage (CH) kWh	Billed Amount 2010 Electricity (CH) \$	Billed Amount 2010 Electricity (Hess) \$	TOTAL COST
West Strand Park Lights	6,669	\$405.07	\$578	
Kingston Point Beach Delaware Ave	16,495	\$3,446.26	\$1,467	
Abeel St (Block Park Lights)	<u>14,160</u>	<u>\$3,003.73</u>	<u>\$1,289</u>	
<b>TOTAL PARK LIGHTING</b>	<b>37,324</b>	<b>\$6,855.06</b>	<b>\$3,334</b>	<b>\$10,189</b>
Canopy Light Pike Plan	26,722	\$2,907.88	\$1,203	\$4,111
Christmas Tree Lights Henry St	<u>2,153</u>	<u>\$372.31</u>	<u>\$187</u>	<u>\$560</u>
<b>TOTALS</b>	<b>66,199</b>	<b>\$10,135.25</b>	<b>\$4,724</b>	<b>\$14,860</b>

## OTHER PUBLIC LIGHTING GHG EMISSIONS

Other public lighting accounts for the balance of GHG emissions. The Canopy Lights Pike Plan account for 8 tonnes of CO<sub>2</sub>e, and Christmas trees lights 1 tonnes of CO<sub>2</sub>e. Park lighting accounts for 12 tonnes of CO<sub>2</sub>e. The GHG emissions for park lighting are presented here for illustrative purposes only. These GHG emissions are already accounted for as part of the operations of the Parks and Recreation Department.

**Table 14: Other Public Lighting GHG Emissions**

Other Public Lighting GHG Emissions	CO <sub>2</sub> tonnes	N <sub>2</sub> O (kg)	CH <sub>4</sub> (kg)	Equiv CO <sub>2</sub> (tonnes)	Energy (MMBtu)	Cost (\$)
Park Lighting	12	0	0	12	127	\$10,189
Canopy Light Pike Plan	8	0	0	8	91	\$4,111
XMAS Tree Lights Henry St	<u>1</u>	<u>0</u>	<u>0</u>	<u>1</u>	<u>7</u>	<u>\$560</u>
<b>TOTALS</b>	<b>21</b>	<b>0</b>	<b>0</b>	<b>21</b>	<b>225</b>	<b>\$14,860</b>

## APPENDIX M. RESOURCES FOR LAND USE PLANNING AND CLIMATE ACTION

### **Canons of Sustainable Architecture and Urbanism**

<http://www.cnu.org/sites/files/Canons.pdf>

### **Chicago Climate Action Plan-Improved Transit Options**

<http://www.chicagoclimateaction.org/pages/transportation/14.php>

### **City of Albany, Mayors Office of Energy and Sustainability**

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

### **City of Albany Comprehensive Master Plan ‘Albany2030’**

<http://www.albany2030.org/>

### **City of Buffalo Comprehensive Plan**

[http://www.ci.buffalo.ny.us/files/1\\_2\\_1/Mayor/COB\\_Comprehensive\\_Plan/section\\_2459290796.html](http://www.ci.buffalo.ny.us/files/1_2_1/Mayor/COB_Comprehensive_Plan/section_2459290796.html)

### **Climate Smart Communities**

<http://www.dec.ny.gov/energy/50845.html>

### **Congress for the New Urbanism (CNU)**

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

### **Creating Livable Sustainable Communities**

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

### **Green Building Codes and Programs**

#### **US Department of Energy**

<http://www.energycodes.gov/GreenBuildings/resources/programs.stm>

### **Governor Cuomo Reauthorizes Executive Order on Climate Change: Interim Climate Action Plan Sees Smart Growth as Cost Effective and Crucial to Reducing Greenhouse Gas Emissions**

<http://www.empirestatefuture.org/2011/01/cuomo-reauthorizes-executive-order-on-climate-change.html>

### **New Rochelle's Sustainability Plan 2010-2030, GreenNR**

<http://www.newrochelleny.com/index.aspx?NID=346>

### **New and Updated EPA Resources Available for Local Governments on Transportation Control Measures, Smart Growth, and Energy Efficiency in Affordable Housing**

EPA's State and Local Climate and Energy Program has released three documents that give straightforward overviews of how local governments can use transportation control measures, smart growth principles, and energy efficiency in affordable housing to reduce greenhouse gas emissions.

