

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 Commission³⁴, 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.

³⁴ 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 costs³⁵ 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)³⁶, 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
City Government Operations	\$1,590,415
Kingston Housing Authority	\$268,389
Kingston Water Department	\$97,034
Dietz Stadium	\$19,564
TOTAL	\$1,975,402
Employee Commute	\$119,904
TOTAL with Employee Commute	\$2,095,306

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.

³⁵ 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.

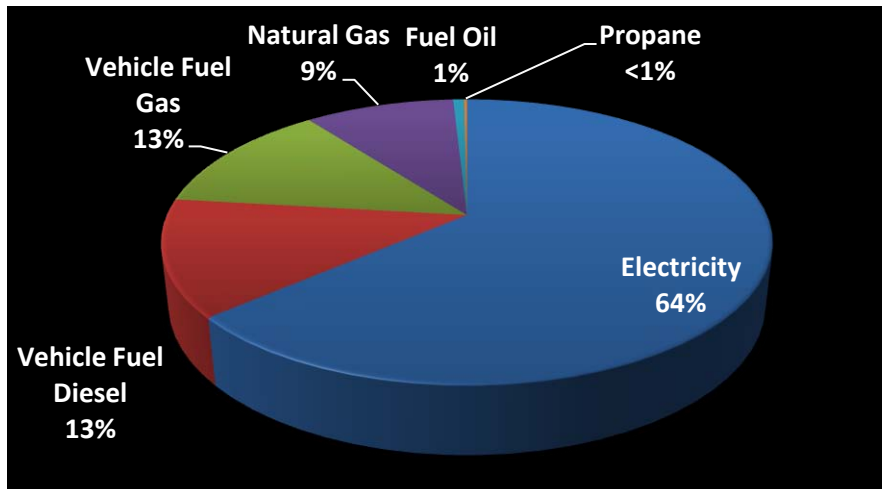
³⁶ Utility data for Stuyvesant Charter was inadvertently not accounted for. Therefore KHA energy usage and cost for 2010 will be slightly greater.

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
TOTAL City Government Costs		\$1,590,411	

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
TOTAL City Government Costs		\$1,975,402		
Employee Commute (Gas-Gal)	41,219	<u>\$119,904</u>		6
TOTAL		\$2,095,306		

*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.

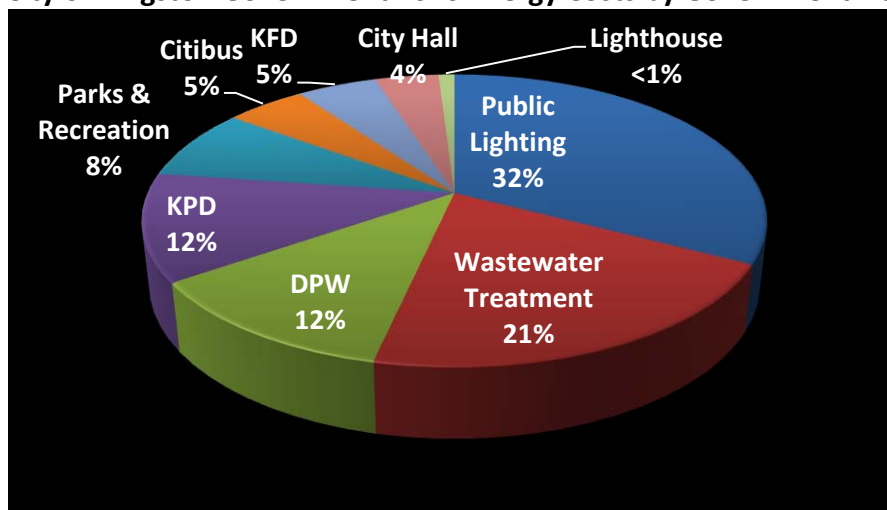
Table 4: City of Kingston Government Energy Cost Summary by Department/Sector

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
TOTAL	\$1,590,415	
KHA	\$268,389	
KWD	\$97,034	
Dietz Stadium	\$19,564	
TOTAL	\$1,975,402	
Employee Commute	\$119,904	
TOTAL	\$2,095,306	
TOTAL DPW	\$1,046,341	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 CO₂, 909 kg of N₂O, 2,103 kg of CH₄ which is equal to an estimated 7,281 tonnes of CO₂e.³⁷

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 CO₂, 867 kg of N₂O, and 1,907 kg of CH₄ which is equal to an estimated 4,587 tonnes of CO₂e.

