

Allegheny County Greenhouse Gas Emissions Inventory Report and Climate Action Plan

BASELINE DATA YEAR: 2008



Allegheny County

Pennsylvania Environmental Council

Student Conservation Association

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TABLE OF CONTENTS

Executive Summary	3
A. Emission Reduction Goals	7
B. Methodology	7
C. Emissions Inventory by Sector	11
Sector 1: Buildings & Facilities	
(1.1) Emissions Inventory	11
(1.2) Emissions Reduction Recommendations	11
Sector 2: Vehicles	
(2.1) Emissions Inventory	16
(2.2) Emissions Reduction Recommendations	17
Sector 3: Water Delivery & Wastewater Treatment	
(3.1) Emissions Inventory	19
(3.2) Emissions Reduction Recommendations	20
Sector 4: Solid Waste	
(4.1) Emissions Inventory	23
(4.2) Emissions Reduction Recommendations	23
Sector 5: Street Lights	
(5.1) Emissions Inventory	26
(5.2) Emissions Reduction Recommendations	26
D. Additional Recommendations	28
E. Green Action Team	31
F. Glossary	33

Appendix A: ICLEI CACP Summary Report	35
Appendix B: Energy and eCO₂ Emission Calculation Details	36

Executive Summary:

This initial benchmark inventory reflects the emissions from County government only. We plan to invite all of the County authorities to participate in a Phase II study using the same software and protocol. Such a study will provide a more comprehensive picture of the region's carbon footprint.

We welcome the support of County Council, as evidenced in its proposed February 2010 legislation, to address matters of climate change.

In 2008, Allegheny County Executive Dan Onorato launched *Allegheny Green*, a comprehensive greening initiative aimed at reducing the County government's carbon footprint, increasing energy efficiency, minimizing environmental impact, and reducing governmental costs. As part of the effort, the County Executive set an ambitious goal of reducing the County's greenhouse gas emissions and energy consumption by 20% from their 2008 levels by 2015. The County also established a goal of converting its fleet vehicles and motorized equipment to technologies with higher efficiency and lower emissions by 5% annually from 2010 through the end of 2014. The County Executive and County departments are to be commended for demonstrating strong leadership and a well-defined vision for reducing the County's energy consumption and carbon footprint.

To spearhead *Allegheny Green*, the County Executive appointed an outside advisory committee called the Green Action Team. The Team will identify strategies and opportunities for realizing the County's goals and make recommendations for consideration by County government officials. Members of the Green Action Team are listed in Section F of this report.

The data acquisition and analysis behind this report show that Allegheny County government produced approximately 77,000 tons of carbon dioxide equivalent (eCO₂) emissions in 2008. To meet its stated goals, that baseline would have to be reduced by 20%, or 15,000 tons, and reach a level of 62,000 tons or less by 2015. The largest source of emissions (86%) comes from operating the County's 139 buildings and facilities since the County's electricity providers use coal as their primary fuel source. The remaining sources of emissions include vehicles, potable water provisions, wastewater treatment, solid waste management, streetlights, and a small segment of fugitive and refrigerant emissions.

Emissions reduction recommendations are listed below. However it is important to note that this task force acknowledges the cost of meeting some of these goals may be substantial. Subject to the County being able to identify the necessary funds, there are numerous efficiency opportunities for the County to consider to meet its objective of reducing annual emissions of greenhouse gases by 20% versus 2008 levels by 2015:

- **Buildings & Facilities** –The energy efficiency recommendations can eliminate a projected 6,000 tons of eCO₂ emissions on an annual basis that occur during building and facility operations. The initial cost of building-related energy efficiency improvements is estimated at \$6.3 million. Projected annual savings are \$0.96 million. Thus, the efficiency projects will pay for themselves in approximately six and a half years.
- **Vehicles** – As the County’s fleet is replaced, it is recommended that the County purchase only four-cylinder vehicles (or vehicles with similar or better fuel efficiency). By replacing 33 County-owned automobiles with four-cylinder models, the County can expect to save more than 2,800 gallons of gasoline and 28 tons of eCO₂ annually. At gasoline costs of \$3 per gallon, this will save the County \$8,500 per year.
- **Water & Wastewater** – To reach its stated goal of 20% improvement in water efficiency, the County would have to reduce its water consumption by more than 260 million gallons per year by 2015. Under separate contract, the County identified savings of 77.5 million gallons of water per year through efficiency and facility decommissioning measures. These water savings would reduce eCO₂ emissions by 150 tons and save the County approximately \$805,000 annually. The water reduction measures identified to date achieve a 6% reduction in total annual water use. To realize the additional 14% reduction, the County will need to identify and act upon other water-saving measures at County parks and swimming pools, which may offer the greatest opportunity for improved efficiencies.
- **Solid Waste** – By recycling glass, metal, plastic, and paper, the County could divert up to 31% of its solid waste from local landfills and reduce its annual eCO₂ emissions by 6,000 tons by 2015.
- **Streetlights** – It is recommended that the County replace all 779 high-pressure sodium streetlights on its roads, tunnels and bridges with LED lights within the next five years. These changes will realize an annual eCO₂ reduction of 155 tons. Replacement costs are estimated at \$471,295. With an estimated annual savings of \$35,912, the payback period for such an investment is approximately 13 years. These estimates assume each high-pressure sodium fixture would need to be replaced with an LED fixture. Given recent innovations in LED lighting output, it may be possible to reduce the total number of lighting fixtures installed on County right-of-ways, thereby significantly reducing the capital cost. It is recommended the County undertake a more comprehensive road lighting study to improve the costs and benefits of conversion to LEDs.

Executive Summary – Chart of Recommended Measures

Sector	Recommended Reduction Measures	Resulting Carbon Reduction	Costs	Annual Savings	Payback	Potential Funding Source
Buildings & Facilities	<ul style="list-style-type: none"> • 14 different measures from steam traps to replacement chillers and new windows • See Table 4 for full detail. 	6,045 tons eCO ₂	\$6,265,721	\$963,927	Varies; average is 6.5 years	<ul style="list-style-type: none"> • 2010 ESCO project
Vehicles	<ul style="list-style-type: none"> • Switch part of fleet to 4-cylinder cars • Explore ZipCar program, bus program • Explore alternative fuel 	28 tons eCO ₂	\$494,670 <i>*Purchase of 33 2010 Chevy Cobalt vehicles @ \$14,990</i>	\$8500	58 years	<ul style="list-style-type: none"> • Operational shift over time, phasing in on annual vehicle purchase schedule • Parking garage fees • Departmental charge-back for car usage • Alternative Fuels Incentive Grant grants
Water & Waste Water	<ul style="list-style-type: none"> • Plumbing controls • Decommission buildings • Water conservation • Decommissioning water-cooled units • See Water section of report for full detail 	150 tons eCO ₂	\$4,339,829	\$804,738	Ranges from 1 to 6.7 years <i>(See Water section of report for detail.)</i>	<ul style="list-style-type: none"> • 2010 ESCO project
Solid Waste	<ul style="list-style-type: none"> • Increase recycling 	6,000 tons eCO ₂	<ul style="list-style-type: none"> • \$100,000 estimated for containers • \$150,000 estimated for dumpsters • \$ TBD for hauling 	Potential reduction in trash hauling costs offset by increase recycling waste hauling costs	N/A	<ul style="list-style-type: none"> • DEP 902, 904 grants for containers • Dumpsters: require waste hauler to provide • Apply landfill tipping fees toward waste hauling charges
Street Lights	<ul style="list-style-type: none"> • Replace 779 HPS lights with LED or other technology 	155 tons eCO ₂	<ul style="list-style-type: none"> • \$471,295 	\$35,912	13 years	<ul style="list-style-type: none"> • PA Energy Development Authority (PEDA) grant or other grant

Table 1. Greenhouse Gas Emissions and Reduction Goals by Sector

Sector	2008 Emissions (tons eCO ₂)	Amount of Reduction (tons eCO ₂)	Emissions Remaining in 20% Target Reduction (tons eCO ₂)
Buildings & Facilities	66,363	6,045	7,228
Vehicles	4,851	28	943
Water & Wastewater	2,513	150	353
Solid Waste	2,081	6,029 ¹	0
Streetlights & Traffic Signals	1,129	155	71
Fugitive Emissions & Refrigerants	271	0	54
Renewable Energy Purchases (increase by 5% per year through 2014)	NA	16,263	NA
Total	77,208	28,670	NA

This study has identified opportunities for reducing more than 12,000 tons per year of carbon emissions. This represents approximately 16% of the County's emissions in 2008. To meet the County goal of a 20% reduction by 2015, it is recommended that the County continue its practice of increasing renewable energy purchases each year by 5%. Already, the County has increased its 2010 purchase commitment to 15% renewable energy. By combining the measures outlined herein with renewable energy purchases, the County could exceed its reduction target of 20% and achieve an emissions reduction of 37% below 2008 levels by 2015. In addition to applying the measures suggested in this report, it is also recommended that the County continue to seek new green business practices, programs and protocols.