<http://www.epa.gov/statelocalclimate/resources/strategy-guides.html>

**New York State Climate Action Council Interim Report 11-9-10**

**Transportation and Land Use Mitigation**

<http://www.nyclimatechange.us/ewebeditpro/items/O109F24019.pdf>

**Non-Motorized Transportation Plan**

<http://www.co.ulster.ny.us/planning/bikeped.html>

**Policy Guide on Planning for Sustainability**

**American Planning Association**

<http://www.planning.org/policy/guides/adopted/sustainability.htm>

**Principle for Sustainable Development**

<http://www.abbotsford.ca/AssetFactory.aspx?did=1702>

**Sustainable Communities Online**

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

**Sustainable Land Use Pledge**

<http://sustainablejersey.com/editor/doc/p8!11.pdf>

**2011 Sustainable Jersey Program Updates**

<http://www.sustainablejersey.com/actionlist.php>

**Sustainability and Land Use Planning: Greening State and Local Land Use Plans and Regulations to Address Climate Change Challenges and Preserve Resources for Future Generations**

[http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=1503379](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1503379)

**TO LEED OR NOT TO LEED: How do you promote “Green Building Design” at the municipal level**

<http://www.greenburghny.com/FCpdf/NY%20APA%20-%20LEED%20Presentation.pdf>

**Transit Friendly Development**

**How to Handle Parking**

<http://www.policy.rutgers.edu/vtc/tod/newsletter/vol3-num1/TODParking.html>

**TRAVELMATTERS.ORG, a project of [The Center for Neighborhood Technology](#)**

<http://www.travelmatters.org/about/transit-climate>

**Ulster County Transportation Council – [The Ulster County Transit System Coordination and Development Plan](#)**

<http://www.ulstercountyny.gov/planning/tdp.html>

**Westchester Action Plan for Climate Change and Sustainable Development**

[http://www.westchestergov.com/pdfs/ENVFACIL\\_globalWarmingAction2008FINAL.pdf](http://www.westchestergov.com/pdfs/ENVFACIL_globalWarmingAction2008FINAL.pdf)

## APPENDIX N. CITY OF KINGSTON SOLID WASTE REFUSE PACKERS

To collect waste and recyclables, in 2010 the City operated ten (10) refuse packers with model years ranging from 1987 to 2008. These 10 heavy duty diesel vehicles used an estimated 20,723 gallons of diesel fuel at a cost of \$51,834. These vehicles traveled an estimated 64,603 miles, an average of 6,460 per vehicles and were used an estimated 5,832 hours.

**Table 1: City of Kingston Refuse Packers**

Vehicle Year	Vehicle Make	Vehicle Model	Miles <sup>83</sup> 2010	Hours Used 2010	Vehicle Type	Fuel Type	Gas Gallons	Diesel Gallons
2008	International	Refuse Packer	5,407	1,020	HD	Diesel		2,357.7
1989	International	Refuse Packer	1,281		HD	Diesel	24.2	904.9
1995	International	Refuse Packer	8,282	1,404	HD	Diesel		2,305.6
1995	International	Refuse Packer	9,096		HD	Diesel		2,609.9
2002	International	Refuse Packer	6,615	1,020	HD	Diesel	4.4	2565
1987	White/Volvo	Refuse Packer	511		HD	Diesel		167.1
2001	International	Refuse Packer	11,691	1,335	HD	Diesel		2,527.1
2005	International	Refuse Packer	6,051		HD	Diesel		2,202.9
2005	International	Refuse Packer	7,323	465	HD	Diesel		2,516.2
2003	International	Refuse Packer	8,346	588	HD	Diesel		<u>2,566.3</u>
<b>TOTALS</b>			<b>64,603</b>	<b>5,832</b>			<b>28.6</b>	<b>20,722.7</b>

As with other City vehicles, the hours used by these vehicles and not the miles traveled will dictate maintenance schedules as refuse packers run for a considerable number of hours but do not necessarily travel a significant number of miles.

**Table 2: Refuse Packers 2010 Usage and Cost**

Refuse Packers	No. of Diesel Vehicles	Diesel (Gal)	Diesel Cost (\$)	VMT Diesel	Estimated Hours of Usage 2010	Gas (Gal)	Gas Cost (\$)	Total Cost (\$)
Heavy Duty	10	20,722.7	\$51,834	64,603	5,832	28.6	\$69	\$51,903

<sup>83</sup> VMTs are not necessarily a good indicator of vehicle use. Refuse packers can spend considerable time idling and therefore preventive maintenance on these vehicles is based on hours of operation, not VMTs. Idling time will have significant impact on fuel efficiency, fuel usage, cost and GHG emissions.

## REFUSE PACKERS GHG EMISSIONS

In 2010 the diesel fuel used by refuse packers used to collect trash and recycling emitted 212 tonnes of CO<sub>2</sub>e.