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 CO₂e.

The GHG emissions of 7,281 tonnes of CO₂e, is equal to the CO₂ 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.³⁸

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 CO₂e, 65% of the total, not including employee commute GHG emissions.

Table 5: City of Kingston GHG Emissions Summary*

GHG Emissions Summary*	CO ₂ (tonnes)	N ₂ O (kg)	CH ₄ (kg)	CO ₂ e (tonnes)	Energy (MMBtu)	Cost (\$)	% of CO ₂ 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
TOTAL	6,593	875	2,073	6,911	127,370	\$1,975,401	
Employee Commute	362	25	21	370	10,467	\$119,904	
TOTALS	6,955	900	2,094	7,281	137,837	\$2,095,305	

*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 CO₂e, almost half of the City government operation GHGs of 4,587 tonnes of CO₂e.

³⁷ 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 CO₂e.

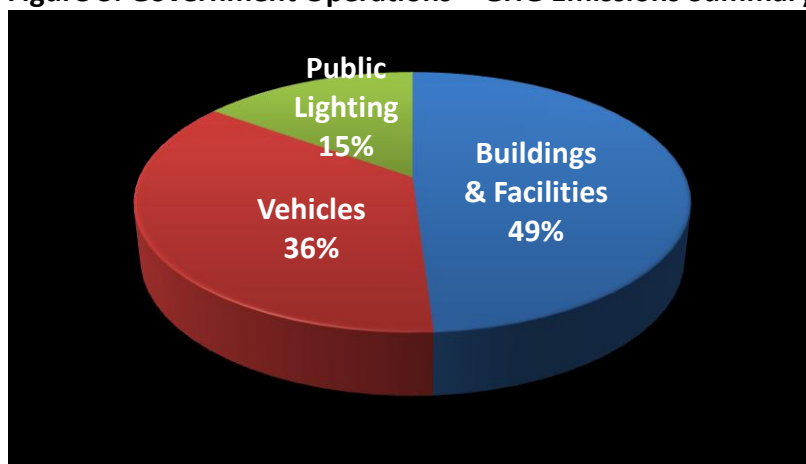
³⁸ EPA GHG Equivalency Calculator <http://www.epa.gov/cleanenergy/energy-resources/calculator.html>

Table 6: City of Kingston Government Operations * GHG Emissions Summary

City Operation GHG Emissions Summary*	CO ₂ (tonnes)	N ₂ O (kg)	CH ₄ (kg)	CO ₂ e (tonnes)	Energy (MMBtu)	Cost (\$)	% of Total CO ₂ 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
	4,276	858	1,898	4,587	86,603	\$1,590,412	

*Just Government Operation – Does not include KHA, KWD, Dietz Stadium or Employee Commuting

Figure 3: Government Operations * GHG Emissions Summary



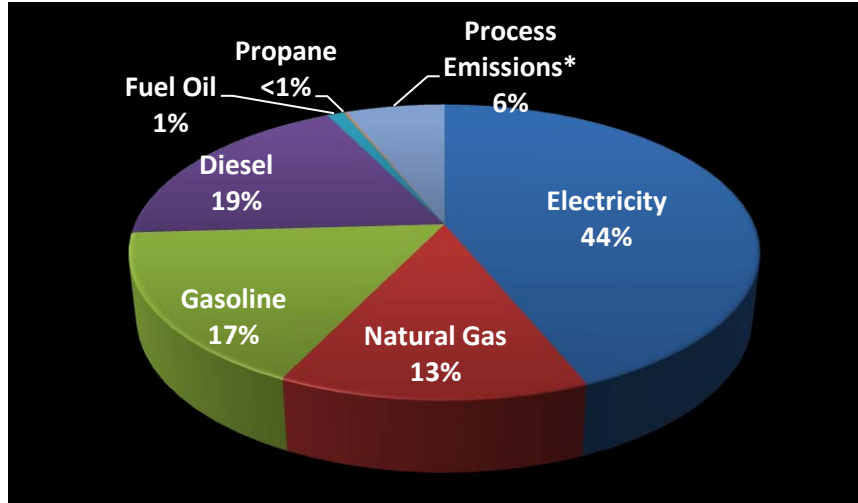
A. GHG EMISSIONS BY FUEL SOURCE

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 CO₂e, 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 ₂ e (tonnes)	% of CO ₂ e
Electricity	2,011	44
Natural Gas	614	13
Gasoline	777	17
Diesel	854	19
Fuel Oil	48	1
Propane	6	<1
Process Emissions	281	6
TOTAL	4,591	