¹ eCO₂ emission reductions for solid waste is the result of avoided methane emissions from decomposition in a landfill plus avoided manufacturing of raw materials due to a recycling program, see appendix B.

A. Emission Reduction Goals

Allegheny County's governing officials have taken steps to address the emissions produced by County government operations. In October 2009, County Executive Dan Onorato signed an Executive Order requiring a number of greening measures, including a requirement that the County publish an annual report card on energy performance, showing the consumption of all energy (electricity, steam, gas, etc.) and all water. Department directors were asked to support this initiative through their business functions and purchasing decisions – within the parameters of achieving required product performance and maintaining good financial stewardship. In addition, the County Executive set a number of ambitious reduction goals for County government to achieve by 2015. Per the Executive Order, the County government aims to reduce its energy consumption by 20%, increase water efficiency by 20%, transform its fleet to higher efficiency vehicles at a rate of 5% per year, and reduce carbon equivalent emissions by 20%. This inventory and action plan can help to guide the County in its efforts to meet these targets.

B. Methodology: ICLEI Local Government Operations Protocol

In response to scientific evidence linking greenhouse gas emissions to climate change, Allegheny County has committed to reducing its carbon footprint and identifying opportunities to decrease emissions in its operations. Reducing energy usage in order to meet lower greenhouse gas emissions targets is projected to also result in significant cost savings for the County. This report establishes the necessary baseline measurement of County greenhouse gas emissions from which subsequent progress comparisons can be made.

The County engaged the assistance of the Pennsylvania Environmental Council (PEC) to help in structuring and completing this project. The County and PEC followed the guidelines discussed in the Local Government Operations Protocol (LGOP)², developed by a partnership of the California Air Resources Board, California Climate Action Registry, The Climate Registry, and ICLEI. The LGOP provides guidelines for developing a local government operations emissions inventory with a five-fold purpose:

1. To allow local governments to develop emissions inventories that follow internationally accepted accounting and reporting principles.
2. To ensure consistent, comparable, and relevant measurement and reporting of emissions.
3. To enable measurement toward climate goals.

² ICLEI - Local Governments for Sustainability, California Air Resources Board, California Climate Action Registry, and The Climate Registry. *Local Government Operations Protocol, Version 1.0*. Rep. Sept. 2008. Web. Dec. 2009. <<http://www.iclei.org/action-center/tools/lgo-protocol-1>>. For the quantification and reporting of greenhouse gas emissions inventories

4. To encourage the understanding of local government in combating climate change.
5. To create synchronization between inventories (among municipalities) developed and reported to numerous programs.²

Under the LGOP, greenhouse gas emissions fall under three separate categories:

- **Scope 1 Emissions** - all direct greenhouse gas emissions produced through combustion of fuels to produce energy, and those released through chemical and physical processes on an organization's premises, or from its vehicles.
- **Scope 2 Emissions** - all indirect emissions of purchased or acquired energy in the form of electricity or purchased steam from an off-site facility.
- **Scope 3 Emissions** - all other indirect emissions that are not covered by Scope 2, including emissions produced from the extraction and manufacturing of purchased products, those produced by transportation-related activities not controlled by the organization, and emissions from outsourced activities.

The LGOP requires all emissions covered in Scopes 1 and 2 to be covered in an inventory, while it is optional to include Scope 3 emissions. For the purposes of Allegheny County's inventory, only emissions from Scopes 1 and 2 have been used, with the exception of those resulting from the pumping of water used by County facilities and wastewater discharged from County facilities, as well as the disposal of solid waste at local landfills. These operations fall under Scope 3 because the County does not own the water delivery, wastewater treatment facilities or local landfills.

The LGOP protocol is incorporated in the Clean Air Climate Protection (CACP) software tool developed by ICLEI-Local Governments for Sustainability, located at www.iclei.org. ICLEI is a membership association of local governments committed to advancing climate protection and sustainable development that includes more than 1,100 cities worldwide, including 600+ in the United States. ICLEI membership includes access to the CACP software package, which provides an international standardized tool for documenting energy use for greenhouse gas inventories. ICLEI tools have become industry standards. As such, they provide consistency with other local government greenhouse gas inventories, including inventories published by the Pittsburgh Climate Initiative in 2006. The eCO₂ emissions from County sectors presented in this report were calculated using the CACP software.

Concurrent to the launch of the emissions inventory project, the County was in the process of selecting an Energy Savings Company (ESCO) to be its partner in identifying energy savings projects. NORESO, the firm ultimately selected by the County, submitted its preliminary recommendations in November 2009. It is important to note that throughout the first four months of 2010, upon its selection as the County's ESCO firm, NORESO was conducting an investment-grade audit of the County's largest 19 facilities for the project. NORESO's scope of work includes identifying measures to conserve energy, reduce water consumption, improve

building envelopes and mechanical systems, and identify opportunities related to power generation and supply. While at the time of this report's publication, NORESO has not yet provided its final recommendations and metrics to the County, the calculations in this report, particularly the analysis, link to some of its preliminary findings.

C. Emissions Inventory by Sector

Allegheny County government's daily operations in 2008 resulted in overall emissions of greenhouse gases calculated to equal approximately 77,000 tons eCO₂ (carbon dioxide equivalent). ICLEI uses the standard measure of eCO₂ to describe the amount of global warming potential of a particular GHG by comparison to carbon dioxide (CO₂). Emissions of greenhouse gases are typically expressed in a common metric, so that their impacts can be directly compared, as some gases are more potent (have a higher global warming potential or GWP) than others. Additional information about the global warming potential of different greenhouse gases can be found in the Glossary following the narrative portion of this report.

Sectors:

The emissions in the scope of this study represent County operations in six different sectors:

1. **Buildings & Facilities:** The County owns and operates 139 buildings and facilities, plus it leases additional space. Scope 1 emissions include emissions resulting from fuel used directly on site, such as natural gas for space conditioning. Scope 2 emissions result from electricity use for normal building operations.
2. **Vehicles:** The County owns and operates 612 vehicles. Scope 1 emissions result from fuel combustion during vehicle operations.
3. **Water & Wastewater:** The County currently draws water from 16 water authorities. Scope 3 emissions result from the total gallons used and total gallons treated.
4. **Solid Waste:** The County currently contracts with four companies to collect all County government-generated waste. These are scope 3 emissions.
5. **Streetlights:** The County currently owns and operates streetlights in County parks and on County bridges. These scope 2 emissions are the result of energy use by each fixture.
6. **Fugitive Processes³ & Refrigerants⁴**

³ The fugitive emissions were produced from diesel generators operated for the annual "Celebration of Lights" event at Hartwood Acres, an Allegheny County park. More information is available at: <http://www.alleghenycounty.us/parks/hwfac.aspx>