**Table 3: Refuse Packers 2010 Scope 1 GHG Emissions**

Refuse Packers	CO <sub>2</sub> (tonnes)	N <sub>2</sub> O (kg)	CH <sub>4</sub> (kg)	CO <sub>2</sub> e (tonnes)	Energy (MMBtu)	Cost (\$)
Fuel Usage	212	0	0	212	2861	-
Vehicle Miles Traveled <sup>84</sup>	0	0	0	0	<u>1437</u>	-
TOTALS	212	0	0	212	4298	\$51,903

<sup>84</sup> VMTs are not necessarily a good indicator of vehicle use. Refuse packers can spend considerable time idling and therefore preventive maintenance on these vehicles is based on hours of operation, not VMTs. Idling time will have significant impact on fuel efficiency, fuel usage, cost and GHG emissions.

## APPENDIX O. RESOURCES FOR CLIMATE ADAPTION PLANNING

### **RESPONDING TO CLIMATE CHANGE IN NEW YORK, CLIMAIID**

This is a state-level assessment of climate change impacts and is specifically geared to assist in the development of adaptation strategies. The NYSERDA-sponsored project acknowledges the need to plan for and adapt to climate change impacts in a range of sectors: Water Resources, Coastal Zones, Ecosystems, Agriculture, Energy, Transportation, Telecommunications, and Public Health. The report provides decision-makers with information on the State's vulnerability to climate change and facilitates the development of adaptation strategies informed by both local experience and scientific knowledge.

<http://www.nyserda.ny.gov/climaid>

### **ICLEI SUSTAINABLE COMMUNITIES ADAPTATION DATABASE AND PLANNING TOOL (ADAPT)**

Resources are available through ICLEI, such as the Adaptation Database and Planning Tool (ADAPT). ADAPT is a powerful, online tool that guides local government users through ICLEI's Five Milestones for Climate Adaptation planning process. It is available as part of ICLEI's Climate Resilient Communities Program. It is recommended that the City of Kingston take advantage of this and other adaptation planning. The long-term local knowledge of City staff and elected officials will be instrumental in assessing vulnerabilities and further developing the plan.

### **NATURAL HAZARD MITIGATION PLAN**

Kingston participated along with ten other municipalities and the County in the Ulster County Multi-Jurisdictional Natural Hazard Mitigation Plan, finalized in February 2009. The hazard mitigation plan can be used as a resource to identify natural hazards which will be exacerbated by climate change, including extreme heat, drought, floods and storms.

[http://www.co.ulster.ny.us/emergencyservices/management/haz\\_mit/index.html](http://www.co.ulster.ny.us/emergencyservices/management/haz_mit/index.html)

### **NEW YORK STATE CLIMATE ACTION PLAN (2010)**

A Technical Work Group was established for the State Climate Action planning process that identified measures to safeguard New Yorkers' public health, infrastructure, ecosystems, and environment from the impacts of climate change. 'Responding to Climate Change in New York' (ClimAID), was the foundational resource for the groups work and is summarized in Chapter 11 'Adapting to Climate Change' of the State's Interim Report.

<http://www.nyclimatechange.us/InterimReport.cfm>

### **NEW YORK STATE SEA LEVEL RISE TASK FORCE**

The Sea Level Rise Task Force was created in 2007 by the New York State Legislature, to assess impacts to the state's coastlines from rising seas and recommend protective and adaptive measures.

<http://www.dec.ny.gov/energy/75794.html>

### **'ROADMAP FOR ADAPTING TO COASTAL RISK'**

The Roadmap for Adapting to Coastal Risk approach focuses a hazards and climate lens on existing issues such as water availability, stormwater management and runoff, and infrastructure maintenance and placement. This means identifying how hazards and climate change can intensify these issues. The approach incorporates relevant hazards and climate data and information into ongoing assessment and planning processes. <http://www.csc.noaa.gov/digitalcoast/training/roadmap/process.html>

### **ADAPTING TO CLIMATE CHANGE: A PLANNING GUIDE FOR STATE COASTAL MANAGERS**

The purpose of this guide, prepared the by National Oceanic and Atmospheric Administration (NOAA) is to help coastal managers develop and implement adaptation plans to reduce the impacts and consequences of climate change and climate variability (climate change). It is intended as an aid, not as a prescriptive directive, and users may choose to use individual steps or chapters or the entire guide, depending on where they are in their planning process. <http://coastalmanagement.noaa.gov/climate/adaptation.html>

### **USEPA CLIMATE READY ESTUARIES PROGRAM**

The Climate Ready Estuaries program works with the [National Estuary Programs](#) and other coastal managers to: 1) assess climate change vulnerabilities, 2) develop and implement adaptation strategies, 3) engage and educate stakeholders, and 4) share the lessons learned with other coastal managers.