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 CO₂e with natural gas usage being second at 2,205 tonnes of CO₂e as depicted in Table 8 and Figure 5(below). Gasoline usage is third at 1,258 tonnes of CO₂e which includes 370 tonnes of CO₂e from employee commuting. Total GHG emissions from vehicle fuel use, gasoline and diesel fuel combined were estimated at 2,119 tonnes of CO₂e.

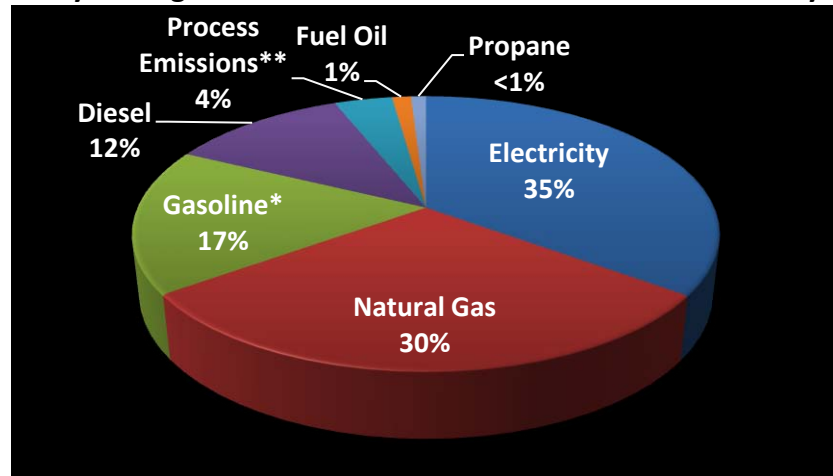
Table 8: City of Kingston Government Greenhouse Gas Emissions by Source*

Source	CO ₂ e (tonnes)	% of CO ₂ 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
TOTAL	7,281	
Gasoline (Employee Commute)	370	
TOTAL WITHOUT Employee Commute	6,911	

* 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 CO₂e, 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 CO₂e, which includes the 694 tonnes of CO₂e from public lighting and 1,329 tonnes of CO₂e from wastewater treatment operations; 58% of the total 4,587 tonnes of CO₂e. The wastewater treatment plant is the single largest producer of GHG emissions: 1,329 tonnes of CO₂e, 29% of the total 4,587 tonnes of CO₂e.

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.

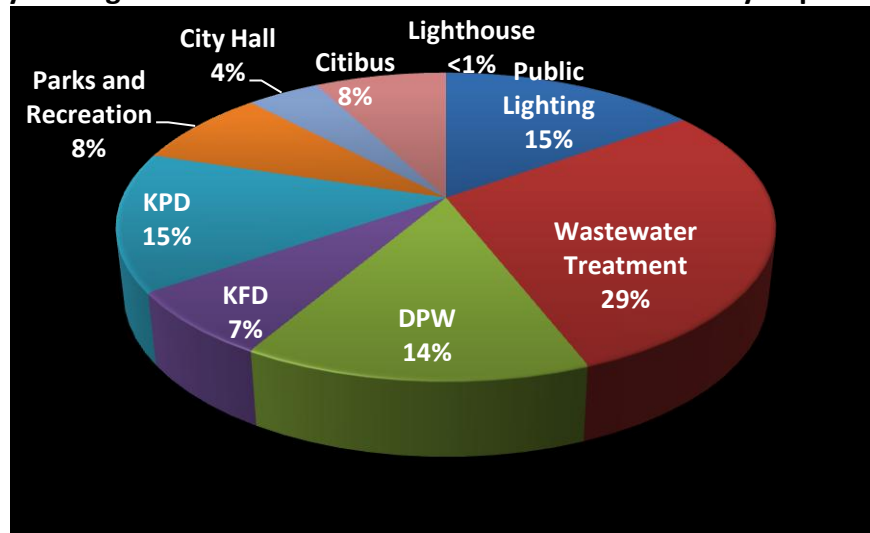
Table 9: City of Kingston Government GHG Emissions Summary by Department