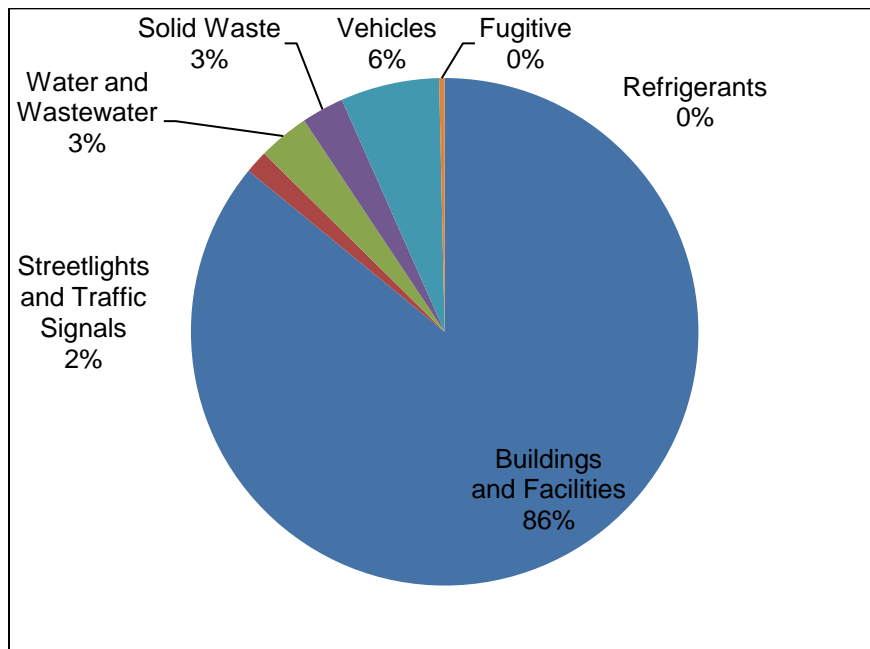
⁴ Emissions from refrigerants based on annual purchase of R-401A Blend refrigerant.

Table 2 and Figure 1 illustrate the emissions by sector. A summary table of emissions from individual sectors, generated by the ICLEI CACP software package, is included in Appendix A.

Table 2. Emissions by Sector

Sector	Emissions (tons eCO ₂)
1. Buildings & Facilities	66,363
2. Vehicles	4,851
3. Water & Wastewater	2,513
4. Solid Waste	2,081
5. Streetlights & Traffic Signals	1,129
6. Fugitive & Refrigerants	271
Total	77,208

Figure 1. Emissions by Sector



SECTOR 1: Buildings & Facilities

1.1 Emissions Inventory

Allegheny County operated 139 buildings and facilities in 2008, four of which were served by the Pittsburgh Allegheny County Thermal Ltd. (PACT) district energy steam loop. The greenhouse gas emissions that resulted from the operations of all 139 buildings fall under Scope 1 (natural gas that is burned on site) and Scope 2 (imported steam that is produced by burning natural gas and electricity). Table 3 shows the County's end-use energy consumption, emissions, and utility costs by fuel source.

Table 3. Energy, Cost and Emissions for Buildings and Facilities

Buildings & Facilities	Energy (kWh)	Cost (\$)	eCO ₂ (tons)	% of Emissions
Steam	64,405,832	4,031,777	12,890	19
Electricity	58,639,925	5,127,917	45,336	68
Gas	40,279,143	1,772,285	8,137	13
Total	163,324,900	10,931,979	66,363	100

The factor used for estimating the emissions from electricity is based on EPA e-GRID data.⁵ The eGRID Region (RFCW) that encompasses Allegheny County is primarily served by coal-fired generating facilities, with some production coming from nuclear power plants and alternative sources.

1.2 Building & Facility Emissions Reduction Recommendations

Buildings and facilities are the County's largest emitter of greenhouse gases (86%).

A preliminary audit⁶ of Allegheny County's buildings performed by NORESKO, an Energy Service Company (ESCO), identified opportunities for energy and eCO₂ reductions through energy efficiency. Fourteen energy-reducing measures identified by NORESKO are presented in Table 4. These recommended measures were evaluated and ranked according to the expected annual eCO₂ emission reductions estimated using the ICLEI CACP software.

The projected annual savings of the measures in Table 4 is 6,000 tons eCO₂. If implemented, these measures are projected to reduce building emissions from 66,363 tons eCO₂ in 2008 to 60,315 tons eCO₂ after implementation, for a 10% reduction in emissions from buildings.

⁵ United States of America. U.S Environmental Protection Agency. Clean Energy. *EGrid*. 27 Apr. 2009. Web. 6 Dec. 2009. <<http://www.epa.gov/cleanenergy/energy-resources/egrid/index.html>>.

⁶ NORESKO. *Allegheny County Department of Public Works Request for Proposal*. Rep. 30 Sept. 2009. Print. Submitted Proposal for Guaranteed Energy Savings Project.

The top five emissions reducing measures for buildings and facilities are:

- (1) Upgrading steam energy traps at the County Courthouse, County Office Building, City-County Building, and Old Morgue (4% reduction);
- (2) Installing an energy management system to control HVAC equipment at the County Courthouse, City-County Building, and Kane Regional Center in Ross Twp. (2% reduction);
- (3) Making leak repairs to the general steam system in the County Courthouse, County Office Building, City-County Building, and County Jail (0.7% reduction);
- (4) Retrofitting light fixtures and installing lighting improvements at several County buildings (0.6% reduction);
- (5) Repairing the steam traps and insulating the steam pipes at the Old Morgue (0.3% reduction).

The efficiency measures identified in Table 4 are projected to have an initial cost of \$6,265,721. The annual energy cost savings that will result from the measures is estimated to be \$963,927 for a project payback period of six and a half years.

It is recommended that the County implement the 14 quantified measures as listed in Table 4 or identify and implement other measures that will result in a similar reduction of eCO₂ by 2015.

Allegheny County retrofitted exit signs in most of its buildings during the last ESCO project it completed in 2003. It is recommended that the County confirm locations of any non-LED exit signage remaining and retrofit all with LEDs.

The average exit sign with incandescent lighting uses approximately 350 kWh per year, while the average LED sign uses 44 kWh⁷, representing a corresponding reduction of eCO₂ emissions from 0.27 tons to 0.03 tons. If the County were to replace 100 exit signs with LED light bulbs, it would reduce eCO₂ emissions by 23.7 tons on an annual basis.

Conventional refrigerated vending machines run continuously, cooling beverages 24 hours a day, seven days a week. Vending machine misers are devices that monitor movement around the machines and switch off cooling during off-peak hours.

⁷ U.S Environmental Protection Agency and U.S Department of Energy. Energy Star. *SAVE ENERGY, MONEY AND PREVENT POLLUTION WITH LIGHT-EMITTING DIODE (LED) EXIT SIGNS*. Web. 5 Dec. 2009. <http://www.energystar.gov/ia/business/small_business/led_exitsigns_techsheel.pdf>

Additional information regarding estimated cost and energy savings from retrofitting exit signs and vending machines is included in Appendix B.

It is recommended that the County retrofit all exit signs with LED bulbs and install vending misers on refrigerated vending machines, where vended contents permit (i.e., will not spoil).

Table 4. Buildings & Facilities Measures

Building Measure	eCO ₂ Saved (tons)	Implementation Cost (\$)	Payback Period (years)	Annual Savings (\$)	Energy Saved/year	Energy Units
Steam Energy Traps	2,418	511,136	2.9	175,912	5,960,000,000	lbs. steam
Energy Mgmt. System	1,362 136	391,508	2.6	156,386	1,761,358 23,145	kWh therms (natural gas)
Steam System Repairs	481	92,706	0.8	114,001	1,184,638,325	lbs. steam
Lighting Improvements	423	466,034	4.6	100,824	547,600	kWh
Steam Traps/Pipe Insulation	203	32,634	1.1	30,293	500,000,000	lbs. steam
Decommission Buildings	190	47,895	0.2	203,433	32,394	therms
New LED Lighting	184	217,020	13	16838	238,574	kWh
New Windows	114 49	1,461,476	67.7	\$21,725	146,874 8,283	kWh therms
Network Power Management	156	65,121	3.6	18225	202,217	kWh
Lighting Controls	150	76,130	7.4	10,184	194,341	kWh
New AC Units	68	2,270,317	211.7	10,689	88,473	kWh
Seal Computer Room Upgrade	55	19,441	3.7	5,249	71,680	kWh
Programmable Thermostat	28 20	24,954	3.9	6,459	35,904 3,386	kWh therms
Secondary Interior Glaze	6 2	589,349	6	93,709	8,251 279.05	kWh therms
TOTALS	6,045	6,265,721	6.5	963,927		
Other Recommendations:						
Retrofit Exit Signs ⁷	0.24	39	0.9	43	306	kWh
Install Vending Machine Misers*	1.35	165	0.9	175	1,750	kWh

Note: The energy and cost savings data from the ESCO has been used for this analysis, and the eCO₂ savings have been calculated using ICLEI's CACP software.