The Climate Ready Estuaries website offers information on climate change impacts to different estuary regions, access to tools and resources to monitor changes, and information to help managers develop adaptation plans for estuaries and coastal communities. <http://www.epa.gov/cre/>

### **USEPA CLIMATE RESILIENCE EVALUATION AND AWARENESS TOOL (CREAT) SOFTWARE**

The Tool uses the most current scientific understanding of climate change to increase awareness amongst drinking water and wastewater utility owners and operators' of potential impacts to operations by assessing climate change impacts and consequences. CREAT is available for download at <http://water.epa.gov/infrastructure/watersecurity/climate/creat.cfm>

### **HUDSON RIVER ESTUARY CLIMATE CHANGE NETWORK**

The Climate Change Network offers an excellent opportunity for agency staff, organizations, businesses, and municipalities to stay up to date on the latest in climate science and policy, learn about upcoming events and funding opportunities, work collaboratively on local climate initiatives, and network with other organizations in the Hudson Valley that are working on climate change

<http://www.dec.ny.gov/lands/39786.html>

### **HUDSON RIVER RESEARCH RESERVE MANAGEMENT PLAN**

The Hudson River National Estuarine Research Reserve is part of the National Estuarine Research Reserve System. HRNERR is operated as a partnership between New York State and the National Oceanic and Atmospheric Administration (NOAA) and relates to federally-designated and state-protected sites along 100 miles of the Estuary. <http://www.dec.ny.gov/lands/4915.html>

## APPENDIX P. CLIMATE ACTION PLAN PUBLIC COMMENT ADDENDUM

### Addendum to Climate Action Plan July 16, 2012

The **Climate Smart and Green Jobs Community Task Force** wants to thank the individuals who submitted comments via Survey Monkey during the month of May and/or attended the meeting on June 1, 2012. Survey Monkey comments are listed in the table below. Comments from the meeting are recorded in the minutes, which can be found at [www.kingstoncac.org](http://www.kingstoncac.org).

We have reviewed the comments and questions and made changes to the Plan as necessary.

The changes to the document include revision to title page and acknowledgement page.

Comments were received on the production of ethanol from food waste as a way to reduce greenhouse gases, heat homes and provide vehicle fuel, the Task Force feels that collection of food waste for ethanol production should be explored on a larger scale than the City of Kingston. To address this, the CAP was amended on page 88 as follows:

- Developing additional composting opportunities at the Kingston Transfer Station to allow for the acceptance of household organics;
- Working with UCRRA and regional entities to promote regional composting or other uses of food waste such as ethanol production.

It was suggested that energy savings one year should be used to buy more energy saving devices the next. This was discussed in the Climate Action Plan, however we have given more emphasis to the idea of a **energy fund** and added this proposed initiative under specific sections Energy and Renewables, Vehicles, and Sustainable Building Operation and Maintenance.

A suggestion to consider a study of city and county bus systems is acknowledged by including a reference to the study on page 65. "*Work with the Citibus, Ulster County Area Transit, Ulster County Transportation Council (UCTC), Ulster County Planning and others to provide consistent development of a comprehensive and coordinated transit plan for the City and County.*"

Citation: Information on [The Ulster County Transit System Coordination and Development Plan](http://www.ulstercountyny.gov/planning/tdp.html) can be found at the Ulster County Transportation Council website, within the Planning website: <http://www.ulstercountyny.gov/planning/tdp.html>, accessed on July 17, 2012.

Do you have any feedback on Section A (Energy and Renewables: Buildings and Facilities)?	RESPONSES
1. Start with lighting initiatives, and track and take advantage of all utility energy programs and incentives.	This is covered in the Climate Action Plan
2. I think that 12 of the 24 initiatives could be accomplished within the next few years.	Thank you for your comment
3. Of course, a task force and point person is essential to the meeting the goals.	This is covered in the Climate Action Plan
4. Ethanol production from food waste to heat homes	Change made Climate Action Plan
Do you have any feedback on Section B (Land Use, Transportation & Vehicles)?	
1. Did you look at the recent study done by a private firm, of the city and county buses. I	The Study is covered in the Climate Action Plan

