Greenhouse Gas Emissions Inventory Report
Wilkes University
Wilkes-Barre, PA

FY 2006 – 2008

Report Issue Date: September 2008

Project Team:

Environmental Work Group

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The Greenhouse Gas Inventory Sub-committee wishes to thank the following individuals who contributed time and necessary information for the inventory:
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Jim Ceccoli, Controller's Office
Carol Murray, Information, Analysis & Planning
John Pesta, Capital Projects
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1.0 Executive Summary

This report summarizes Wilkes University's anthropogenic green house gas emissions for fiscal years 2006 – 2008. This inventory process is part of the American College and University President's Climate Commitment (ACUPCC) that Dr. Gilmour, President of Wilkes University, signed on May 29, 2007. The inventory serves as a benchmark for future reduction strategies as Wilkes University moves towards its long-term sustainability goals. This report also discusses specific reporting challenges and offers suggestions for improvement and refinement.

Wilkes University is dedicated to contributing to the efforts to address climate change. As a participant of the ACUPCC, Wilkes University has agree to initiate the development of a comprehensive plan to achieve climate neutrality as soon as possible and to initiate the following ACUPCC tangible actions to reduce greenhouse gases while the more comprehensive plan is under development:

1. Establish a policy that all new campus construction will be built to at least the U.S. Green Building Council's LEED Silver standard or equivalent.
    - Wilkes will implement an institutional policy that requires all future construction of over $200K in total value meet or exceed the LEED Silver Standard
2. Adopt an energy-efficiency appliance purchasing policy requiring the purchase of ENERGY STAR certified products in all areas for which such ratings exist.
    - Currently, the University purchases all appliances (including ITS equipment) that are ENERGY STAR certified. The University will implement an institutional policy that takes into account energy efficiencies as purchasing criteria and requires any future appliances (including ITS related equipment) purchased be ENERGY STAR certified.

Wilkes also has plans underway to make sustainability a part of the curriculum and campus culture.

The Clean Air-Cool Planet Campus Carbon Calculator (Version 5.0)[1] was used to model Wilkes' greenhouse gas (GHG) emissions. Emissions are reported in Metric Tons Carbon Dioxide Equivalents ($MTeCO_2$). $MTeCO_2$ considers the global warming potential (GWP) of the individual greenhouse gases recorded and converts them into

carbon dioxide equivalent values. The inventory will be used as a tool for identifying emission sources and will be periodically updated.

Data Limitations

Input to the model has the following data constraints:

- FYs 2006 – 2008 were chosen for the inventory due to the lack of availability of specific operational data from earlier years.
- Student, staff and faculty commuter travel data were not available and were estimated.
- Fleet fuel usage was not included in the model for FY 2006 and 2007 because this data was not available.
- FY 2007 and 2008 data for solid waste generation from the University Towers residence hall were unavailable and values used for the model were extrapolated from available information.

Inventory Results

- On an annual basis (FY 2006 – 2008), Wilkes University emits an average of approximately 18,200 (18,222) $MTeCO_2$ (metric tons of carbon dioxide equivalents).
- Emissions per full-time student for the past 3 fiscal years (FY 2006 – 2008) has been consistent at approximately 5.4 $MTeCO_2$
- The full-time student population increased from 3,226 in 2006 to 3,634 in 2008 (12.7%)
- Total campus building space square footage increased from 1,187,013 in 2006 to 1,357,013 in 2008 (14.3%)
- Purchased electricity was the major source of emissions at Wilkes University (~ 45% of the 2008 total emissions)
- On-campus stationary sources and transportation were the second largest sources of emissions:
  - On-campus stationary = ~ 26% of the 2008 total emissions
  - Transportation = ~ 28% of the 2008 total emissions
    - Commuting by students in 2008 was estimated to be the largest source of emissions within the transportation category.
- Emissions in 2008 due to Agriculture, Solid Waste and Refrigerants were minimal (< ~1.6%)

Key Observations and Recommendations

Overall Observations:
Utility usage (purchased electricity and stationary sources) and greenhouse gas emissions have increased as the student population and campus square footage have expanded. Total emissions have steadily increased for the past 3 FY. Student emission rates have remained constant for the past 3 FY. Increasing energy efficiency campus-wide will be a critical component for Wilkes University to focus on as it implements emission reduction programs.