* Energy and emission savings are based on the retrofit of a single exit sign and a single vending machine.

Institute a LEED Certification Requirements Program

The County instituted a policy requiring building projects larger than 35,000 ft² at all County-owned buildings to achieve “Certified” status under the Leadership in Energy and Environmental Design ® (LEED) green building system. It is recommended that the County broaden this existing commitment to achieve LEED for New Construction and Major Renovation to include even smaller building projects, specifically those at least 5,000 ft², and to require the higher “Silver” level certification under the LEED system.

The LEED rating system was developed by the U.S. Green Building Council to provide a set of standards for sustainable design, construction and operation of buildings. LEED buildings are designed to use less energy and water, thus helping the County meet its sustainability goals. Once constructed, it is recommended that the County track the actual performance data for LEED buildings so that it can make informed decisions in the future about the use of the LEED rating system.

It is important to note that the County has also committed to explore how to run its existing buildings in a greener manner by forming a Task Force to evaluate the steps and costs necessary for achieving the LEED for Existing Buildings/Operations & Maintenance certification. These greener operations can conceivably lead to additional energy and water savings opportunities.

Heat Recovery System

The preliminary energy audit of selected County buildings completed in September 2009 identified the County Jail’s chiller plant heat recovery system as not operating efficiently. This system recovers heat from steam condensation and returns it to the district steam system. The recovered heat is used to heat domestic water at the jail. It was recommended that the heat recovery system be re-calibrated in order to optimize its operation and reduce energy usage and cost.

It is recommended that the County identify other opportunities for installing heat recovery systems for steam and natural gas fueled boilers and chillers at County buildings and facilities as a way to reduce energy usage and cost and associated eCO₂ emissions, and/or work with PACT to collaboratively capture waste heat for this purpose.

SECTOR 2: Vehicles

2.1 Emission Inventory

Allegheny County government owns and operates a fleet of 612 vehicles falling under eight different vehicle categories: law enforcement, medium-heavy, van, light truck, automobile, SUV, heavy special equipment, and other. The County also operates approximately 500 pieces of equipment that mostly use diesel fuel. These vehicles and equipment produced 4,851 tons eCO₂ in 2008.

Table 5 shows emissions by vehicle and fuel type. Seventeen percent (17%) of the emissions are attributed to personal vehicles driven in the course of business specifically for the Department of Human Services (DHS), which conducts extensive family, child, and elder care case work in the field.

Table 5. Vehicle Emissions by Type

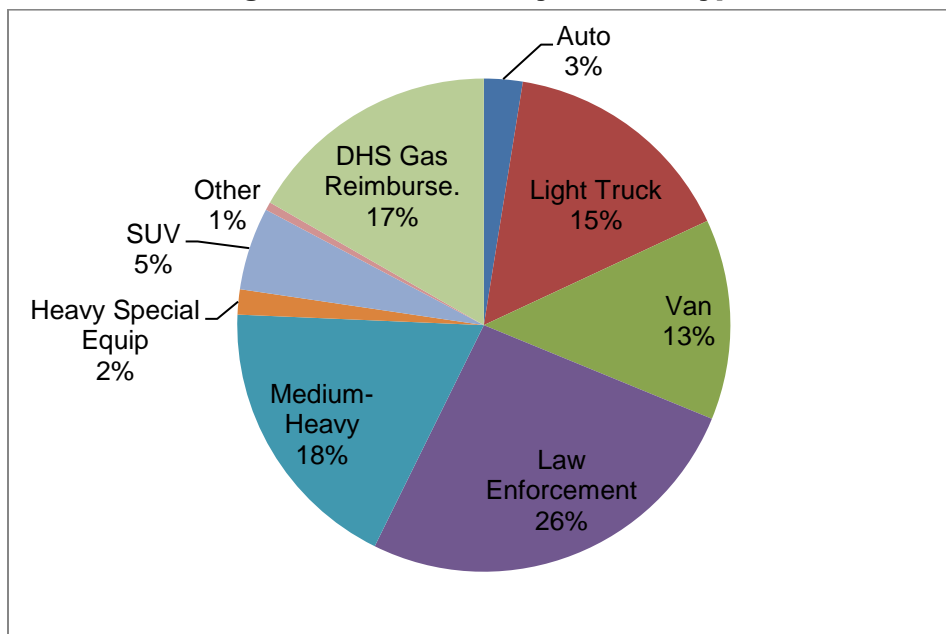
Vehicle Type	Number	Diesel Used (gallons)	Emissions (tons eCO ₂)	Gas Used (gallons)	Emissions (tons eCO ₂)	Total Emissions (tons eCO ₂)
Law Enforcement	181	1,870	21	127,112	1,245	1,266
Medium-Heavy	124	51,547	577	31,826	315	892
DHS Gas Reimbursements ⁸	N/A	0	0	81,844	811	811
Light Truck	118	2,144	24	74,171	729	753
Van	92	15	0	65,110	638	638
SUV	42	0	0	26,798	263	263
Auto	33	0	0	12,514	123	123
Other	9	1,687	19	671	7	26
Heavy Special Equipment	13	6,822	76	338	3	79
Total	612	64,085	717	420,384	4,134	4,851

⁸ Gasoline usage for Department of Human Services based on County employees expense reports for use of personal vehicles for County business.

Table 6. Emissions by Fuel-Type

Emissions by Fuel-Type	Total Gas	Total Diesel
Emissions (tons eCO ₂)	4,134	717
Gallons	420,384	64,085

Figure 2. Emissions by Vehicle Type



2.2 Vehicle Emissions Reduction Recommendations

According to the 2007 Fuel Economy Guide issued by the DOE, EPA, and Office of Energy Efficiency & Renewable Energy,⁹ 20 four-cylinder 2007 model cars averaged 25.95 miles per gallon under city driving conditions, and 20 six-cylinder 2007 model cars averaged 19.68 miles per gallon. On average, the 20 four-cylinder cars were found to be approximately 32% more fuel efficient than the 20 six-cylinder models listed in the 2007 Fuel Economy Guide.

⁹ U.S Environmental Protection Agency and U.S Department of Energy. Office of Energy Efficiency and Renewable Energy. *Fuel Economy Guide*. By DOE/EE-0314. EERE Information Center, 2007. Web. 6 Dec. 2009. <www.fueleconomy.gov>.

While the bulk of six-cylinder vehicles are used for law enforcement purposes, a portion of the County's general pool vehicles consists of six-cylinder vehicles. According to County records, the 33-vehicle fleet traveled a total 229,042 miles, or an average of 6,941 miles per year.

Assuming the County was to replace one six-cylinder vehicle with a four-cylinder model and realize the fuel efficiency improvement as described above, each vehicle would use 86 fewer gallons of gas, assuming each travels 7,000 miles per year. This substitution would reduce eCO₂ emissions by 0.85 tons and reduce annual fuel purchases by \$258 per vehicle at \$3 per gallon. Replacing all 33 vehicles with four-cylinder models would result in an annual reduction of 28 tons eCO₂.

In addition to the above change, it is strongly recommended that the County buy and install a fleet management system to track the statistics of its vehicle usage or shift its tracking mechanism. Currently, vehicle mileage and fuel consumption data must be extracted from two separate sources – a vehicle database and a fuel usage report from the County's fuel card vendor – and then cross-referenced. A fleet management system will enable the County to better track and analyze the fuel consumption and mileage of its vehicles, and thus optimize operational needs and the objective to transition to more fuel-efficient vehicles.