<p>would like to know the results of that study. There has been an effort to encourage the use of our public transportation, with no success. I hate seeing the empty buses driving around! What a waste! Maybe we could use our non-profits and find a better way to transport the few people who need rides.</p>	<p>on page 65. Promotion of the use of transit is covered on pages vi and 63.</p> <p>Information on <u><i>The Ulster County Transit System Coordination and Development Plan</i></u> can be found at the Ulster County Transportation Council website, within the Planning website:  <a href="http://www.ulstercountyny.gov/planning/tdp.html">http://www.ulstercountyny.gov/planning/tdp.html</a>, accessed on July 17, 2012.</p> <p>The Plan should be completed in Fall 2012. Citibus is on the Technical Advisory Committee.</p> <p>Quoting from website: "The plan will evaluate the existing transit services within the County, the City of Kingston's Citibus and Ulster County Area Transit (UCAT), and determine how service improvements and integration between systems can improve public transportation for County residents. It will provide the framework for how decisions will be made over the next ten (10) years for all aspects of transit and paratransit operations, capital facilities, maintenance and programming."</p>
2. I agree we need to make our city walker friendly.	Thank you for your comment.
3. Ethanol production from food waste to fuel vehicles	Change made Climate Action Plan
<b>Do you have any feedback on Section C (Materials Management: Waste Reduction, Re-Use, Recycling &amp; Composting)?</b>	
1. I agree with all proposed goals and the proposed initiatives.	Thank you for your comment.
2. There will need to be fines and fees for these plans to work. All the marketing and promoting will not be enough. There needs to be enforcement and fines to back up the initiatives.	This is covered in the Climate Action Plan.
3. Ethanol production from food waste reduces significant part of waste stream	Change made Climate Action Plan
<b>Do you have any feedback on Section F (Climate Adaptation)</b>	
1. Ethanol production from food waste reduces greenhouse gases	Change made Climate Action Plan

## APPENDICES NOTES

<sup>i</sup> Local Government Operations Protocol, May 2010, p. 4

<sup>ii</sup> International Local Government Greenhouse Gas Emissions Analysis Protocol (IEAP). ICLEI.

<http://www.iclei.org/index.php?id=ghgprotocol>

<sup>iii</sup> [2005-2009 American Community Survey 5-Year Estimates, B25117. TENURE BY HOUSE HEATING FUEL](http://factfinder.census.gov/servlet/DTTable?_bm=y&-geo_id=16000US3639727&-ds_name=ACS_2009_5YR_G00_&-redoLog=false&-mt_name=ACS_2009_5YR_G2000_B25117)

[http://factfinder.census.gov/servlet/DTTable?\\_bm=y&-geo\\_id=16000US3639727&-ds\\_name=ACS\\_2009\\_5YR\\_G00\\_&-redoLog=false&-mt\\_name=ACS\\_2009\\_5YR\\_G2000\\_B25117](http://factfinder.census.gov/servlet/DTTable?_bm=y&-geo_id=16000US3639727&-ds_name=ACS_2009_5YR_G00_&-redoLog=false&-mt_name=ACS_2009_5YR_G2000_B25117)

<sup>iv</sup> Energy Information Administration, State Energy Data System, Table CT4. Residential Sector Energy Consumption Estimates, 1960-2009, New York

[http://www.eia.gov/state/seds/hf.jsp?incfile=sep\\_use/res/use\\_res\\_NY.html&mstate=New%20York](http://www.eia.gov/state/seds/hf.jsp?incfile=sep_use/res/use_res_NY.html&mstate=New%20York)

<sup>v</sup> NYSERDA Energy Prices, Supplies, and Weather Data

[http://www.nyserda.org/energy\\_information/energy\\_prices\\_supplies.asp](http://www.nyserda.org/energy_information/energy_prices_supplies.asp)

<sup>vi</sup> Energy Information Administration, State Energy Data System, Table CT5. Commercial Sector Energy Consumption Estimates, 1960-2009, New York

[http://www.eia.gov/state/seds/hf.jsp?incfile=sep\\_use/com/use\\_com\\_NY.html&mstate=New%20York](http://www.eia.gov/state/seds/hf.jsp?incfile=sep_use/com/use_com_NY.html&mstate=New%20York)

<sup>vii</sup> US EPA <http://www.epa.gov/cleanenergy/energy-resources/egrid/index.html>

<sup>viii</sup> New York State Department of Public Service

[http://www3.dps.state.ny.us/e/energylabel.nsf/Web+Enviromental+Labels/DC8C82FDE996CB4085257801005D0152/\\$File/CENHUD.PDF?OpenElement](http://www3.dps.state.ny.us/e/energylabel.nsf/Web+Enviromental+Labels/DC8C82FDE996CB4085257801005D0152/$File/CENHUD.PDF?OpenElement)

<sup>ix</sup> Ibid

<sup>x</sup> New York State Climate Action Council Interim Report 11-9-10 <http://www.nyclimatechange.us/InterimReport.cfm>