GHG Emissions Summary by Department*	CO ₂ tonnes	N ₂ O (kg)	CH ₄ (kg)	CO ₂ e (tonnes)	Energy (MMBtu)	Cost (\$)	% of Total CO ₂ e*	% of Total CO ₂ 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
TOTAL	4,275	857	1,897	4,587	86,603	\$1,590,415		
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
TOTAL	6,592	874	2,072	6,911	127,370	\$1,975,402		
Employee Commute	362	25	21	370	10,467	\$119,904		5
TOTAL	6,954	899	2093	7,281	137,837	\$2,095,306		
*Total Public Works	2,386	820	1,810	2,681	35,517	\$1,037,828		

*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
TOTAL		\$652,793	41		\$1,005,797	51
TOTAL ENERGY COSTS		\$1,590,415			\$1,975,401	

* 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
TOTALS	4,232,777	\$487,764	113,267	\$151,056	4,582	\$11,225	1,044.1	\$2,748	\$652,793
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
TOTALS	6,042,003	\$709,333	406,332	\$270,108	8,934	\$21,978	1,824.4	\$,4376	\$1,005,794

*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 lighting³⁹ 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
TOTAL	4,232,777			\$487,764	0.115		
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
TOTALS	6,042,003			\$709,333	0.12		

*Without KHA, KWD, Dietz

Average New York commercial electric rate is \$0.162/kWh.

³⁹ 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*

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

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
TOTALS	113,267	115,985			\$151,057		
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	
TOTALS	406,332	416,084			\$270,109		

*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
TOTALS	4582	\$11,226	1,044.1	\$2,748	\$13,974
KWD	4352	\$10,752	780.3	\$1,628	\$12,380
TOTALS	8,934	\$21,978	1,824.4	\$4,376	\$26,354

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 CO₂e.

With KHA included, natural gas usage was the biggest contributor to GHG emission from buildings and facilities, 2,205 tonnes of CO₂e. Natural gas usage at KHA facilities emitted an estimated 1,941 tonnes of CO₂e 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 ₂ (tonnes)	N ₂ O (kg)	CH ₄ (kg)	CO ₂ 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	
TOTAL		4,176	820	2,010	4,469⁴⁰	63,629	\$1,005,795

* 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 CO₂e. Without wastewater process emissions, the GHG emission from buildings and facilities used of fossil fuels is 1,983 tonnes of CO₂e.

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 CO₂e.

Table 18: City of Kingston Government Building & Facility 2010 GHG Emissions Summary

Building and Facility* Energy Source	2010 Usage	CO ₂ (tonnes)	N ₂ O (kg)	CH ₄ (kg)	CO ₂ 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
TOTALS		1,977	22	106	1,983	26,768	\$652,795
Process Emissions		0	0	1738	37	0	0
Process Emissions		0	789	0	244	0	0
TOTALS		1,977	811	1,844	2,264	26,768	\$652,795

*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 CO₂e, water delivery facilities 204 tonnes and the solid waste transfer station 8 tonnes. Total CO₂e 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.

⁴⁰ 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 CO₂e is equal to the CO₂ 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.⁴¹

Table 19: City of Kingston Government Buildings and Facilities 2010 GHG Emissions

Buildings and Facilities	CO ₂ tonnes	N ₂ O (kg)	CH ₄ (kg)	CO ₂ 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
TOTALS	1,975	802	1,835	2,264	26,774	\$652,795
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
TOTALS	4,178	811	2,012	4,469	63,628	\$1,005,794

Table 20 identifies the top five facilities that contribute to GHG emissions based on tonnes of CO₂e 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 ₂ tonnes	N ₂ O (kg)	CH ₄ (kg)	CO ₂ 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

⁴¹ 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 ₂ (tonnes)	N ₂ O (kg)	CH ₄ (kg)	CO ₂ 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.⁴² 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.