Other vehicle recommendations for the County include:

- Purchasing four-cylinder models when buying new vehicles.
- Reducing or ending the practice of “remaindering” six-cylinder law enforcement vehicles to become pool cars for other transportation needs. These vehicles could potentially be sold at auction instead, opening the door for vehicles with higher fuel efficiency to serve the pool car needs.
- Replacing a portion of the pool vehicle fleet with ZIP cars.
- Rewarding departments that invest in hybrid vehicles with premium parking, and exploring other low/no-cost incentives to push toward higher fuel efficiency.
- Exploring transportation alternatives and/or incentives for DHS employees to reduce fuel consumption, carbon and reimbursement needs. Because the normal duties of case workers' jobs require site visits to clients, this may present unique challenges.
- Implementing a controlled, standard system, such as permission-granted bus tickets, to enable employees to use public transportation where practical to conduct County business.

SECTOR 3: Water Delivery and Wastewater Treatment

3.1 Emissions Inventory

Allegheny County government used 1,300 million gallons of water in 2008. The County procures water from 16 different water authorities, each of which bills the County for water and sewage. Allegheny County requested and received water consumption information from all 16 water authorities serving it.

The County was only able to obtain energy consumption data from 10 of the 16 participating water authorities. Given incomplete data, literature data was used to estimate the energy required for water provisions. An energy intensity of 1.0 kilowatt hours per thousand gallons was used for this analysis.¹⁰

It is assumed that all of the water consumed by the County was also discharged to the Allegheny County Sanitary Authority wastewater treatment system. For the treatment of wastewater, an energy intensity of 1.5 kilowatt hours per thousand gallons treated was used.¹¹

Given these energy intensities and the County's water use, water delivery and wastewater treatment were estimated to have produced 1,005 and 1,508 tons of eCO₂ respectively.

The emissions calculated for water delivery and wastewater treatment are presented in Table 7.

¹⁰ Burn, S. "Pump Scheduling Optimization in Four US Cities: Case Studies." *Water Distribution Systems Analysis Symposium*. Proc. of The 8th Annual Water Distribution Systems Analysis Symposium, Ohio, Cincinnati. American Society of Civil Engineers, 2006. Print.

¹¹ Tchobanoglous, G., FL Burton, MD Stensel, and McGraw-Hill. "Wastewater Engineering: Treatment and Reuse. Comparison of On-Site and Upstream Greenhouse Gas Emissions from Canadian Municipal Wastewater Treatment Facilities." *Journal of Environmental Engineering and Science* (2003): 1704. Print.

Table 7. Water Use and Wastewater Discharges by Water Authority

Water Authority	Water Delivery (tgal)	Tons of eCO ₂	Wastewater Treatment (tgal)	Tons of eCO ₂
1. Plum	910,007.75	703.18	910,007.75	1,055.12
2. Pittsburgh Water & Sewer Authority	174,609.00	134.92	174,609.00	202.46
3. Penn American	100,334.73	77.53	100,334.73	116.33
4. West View	89,942.00	69.50	89,942.00	104.28
5. Monroeville	13,534.00	10.46	13,534.00	15.69
6. Robinson	3,800.00	2.94	3,800.00	4.40
7. South Park Township (3 separate suppliers)	2,712.00	2.10	2,712.00	3.14
8. Oakmont	2,273.00	1.76	2,273.00	2.63
9. McCandless	1,565.00	1.21	1,565.00	1.81
10. Harrison	993.00	0.77	993.00	1.15
11. Hampton	716.00	0.55	716.00	0.83
12. West Mifflin	78.30	0.06	78.30	0.09
13. Western Allegheny	18.41	0.01	18.41	0.03
14. Fawn Frazier	15.00	0.01	15.00	0.02
Total	1,300,598.19	1,004.99	1,300,598.19	1,507.98

3.2 Water Efficiency Reduction Measures

Allegheny County set a goal of improving water use efficiency by 20% by 2015. To achieve this, the County will need to reduce water use by 260 million gallons for a total of no more than 1.041 million gallons by 2015. Such a decrease in water use and wastewater discharges will reduce the overall emissions associated with water use by 503 tons eCO₂ for a projected total of 2,011 tons eCO₂ by 2015

Given that the County does not own water supply facilities, demand-side management techniques were evaluated for potential eCO₂ reductions. A list of recommended water use reduction measures are presented in Table 8.

In order of eCO₂ emission reduction effectiveness, these reduction measures include:

- (1) Plumbing Control Installation at the County Jail (4% reduction) – This measure will reduce water consumption at the facility by installing low-flow plumbing devices and a control system to automatically limit inmate water use. Estimated cost is \$3,780,777 for an annual savings of \$565,736 and 6.7-year payback.
- (2) Decommissioning Buildings (1% reduction) – This measure will reduce water consumption by decommissioning the Old Morgue and the inactive portions of the Health Administration Building, which still have an operational plumbing system. However, the Old Morgue is slated for renovation in the next 18 months, and it is anticipated that much of the plumbing structure will be re-used. This measure will provide reductions, but they will not likely be sustainable over the five-year period and beyond. The estimated cost for water-saving portion is \$18,626 for an annual savings of \$77,253 with a payback period of less than a year.
- (3) Plumbing Control Installation at Selected Buildings and Facilities (0.6% reduction) – This measure includes showerhead upgrades at the Kane Regional Centers in McKeesport, Ross, Scott, and Glen Hazel. It includes upgrading the toilets, urinals, and lavatory fixtures at the County Courthouse, City-County Building, Shuman Juvenile Detention Center, Health Department STD Clinic, Clack Buildings 1, 6 and 7, Boyce Park Maintenance Center, Fourth Avenue Parking Garage, South Side Garage, Homestead Center, Yeshiva House, and Nova House. It is important to note that all health-care facilities cannot use *aerolized* showerheads because of their propensity to harbor Legionnaire’s Disease. Some special considerations may impact appropriate fixture costs and associated water and carbon savings. Estimated cost is \$434,383 for an annual savings of \$131,926 and 3.3-year payback.
- (4) Decommissioning Water-Cooled Coolers (0.2% reduction) – This measure will reduce water consumption by shutting down the Old Morgue’s refrigerated coolers that use the water system for thermal exchange. Estimated cost is \$106,042 for an annual savings of \$29,823 and 3.6-year payback.

Table 8 summarizes these recommended water saving measures. The recommendations will save approximately 77.5 million gallons of water, resulting in a revised total consumption of 1.22

million gallons, or a 5.96% reduction below 2008 water use. The projected water reduction would save an estimated 150 tons of eCO₂ emissions annually.

Table 8. Emission Reductions for Water Measures

Water Measure	eCO ₂ Saved (tons)	Annual Savings (tgal)	Implement. Cost (\$)	Annual Savings (\$)	Payback Period (years)
Plumbing Controls	100.09	51,805	3,780,777	565,736	6.7
Decommission Building	30.54	15,81	18,626	77,253	0.24
Water Conservation	13.94	7,215	434,384	131,926	3.3
Decommission Water-Cooled Coolers	5.25	2,719	106,042	29,823	3.6
Total	149.82	77,549	4,339,829	804,738	5.4

By adopting the water conservation measures noted above, the County is projected to improve water efficiency by 6% by 2015. In order to achieve the additional 14% reduction established in the target reduction goal, the County will need to identify and prioritize additional water-saving measures. These could include:

- 1) Identifying and stopping leaks in the water supply and distribution system on County properties and at County buildings and facilities, including in the County parks, where leaks are known to have been a recurring issue due to aging infrastructure.
- 2) Reducing water consumption at County swimming pools, especially water loss due to regular required filtering processes. It is estimated that North Park Swimming Pool, at a 1-million gallon capacity, loses 30,000 gallons weekly due to the back-filtering process.

Sector 4: Solid Waste

4.1 Emissions Inventory

Allegheny County operations produced 3,767 tons of solid waste in 2008. The County does not own or operate any solid waste management facilities. All waste from Allegheny County operations is sent to privately-owned local landfills. As a result, eCO₂ emissions from this sector are classified as Scope 3.