Utility (Purchased Electricity and Stationary Sources)

Recommend:
- Optimizing methods for the estimation and tracking of utility usage in individual buildings on campus.
- Further develop a protocol for evaluating the effectiveness of reduction strategies.
- Develop a strategy for prioritization.
- Request that utility vendors provide more user friendly reports.
- Implement a campus-wide awareness program to educate the importance of energy efficiency.

Transportation

Recommend:
- The development of a standardized process for tracking and recording airline travel. The process should be digital to allow retrieval, tracking and archiving.
- The development of a standardized process for tracking of university vehicle travel. The process should be digital to allow retrieval, tracking and archiving.
- The development of a standardized process for tracking commuter (students, staff and faculty) behavior. The process should be digital to allow retrieval, tracking and archiving.

Solid Waste

Recommend:
- Development of a protocol for recycling at Wilkes events and in residential facilities.
- Continue discussions with food service vendor to facilitate recycling and waste minimization at all campus eateries.

- o Development of a program to increase campus awareness of the importance of recycling.
- o Establish a two-sided copying / printing standard.
- o Consider the implementation of campus-wide programs to minimize junk mail.
- o Consider the implementation of campus-wide programs to promote electronic document storage.

Offsets

Recommend:

- o Perform a carbon offset inventory of campus landscape and other Wilkes' holdings to assess offsets potential for campus greenhouse gas emissions.
- o Investigate feasibility of a purchased off-set program (for air travel, etc.).

Other

Recommend:

- o Continue to phase-out equipment and replace with ENERGY STAR and non-HCFC containing models.

2.0 Introduction

On May 29, 2007 Wilkes University president Dr. Joseph E. (Tim) Gilmour signed the American College and University President's Climate Commitment (ACUPCC). As stated in the Commitment, Colleges and University's that choose to sign agree to recognize the scientific consensus that global warming is real and has the potential to cause widespread adverse environmental and economic conditions. Signatories have agreed to exert leadership in addressing climate change.

Dr. Gilmour charged Petra Carver, VP for Finance and Support, to create, chair and recruit members for an Environmental Work Group (EWG). Members of this group are comprised of students, staff, administration and faculty. The EWG has met on a regular basis to identify and plan for campus-wide initiatives to meet the goals of the ACUPCC. A sub-committee of this group, the green-house gas inventory (GHGI) sub-committee, undertook the task of performing the Wilkes inventory of GHG emissions. This report is a summary of their findings for FY 2006 – 2008.

3.0 Wilkes University Inventory Process

The GHGI sub-committee met and worked on the performance of the inventory from January through September 2008. Wilkes conducted its greenhouse gas inventory using the framework provided by the non-partisan 501(c)3 non-profit organization Clean Air – Cool Planet (CA-CP). Version 5.0 of CA-CP Campus Carbon Calculator was used to model greenhouse gas emissions[1]. The CA-CP Calculator utilizes the protocols and Global Warming Potential (GWP) established by the Intergovernmental Panel on Climate Change (IPCC) for greenhouse gas calculations. The CA-CP calculator inventories emissions of the six greenhouse gases outlined in the Kyoto Protocol: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydroflourocarbons (HFC), perflourocarbons (PFCs) and sulfur hexafluoride (SF_6). Emissions are reported in Metric Tons Carbon Dioxide Equivalents ($MTeCO_2$). Carbon Dioxide equivalents are a metric measure used to compare the emissions form various greenhouse gases based on their global warming potential (GWP). The Carbon Dioxide equivalent for a gas is derived by multiplying the tons of the gas by the associated GWP of the gas. Wilkes chose to use the CA-CP Calculator because it had a proven track record at numerous colleges and universities[2-7].