⁴² 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 equipment⁴³ 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 Summary⁴⁴

2010 Vehicle Summary	DPW ⁴⁵	KPD	KFD	Parks & Rec ⁴⁶	City Hall	Citibus	TOTALS	KHA	KWD	TOTALS
Heavy Duty	50	2	10	8	0	9	79	0	10	88
Light Truck	20	5	5	6	4	0	40	5	3	48
Passenger	<u>0</u>	<u>37</u>	<u>4</u>	<u>1</u>	<u>4</u>	<u>0</u>	46	<u>0</u>	<u>1</u>	47
TOTALS	70	44	19	15	8	9	165	5	14	184
% 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		84,402.6	2,563.6	9,997.9	96,964.1
% of Gas	21	62	4	9	3					
Gas Cost	\$43,677	\$125,750	\$9,109	\$18,035	\$6,399		\$202,970	\$6,189	\$24,043	\$233,202
% of Gas (\$)	22	62	4	9	3					
Diesel (Gal)	40,735	21.5	7,989.5	103.2		34,663.4	83,512.6		697.5	84,210.1
% of Diesel	49	<1	10	<1		42			1	
Diesel Cost	\$101,794	\$51	\$20,727	\$259		\$87,195	\$210,026		\$1,755	\$211,781
% of Diesel (\$)	48	<1	10	<1		42			1	
Vehicle Miles	321,831	638,100	80,858	65,542	41,363	727,238	1,874,932	23,800	100,734	1,999,466
% 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.

⁴³ 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.

⁴⁴ Fuel Usage includes off-road equipment.

⁴⁵ Fuel usage for DPW includes gas and diesel off-road equipment (approx 32 pieces)- 13,886 hours

⁴⁶ 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
TOTAL	84,402.6	\$202,970	83,512.6	\$210,026	\$412,996	1,874,932		
KHA	2,563.6	\$6,189			\$6,189	23,800		
KWD	9,997.9	\$24,043	698	\$1,755	\$25,798	100,734		
TOTALS	96,964.1	\$233,202	84,210	\$211,781	\$444,983	1,999,466		

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 CO₂e.

Including KHA and KWD, the 184 vehicles resulted in the release of an estimated 1,750 tonnes of CO₂e.

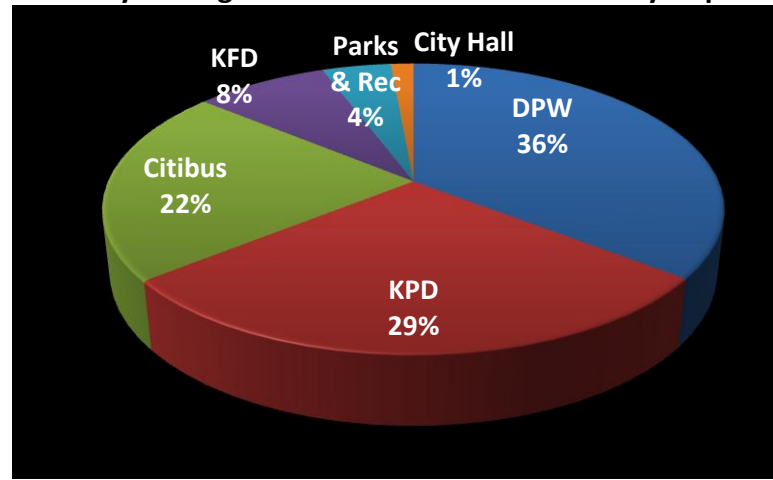
More than a third of the emissions were from DPW vehicles with the Kingston Police Department and Citibus responsible for 29% and 22% respectively as depicted in Table 24 and Figure 7.⁴⁷

Table 24: City of Kingston Vehicle GHG Emissions Summary

Vehicle GHG Emissions Summary	CO ₂ (tonnes)	N ₂ O (kg)	CH ₄ (kg)	CO ₂ e (tonnes)	Energy (MMBtu)	Cost (\$)	% of Total CO ₂ 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
TOTAL	1,613	46	46	1,629	52,221	\$412,997	
KHA	23	0	0	23	541	\$6,189	
KWD	95	8	9	98	3,365	\$25,798	
TOTALS	1,731	54	55	1,750	56,127	\$444,984	

⁴⁷ 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 CO₂e, 48% of vehicle related GHGs and 17% of city operations total GHG emissions. The usage of diesel fuel released an estimated 854 tonnes of CO₂e, 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 Source⁴⁸

Source	Consumption (gal)	Metric Tons CO ₂ e	% of Vehicle CO ₂ e	% of City Total CO ₂ 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
TOTALS	167,915.2	1,631		36	\$412,996		

With KHA and KWD vehicle fuel usage included, the 184 vehicles' use of gasoline produced 889 tonnes of CO₂e and the use of diesel fuel produced an estimated 861 tonnes of CO₂e, 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 Source⁴⁹

Source	Consumption (gal)	Metric Tons CO ₂ e	% of Vehicle CO ₂ e	% of City Total CO ₂ 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
TOTALS	181,174.2	1,750		25	\$444,983		23

⁴⁸ The figures in this table do not include gasoline used in employee commuting.