National average solid waste composition data was used to represent the County's waste stream. Table 9 shows calculated Allegheny County solid waste by waste category based upon national average solid waste composition at a standard managed landfill.¹²

Total emissions from the County government's waste were 2,081 tons eCO₂ in 2008. This figure is based on 198,147 pounds of methane produced from the decomposition of organic matter in the solid waste deposited by the County in local landfills.

Table 9. Solid Waste Composition

Waste Category	% of Waste	Waste Category (tons)	Waste Category	% of Waste	Waste Category (tons)
Paper Products	31	1167.77	Plastic	12.0	452.04
Food	12.7	478.409	Rubber & Textiles	7.9	297.593
Plant Debris	13.2	497.244	Metals	8.4	316.428
Wood	6.6	248.622	Glass	4.9	184.583
All Other Waste	3.3	124.311	TOTAL	100.0	3,767

4.2 Solid Waste Emissions Reduction Recommendations

Recommendations are based on opportunities for landfill diversion. The primary recommendation is to establish a recycling program for all Allegheny County operations. Five categories of waste were identified for the recycling program: glass, paper, metal, plastic products and wood.

¹² U.S Environmental Protection Agency. *Municipal Solid Waste Generation, Recycling, and Disposal in the United States: Facts and Figures for 2008*. Publication no. 5306P. United States of America, 2009. Print. EPA-530-F-009-021.

It is recommended that the recycling program be started in 2010 with a goal of achieving 10% mixed recycling. Each year thereafter, the County should increase its annual recycling rate by 10% in order to reach a goal of 50% recycling, for the products identified above, by 2015.

As a result of landfill diversion and material reuse, the recycling program will account for a total annual reduction of 6,029 tons eCO₂ annually by 2015 (at 50% recycling). Annual savings achieved by Allegheny County are discussed in Table 10 and illustrated in Figure 3. The energy and emissions impacts of recycling are calculated in the CACP software Measures module. This calculation combines two different emissions savings: first, recycled material will not contribute to landfill methane emissions, and secondly, the reuse of the material has eliminated the need for the future development of virgin material for a product.

In this first calculation, emission savings are realized by avoided methane emissions resulting from a recycling program that reuses valuable material, instead of depositing it in a landfill. The methane calculations are based on the life of the product and its individual contribution to methane release within a landfill.

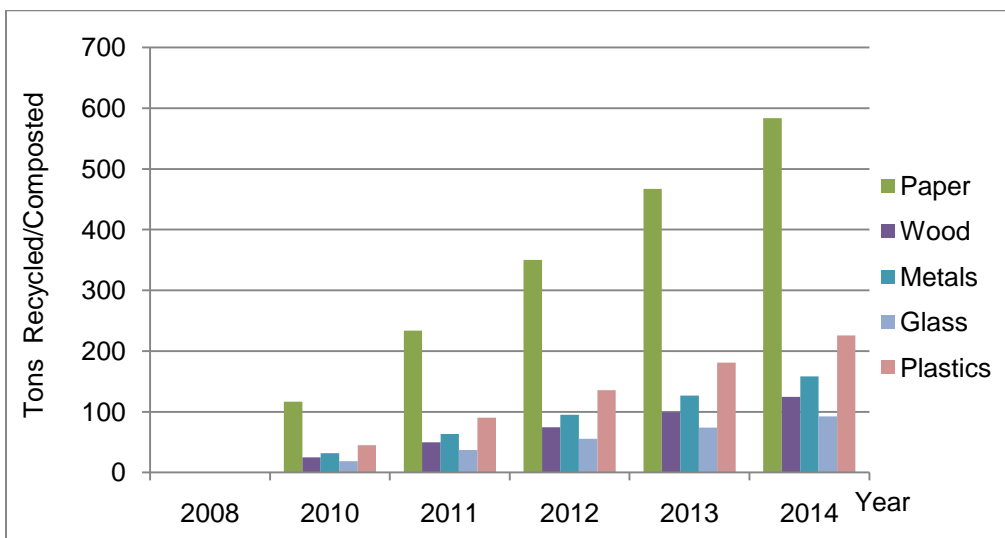
The second calculation is based on the Life Cycle of the material. Reuse eliminates future demand for virgin production materials, thus decreasing eCO₂ emissions associated with material production. Additional information regarding the calculation of eCO₂ emission savings is included in Appendix B.

Combined, these calculations will exceed the eCO₂ from solid waste produced by the County in 2008, showing the potential emissions savings from a recycling program.

Table 10. eCO₂ Reductions from Recycling

	2008	2010	2011	2012	2013	2014
Mixed Recycled (%)	0% of 2,369.4 tons of mixed waste	10%	20%	30%	40%	50%
Recycling Target (tons)	0	236.94	473.89	710.83	947.78	1,184.72
eCO₂ Reduction (tons)	0	1,206	2,411	3,617	4,823	6,029

Figure 3. Recycled Solid Waste (tons)



Composting of Food and Plant Waste

It is recommended that the County evaluate the potential of implementing food and plant waste composting programs for its facilities and operations.

If the County were to implement a managed aerobic composting program, it could reduce the volume of food waste and plant debris that is deposited in local landfills. This could be linked to programming at its residential facilities. If Allegheny County were to develop a managed aerobic composting program in 2010 (starting at 10%) and with 10% annual increments leading to 50% composting of all food and plant waste by 2015, it would achieve a reduction of 115 tons eCO₂ and reduce the amount of food and plant waste going to local landfills by 487.83 tons.

The calculation by the CACP software package of emission savings resulting from the diversion of food and plant waste simply accounts for the methane emissions avoided from the diversion of that waste. It does not account for the greenhouse gas emissions resulting from the composting of the diverted waste. Some methane can be produced as a result of the anaerobic decomposition of organic matter in composting operations. The production of methane can be minimized by active management of the compost to ensure aerobic decomposition of organic matter during the composting process.¹³ Nitrous oxide may also be produced as a result of composting food and plant waste.

¹³ Peters, Lundie S. "Life Cycle Assessment of Food Waste Management Options." *Journal of Cleaner Production* 13.3 (2005): 275-86. Print.

Sector 5: Street Lights

5.1 Emissions Inventory

Streetlights owned and operated by Allegheny consumed a total of 1,460,608 kWh in 2008, costing \$156,303 and producing an estimated 1,129 tons of eCO₂. This electricity usage is based on all of the energy consumption for streetlights in County parks and tunnels on County roads and bridges. Table 11 lists the top five energy consuming streetlight locations. They consume 44% of the total kWh of County streetlights.

Table 11. Top 5 Energy Consuming Streetlight Locations

Streetlight Location	Energy Consumed per Year (kWh)
Coraopolis Bridge Navigation	208,600
South Expressway Section 15	197,440
Homestead Grays Bridge	80,560
South Expressway Section 14A	79,600
Rankin Bridge East End	79,000

Based on available data, there are 779 high-pressure sodium lights among the 1,000+ street lights on Allegheny County roads and bridges and in County tunnels. A detailed count of streetlight fixtures located in Allegheny County parks is not currently available.

5.2 Streetlight Emissions Reduction Recommendations

It is recommended that the County replace all 779 high-pressure sodium streetlights located in tunnels and on roads and bridges with LED lights over a five-year period beginning in 2010. It is estimated that the LED bulbs will reduce electricity consumption by 52% (see Appendix) for each retrofitted streetlight.

By replacing all 779 high-pressure sodium bulbs with LED bulbs, the County would reduce annual eCO₂ emissions from streetlights by 155 tons by 2015 if implemented over a 5-year period beginning in 2010.

The estimated electricity savings for the recommended LED retrofit program are based on a study performed in Oakland, California, which found that high-pressure sodium bulbs could be effectively replaced with LED bulbs.¹⁴

It is understood that the streetlighting demand for Oakland, California, is not representative of Southwestern Pennsylvania. However, these figures provide a rough approximation of the upfront costs and annual energy savings that can be realized through a retrofit program for high-pressure sodium streetlights in Allegheny County.

These recommendations reflect current LED technology and costs. The County may consider implementing the technology in phases to allow for potential improvements and cost reductions in LED and alternative lighting technology.