The CA-CP Calculator requires the input of seven categories of data: institutional data, energy, transportation, agriculture, solid waste, refrigeration, and GHG emission offsets. The following is a discussion for the basis of the input data used by Wilkes in the CA-CP Calculator for this study.

Inventory Years

The inventory utilized operational data between fiscal years 2006 – 2008. This reporting period was chosen based on the ready availability of the majority of required data records for the model input parameters from this time period.

Study Boundaries

The inventory looked at the operations of the entire Wilkes University Wilkes-Barre campus and as well as off-campus athletic facilities located in Kingston.

Institutional Data

The 2005, 2006 and 2007 Wilkes University Fact Books[8-10] were utilized for the required institutional data. Supplemental institutional data was obtained from the Mr. Brian Bogart and Ms. Carol Murray Office of Information, Analysis & Planning; Mr. Jim Ceccoli, Controller's Office; and Mr. John Pesta, Capital Projects.

Purchased Electricity and On-campus Stationary Use

Four years of data were assembled from billing invoices for individual buildings or accounts by Mr. Robert Swetts, Manager of Preventative and Predictive Maintenance. These were summed by fiscal year to provide annual totals.

Transportation

Commuter Travel

Postal codes were extracted from a data base of faculty, staff, and off-campus student addresses. The distance from each postal code to Wilkes University (18766) was estimated using Google Maps. Full-time faculty lived a mean distance of 11.2 miles from the University, while part-time faculty lived a mean distance of 22.5 miles away. Assuming that full-time faculty were on campus 5 days/week and part-time faculty were present 2 days/week, the estimated mean commuting distance for all faculty was 16.3 miles. Mean staff commuting distance was 12.8 miles. Median student commuting distance was 20.6 miles. Students and full time faculty were assumed to commute 157

days/fiscal year while staff were assumed to commute 240 days/fiscal year. Part-time faculty were assumed to commute 63 days/fiscal year.

Fleet vehicles
Annual fuel consumption for FY 2008 was provided by the Manager of Campus Support Services, Mr. Michael Malkemes.

Air Travel
Air travel miles for FY 2008 were provided by the Vice-President for Finance and Support and the Manager of Campus Support Services.

Agriculture
Fertilizer usage data were obtained from Mr. Matt Yencha of Campus Support Services.

Solid Waste / Composting
Data were obtained from Mr. Matt Yencha of Campus Support Services and Mr. Robert Swetts, Manager, Preventive and Predictive Maintenance. FY 2007 and 2008 data for solid waste generation from the University Towers residence hall were unavailable and values used for the model were extrapolated from available information.

Refrigeration
Data were obtained from Mr. Robert Swetts, Manager, Preventive and Predictive Maintenance.

Emission Offsets
Composting data was the only source of off-set data included in the model. University owned properties (~160 acres in the Poconos and ~ 10 acres of the Nuangola Bog) had not been inventoried to assess their offset potential and therefore were not included in the model.

4.0 Inventory Results

Figure 1 illustrates greenhouse gas emissions by sector for FY 2006 - 2008. Greenhouse gas total emissions for FY 2006 – 2008 are displayed in Figure 2. An overview of annual emissions for FY 2008 is illustrated in Figure 3. Summary inventory results generated from the CA-CP Calculator for FY 2006, 2007 and 2008 are included in Appendix A.