⁴⁹ 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 CO₂e as depicted in Table 27. Most of the GHG emissions from the buses are attributed to the use of diesel fuel, 354 tonnes of CO₂e, or more than 99% of the GHG emissions.

Table 27: Citibus 2010 GHG Emissions

Citibus GHG Emissions	CO ₂ tonnes	N ₂ O (kg)	CH ₄ (kg)	CO ₂ e (tonnes)	Energy (MMBtu)	Cost (\$)
Diesel Fuel Usage	354	0	0	354	4786	\$87,195
Vehicle Miles Traveled	0	3	4	1	16176	0
TOTALS	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%⁵⁰ of the government operations electricity, the largest percentage of government operations total electricity usage.

⁵⁰ (2,525,109 kWh of 6,461,721 kWh) Percentage based on City operations electricity usage, does not includes 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 (CH₄) and nitrous oxide (N₂O) 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 CO₂e 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 CO₂e 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 CO₂e, 37 and 244 tonnes respectively. Vehicle use at the plant resulted in 127 tonnes of CO₂e.

Table 28: Wastewater Treatment Plant 2010 GHG Emissions Summary

WWTP	CO ₂ (tonnes)	N ₂ O (kg)	CH ₄ (kg)	CO ₂ e (tonnes)	Energy (MMBtu)	Cost (\$)
WWTP Buildings and Facilities	915	10	32	921	11,135	\$303,141
Methane (CH ₄) emissions from anaerobic digester	0	0	1,738	37	0	0
Process & Effluent-Nitrous Oxide(N ₂ 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>
TOTALS	1,040	804	1,775	1,329	14,455	\$335,992

Wastewater treatment facility operations account for 29% of the City operations GHG emissions of 4,587 tonnes of CO₂e. Wastewater treatment plant emissions are 18% of the overall total emissions of 7,281⁵¹ tonnes of CO₂e 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,

⁵¹ 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 CO₂e. Table 29 summarizes the GHG emissions for the City of Kingston Water Department. KWD buildings and facilities accounted for an estimated 202 tonnes of CO₂e, two-thirds of total emissions, with KWD vehicle use accounted for an estimated 98 tonnes of CO₂e, the remaining third.

Table 29: Water Department 2010 GHG Emissions Summary

Water Department GHG Emissions Summary	CO ₂ (tonnes)	N ₂ O (kg)	CH ₄ (kg)	CO ₂ e (tonnes)	Energy (MMBtu)	Cost (\$)	% of Total CO ₂ e
Buildings and Facilities	201	1	12	202	2,640	\$71,237	67
Vehicles	95	8	9	98	3,365	\$25,798	33
TOTALS	296	9	21	300	6,005	\$97,035	

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%⁵² of the total electricity usage and 52%⁵³ of the City’s electric bill.⁵⁴ The majority of the usage and cost for public lighting was for street lighting.

⁵² (2,228,944 kWh of 6,461,721 kWh)

⁵³ (\$524,620 of \$1,012,384)

⁵⁴ Percentage based on city operations alone, does not include KHA, KWD and Dietz Stadium.