It is recommended the County undertake a comprehensive inventory of all streetlights on its roads, bridges and in tunnels and parks and evaluate retrofit options to improve the costs and benefits of conversion to LEDs and/or other energy efficient lighting alternatives.

¹⁴ Energy Solutions. *Demonstration Assessment of Light Emitting Diode (LED) Street Lighting, Phase III Continuation*. Rep. no. 0726. Mary Matteson Bryan, P.E at Pacific Gas and Electric Company, Nov. 2008. Web. Nov. 2009. <http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/gateway_oakland-phase3.pdf>.

D. Additional Recommendations

1. Increase Renewable Energy Purchases by 5% per Year

Allegheny County purchased renewable energy for approximately 10% of its electricity use in 2008 through an auction process led by the County on behalf of a consortium of buyers, including the City of Pittsburgh and some County authorities. That amount increased to 15% in 2010. In order to meet the County’s goal of reducing its carbon emissions by 20% by 2015, it is recommended that the County continue the trend of buying 5% more of its energy from renewable sources each year. Thus, by 2015, 35% of the County’s electricity would be produced by renewable supplies.

Assuming the County’s annual electricity demand remains constant at 60,000 MWh in 2015 for buildings, facilities and streetlights. The County would need to purchase 21,000 MWh of renewable electricity in 2015 to meet a 35% renewable energy purchasing. Assuming the source is 100% wind energy, the eCO₂ reductions associated with a 35% renewable purchase would be 16,263 tons eCO₂, or 21% of the County’s total emissions in 2008. Table 13 demonstrates similar values for a 35% renewable purchase.

Table 12. Emission Reductions for 35% Renewable Energy Purchasing Program

Year	Emissions (tons eCO ₂)
2008	77,210
2015	60,950
Reduction	16,263
% Reduction	21

Table 13. Emission Reductions for Renewable Energy Purchases

2008 Electricity	No Renewable in 2015	10% Renewable in 2015	35% Renewable in 2015
Building Emissions from Electricity (tons eCO ₂)	45,336	40,800	29,468
Streetlight Emissions (tons eCO ₂)	1,129	1,016	734
Total Emissions (tons eCO ₂)	46,465	41,816	30,202

When the 35% renewable energy purchase is factored into the 2015 target emissions, the total County emissions resulting from electricity use by County buildings, facilities and streetlights drop from 46,465 tons eCO₂ to 30,202 tons eCO₂. Currently, price premiums for Renewable Energy Credits (REC) in Mid-Atlantic States that are produced with wind power are approximately \$0.025/kWh.¹⁵ Assuming that the County pays approximately \$0.10/kWh for electricity made from coal, purchasing renewable energy credits currently represents a 25% increase in electricity costs.

2. Plant More Trees

According to the National Tree Benefit Calculator, the average red maple tree in Allegheny County’s climate region with a diameter of 10 inches annually sequesters approximately 252 pounds of carbon dioxide¹⁶. A case study of five tree nurseries that sell maple trees revealed the average tree costs approximately \$39. Details about this pricing study can be found in Table 14.

Table 14. Tree Sapling Costs

Source	Type	Price
www.maple-trees.com	Autumn Flame-Red Maple	\$39.95
www.tytyga.com	Flame Maple	\$49.75
www.naturehills.com	Sugar Maple	\$44.95
www.porkyfarm.com	Sugar Maple	\$38.00
www.starkbros.com	Red Sunset Maple	\$24.99
	Average Price	\$39.53

In November 2008, Allegheny County planted 157 trees in partnership with TreeVitalize Pittsburgh, a joint project with the City of Pittsburgh, Allegheny County, Pennsylvania Department of Conservation & Natural Resources, Western Pennsylvania Conservancy, and Friends of the Pittsburgh Urban Forest.¹⁷ It is recommended that the County continue this effort and make use of volunteer and nonprofit labor for tree planting help.

¹⁵ U.S Department of Energy. Energy Efficiency and Renewable Energy. *Renewable Energy Certificates (RECs) Retail Products*. The Green Power Network, 16 Nov. 2009. Web. 6 Dec. 2009. <<http://apps3.eere.energy.gov/greenpower/markets/certificates.shtml?page=1>>.

¹⁶ Casey Trees, and Davey Tree Expert Co. *National Tree Benefit Calculator*. Web. 5 Dec. 2009. <<http://www.treebenefits.com/calculator/>>.Site based on i-Tree, a peer-reviewed software suite from the USDA Forest Service

¹⁷ Allegheny County Pennsylvania. County Executive. *The Inside Story. Publications*. Kevin Evanto, Nov. 2008. Web. 5 Dec. 2009. <http://www.alleghenycounty.us/welcome/InsideStory/2_Tree.pdf>.

The County could sequester additional carbon by establishing a tree planting program as part of its *Allegheny Together* program, which assists communities in revitalizing their central business districts through a number of efforts, including façade improvements.

3. Portfolio Manager Software

The County is currently conducting an energy audit of the majority of its large buildings. It is recommended that the County enter the building data into Energy Star's Portfolio Manager (ES-PM) software. Energy Star is a joint program of the U.S. Environmental Protection Agency and U.S. Department of Energy. The Portfolio Manager Software package is an interactive, online energy management tool that enables an organization to track and assess energy and water consumption. Its use can assist County staff in managing buildings more efficiently and in consolidating data for the next emissions inventory.

4. Implement a Standard Reporting System

It is recommended that the County implement a standard reporting system for all utilities and fleets. The County can use the data gathered through this initial greenhouse gas emissions inventory to create a standard reporting system for all of its operations. This reporting system should be designed to be compatible with EPA Energy Star Portfolio Manager ES-PM software in order to simplify and accelerate the County's ability to manage and calculate energy use and emissions. This would create a more efficient and streamlined data collection process for tracking emissions and reductions for future greenhouse gas inventories.

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F. Glossary

BTU	British thermal unit - the quantity of heat needed to raise the temperature of one pound of water by one degree Fahrenheit at about 39.2 degree Fahrenheit
CACP	Clean Air & Climate Protection software - ICLEI emissions management tool that calculates and tracks emissions and reductions of greenhouse gases and criteria air pollutants associated with electricity, fuel use, and waste disposal
eCO ₂	Carbon dioxide equivalent emissions - a quantity that describes the global warming potential for a mix of greenhouse gases
ESCO	Energy Service Company - a business that develops and installs projects designed to improve energy efficiency and reduce maintenance costs
GHGs	Greenhouse Gases - atmospheric gases that absorb solar radiation including: carbon dioxide (CO ₂), nitrous oxide (N ₂ O), methane (CH ₄), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride (SF ₆)
ICLEI	Local Governments for Sustainability - an international association of local governments as well as national and regional local government organizations who have made a commitment to sustainable development
HVAC	Heating Ventilation & Air Conditioning
Lbs steam	pounds of steam
LED	Light-emitting diode
LEED®	Leadership in Energy and Environmental Design - green building designation of the U.S. Green Building Council
LGOP	Local Government Operations Protocol - the U.S. national standard guidebook on how to quantify and report local government greenhouse gas emissions from ICLEI
kWh	kilowatt hour - a unit of electric energy equal to the work done by one kilowatt acting for one hour
MPG	miles per gallon
PACT	Pittsburgh Allegheny County Thermal Ltd.
Tgal	thousand gallons

Therm	one hundred thousand Btu
Ton (short ton)	U.S. ton equivalent to 2,000 pounds
US DOE	United States Department of Energy - U.S. governmental department whose mission is to advance energy technology and promote related innovation in the United States
US EPA	United States Environmental Protection Agency - U.S. government agency charged with protecting human health and safeguarding the natural environment
USGBC	United States Green Building Council - Non-profit organization dedicated to sustainable building design and construction, developers of the LEED building rating system
ZIP Car	Car sharing service offered in Pittsburgh PA (www.zipcar.com)

Global Warming Potentials and the Use of a Common Metric – eCO₂¹⁸

Emissions of greenhouse gases are typically expressed in a common metric, so that their impacts can be directly compared, as some gases are more potent (have a higher global warming potential or GWP) than others. The international standard practice is to express greenhouse gases in carbon dioxide (CO₂) equivalents. Emissions of gases other than CO₂ are translated into CO₂ equivalents using global warming potentials. These global warming potentials are:

Greenhouse Gas	GWP
Carbon dioxide (CO ₂)	1
Methane (CH ₄)	21
Nitrous oxide (N ₂ O)	310
Hydrofluorocarbon (HFC)-134a (used in mobile source air conditioning)	1,300

¹⁸ US Environmental Protection Agency, 2010. *Emission Facts: Metrics for Expressing Greenhouse gas Emissions: Carbon Equivalents and Carbon Dioxide Equivalents*. <http://www.epa.gov/oms/climate/420f05002.htm>

Appendix A
ICLEI CACP Summary Report

Allegheny County
Government Greenhouse Gas Emissions in 2008
Summary Report

Sector	CO₂ (tons)	N₂O (lbs.)	CH₄ (lbs.)	eCO₂ (tons)	% of eCO₂	Energy (kWh)	Cost (\$)
Buildings & Facilities	66,065	1,587	5,022	66,363	86.0	163,718,985	6,900,202
Streetlights & Traffic Signals	1,123	38	27	1,129	1.5	1,460,608	156,303
Water Delivery Facilities	1,000	33	24	1,005	1.3	1,300,598	0
Wastewater Facilities	1,500	50	36	1,508	2.0	1,950,897	0
Vehicle Fleet	4,797	333	311	4,852	6.3	17,904,955	1,385,782
Other Process Fugitive*	270	0	198,147	2,351	3.0	–	–
Refrigerants	0	0	0	1	0.0	–	–
Total	74,755	2,040	203,566	77,209	100	186,336,043	8,442,287

This report has been generated for Allegheny County, Pennsylvania using ICLEI's Clean Air and Climate Protection 2009 Software.

* Note: Other Process Fugitive sector emissions include 2,081 tons eCO₂ from solid waste plus 270 tons eCO₂ emissions from diesel fuel use at the annual “Celebration of Lights” at Hartwood Acres.

Appendix B

Energy and eCO₂ Emission Calculation Details

Sector 1: Buildings & Facilities

Retrofit Exit Signs with LEDs

At a price per kWh of \$0.10, using an LED sign will save approximately \$30.60 in electricity per year. Incandescent lights have an expected life of 2.8 months, while LEDs have a lifespan of 10 years or more.¹⁹ Assuming the labor and material cost to be \$3 for changing a light bulb, the savings per year is estimated to be \$12 in labor and materials for a total yearly savings of \$42.60. Assuming the cost of an LED fixture is \$39.00, the payback period of replacing one sign is 0.915 years or 10.99 months.

Install Vending Machine Misers

According to a study conducted at Tufts University, installing a vending miser can reduce the amount of electricity used by a vending machine by half.²⁰ According to the Pittsburgh Climate Action Plan, the average vending machine uses approximately 3,500 kWh per year, which produces approximately 2.71 tons of eCO₂. Assuming that a miser could cut this energy use and resulting emissions in half, installing a miser on one machine would save approximately 1750 kWh per year and 1.35 tons of eCO₂.

Assuming an electricity cost of \$0.10 per kWh, a miser cost of \$165²¹, and negligible maintenance needs, each miser would save \$175 (1750 kWh x \$0.10) per year and have a payback period of 0.94 years or 11.3 months.

Sector 4: Solid Waste

Calculations of emissions resulting from solid waste in the inventory are based on the EPA breakdown of solid waste, as presented in Table 9 and cited by footnote 14. As stated, the County does not directly own or operate landfill facilities; therefore assumptions had to be made to determine the future composition of recycled material. It is assumed that all metal recycling

¹⁹ U.S Environmental Protection Agency and U.S Department of Energy. *Energy Star*. 29 Apr. 2009. Web. 5 Dec. 2009. <http://www.energystar.gov/ia/business/bulk_purchasing/bpsavings_calc/Calc_Exit_Signs.xls>

²⁰ Tufts University. "Vending Misers: Facts and Issues." *Office of Sustainability*. Tufts Climate Initiative, Aug. 2009. Web. 5 Dec. 2009. <<http://sustainability.unc.edu/Portals/0/Documents/Vending%20Miser%20Handout.pdf>>.

²¹ Baxter, Lindsay, comp. *Pittsburgh Climate Initiative, Pittsburgh Climate Action Plan, Version 1.0*. Publication. Green Building Alliance and Clean Air, Cool Planet, June 2008. Web. 6 Dec. 2009. <http://www.city.pittsburgh.pa.us/district8/assets/08_pgh_climate_action_plan.pdf>.

will be in the form of Aluminum (based on the assumption that the majority will be soft drink cans). It is also assumed that all recycled plastic is PET, Polyethylene Terephthalate, used for soft drink bottles, and other common consumer products. A better understanding and composition break down of the actual recycled aluminum and plastic material can be made after the program has been established.

ICLEI, within the Government Analysis function in the CACP software, takes into consideration the total life methane release of one ton of waste. In other words, that waste is not broken down into individual components and methane measurements are made on behalf of the total waste amount. These individual material allotments are only considered within the Measures function in the software (and the data given in the recommendation section of this inventory). This function calculates both individual material methane savings as well as material life cycle savings. ICLEI Defines Life Cycle Analysis as:

“A technique to assess the environmental aspects and potential impacts associated with a product, process, or service, by compiling an inventory of relevant energy and material inputs and environmental releases and evaluating the potential environmental impacts associated with identified inputs and releases.”

Allegheny County chooses not to go above and beyond the current software life cycle analysis based on the ICLEI recommendation below. ICLEI states:

“ICLEI’s CACP software does not take into account all stages of a product’s lifecycle when calculating waste sector emissions. Reducing the amount of waste land filled and incinerated will show a corresponding change in emissions that reflects the reduced emissions from decomposition and some other lifecycle stages. However, ICLEI does not recommend incorporating emissions reductions from other stages of the lifecycle into an updated emissions inventory unless they were also incorporated into the original emissions inventory.”

Recycling calculations are estimated by the ICLEI CACP software based on the EPA WARM Model and ICLEI Resource Guide: Recycling and Solid Waste Management.²²

The landfills that receive Allegheny County solid waste have methane collection systems. The estimated eCO₂ emissions from Allegheny County solid waste takes into account methane collection at those landfills. The CACP software calculation of eCO₂ emissions from the disposal of solid waste in landfill uses a default value of 75% methane collection by landfill methane collection systems based on recommendations of the LGOP.

²² *ICLEI Resource Guide: Recycling and Solid Waste Management*. Publication. ICLEI, Local Governments for Sustainability, Mar. 2008. Web. 5 Apr. 2010. <<http://www.icleiusa.org/action-center/learn-from-others/Recycling%20and%20Solid%20Waste%20Guide.pdf/?searchterm=recycling>>.

Sector 5: Streetlights

A study performed in Oakland, California, found that 121 Watt high-pressure sodium bulbs could be effectively replaced with 58.3 Watt LED bulbs.²³ With an approximate 4,100 yearly hours of use, the study found that LEDs saved approximately 257 kWh per year. A savings of 257 kWh for a streetlight in Allegheny County would result in a reduction of 397.37 lbs. of eCO₂ emissions on an annual basis.

Assuming a cost of \$0.10/kWh, each LED fixture would save approximately \$25.70 per year in energy costs for the County. The Oakland study also found that the LEDs saved approximately \$20.40 per year in maintenance costs over high-pressure sodium because they last longer and require less maintenance. The total cost to retrofit an existing sodium light fixture was \$605 according to the Oakland study. With an assumed annual savings of \$46.10 (\$25.70 + \$20.40), it is estimated that the payback period for a single fixture will be 13.1 years.

²³ Energy Solutions. *Demonstration Assessment of Light Emitting Diode (LED) Street Lighting, Phase III Continuation*. Rep. no. 0726. Mary Matteson Bryan, P.E at Pacific Gas and Electric Company, Nov. 2008. Web. Nov. 2009. <http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/gateway_oakland-phase3.pdf>.