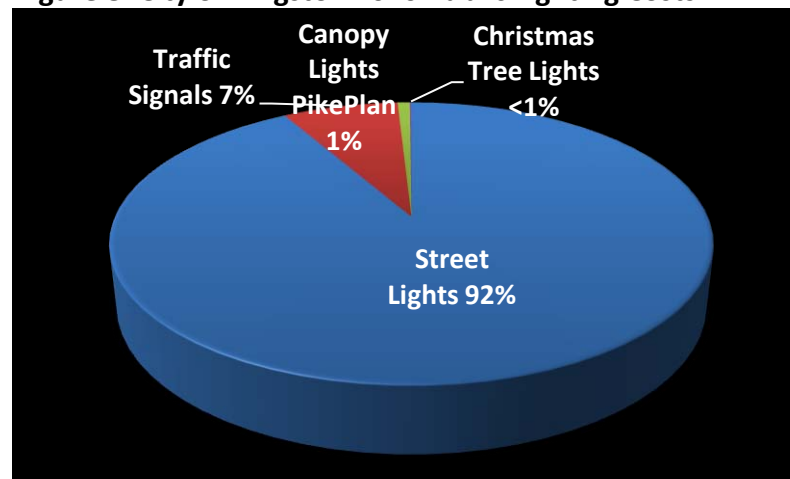
As is depicted in Table 30 and Figure 8 street lighting accounts for the majority of usage and costs associated with public lighting. In 2010, streets lights used 1,937,278 kWh (1,884,320+52,958) at a cost of \$481,008 (\$471,715+\$9,292), 92%. Traffic signals used 262,791kWh at a cost of \$38,941, 7%. 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	2,153	\$560	<1
TOTAL	2,228,944	\$524,620	
Park Lighting	37,324	\$10,189	

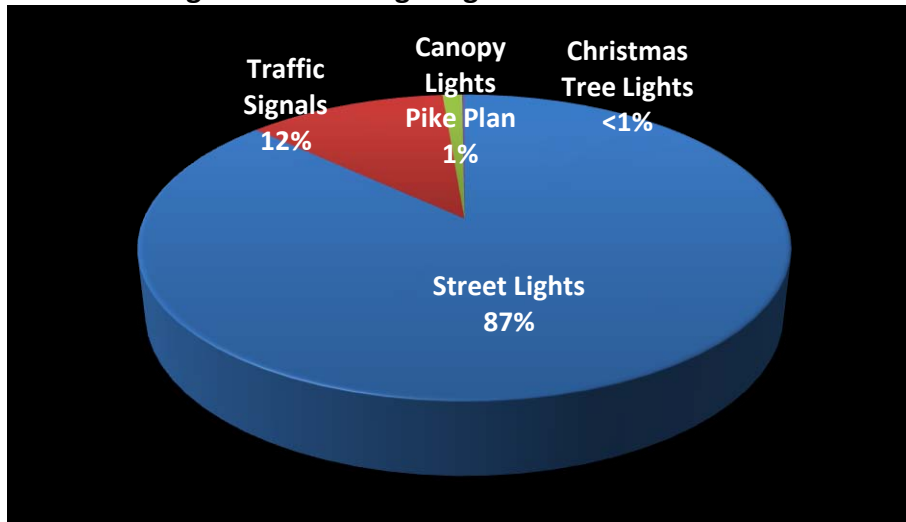
Figure 8: City of Kingston 2010 Public Lighting Costs



PUBLIC LIGHTING GHG EMISSIONS

Electricity usage associated with public lighting in the City of Kingston produced an estimated 694 tonnes CO₂e. As would be anticipated electricity usage associated with street lighting produces the greatest amount of GHG emissions with 603 tonnes CO₂e or more than 87% of the total GHGs from public lighting. Electricity used for traffic signals produced 82 tonnes of CO₂e, 12% of the total. The Pike Plan Canopy lights produced 8 tonnes of CO₂e, with the Christmas tree lights emitting 1 tonne of CO₂e.

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 CO₂e.

The diesel fuel used by refuse packers used to collect waste and recycling in 2010 emitted 212 tonnes of CO₂e. 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 CO₂e 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 ₂ (tonnes)	N ₂ O (kg)	CH ₄ (kg)	CO ₂ 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
TOTALS	220	0	0	220	4,383	\$55,605

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 CO₂e 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 ₂ e (tonnes)
Passenger Vehicles	20,214	\$58,801	371,566	**
Light Trucks	21,005	\$61,103	328,302	**
TOTALS	41,219	\$119,904	699,868	370

*Ave price per gallon of gas for City Government in 2010 = \$2.909/gal

** CACP 2009 Software does not give a breakdown of CO₂e 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 ₂ e (tonnes)	% of CO ₂ 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
	\$1,590,409		4,587	
Kingston Housing Authority	\$268,389		1,982	
Kingston Water Department	\$97,034		300	
Dietz Stadium	\$19,564		<u>42</u>	
	\$1,975,396		6,915	
Employee Commute	\$119,904		<u>370</u>	
TOTAL City Government Costs	\$2,095,300		7,285	

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.