The following are key summary results:

- On an annual basis (FY 2006 – 2008), Wilkes University emits an average of approximately 18,200 (18,222) $MTeCO_2$ (metric tons of carbon dioxide equivalents).
- Emissions per full-time student for the past 3 fiscal years (FY 2006 – 2008) has been consistent at approximately 5.4 $MTeCO_2$
- The full-time student population increased from 3,226 in 2006 to 3,634 in 2008 (12.7%)
- Total campus building space square footage increased from 1,187,013 in 2006 to 1,357,013 in 2008 (14.3%)
- Purchased electricity is the major source of emissions at Wilkes University (~ 44% of the 2008 total emissions)
- On-campus stationary sources and transportation are the second largest sources of emissions:
    - On-campus stationary = ~ 26% of the 2008 total emissions
    - Transportation = ~ 28% of the 2008 total emissions
        - Commuting by students in 2008 was estimated to be the largest source of emissions within the transportation category.
- Emissions in 2008 due to Agriculture, Solid Waste and Refrigerants were minimal (< ~1.6%)

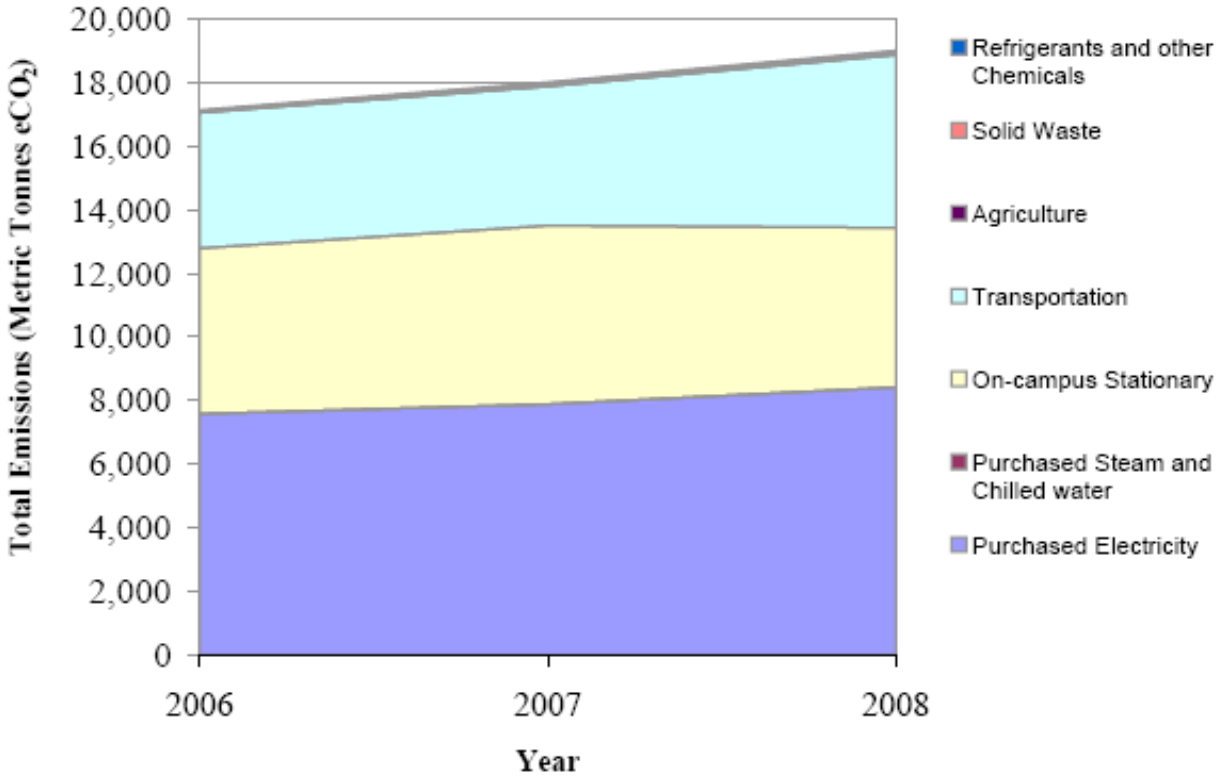

Figure 1. Greenhouse Gas Emissions by Sector at Wilkes University ($MTeCO_2$). Source: Clean Air-Cool Plant Greenhouse Gas Campus Calculator Version 5.0 (FY 2006 – 2008)

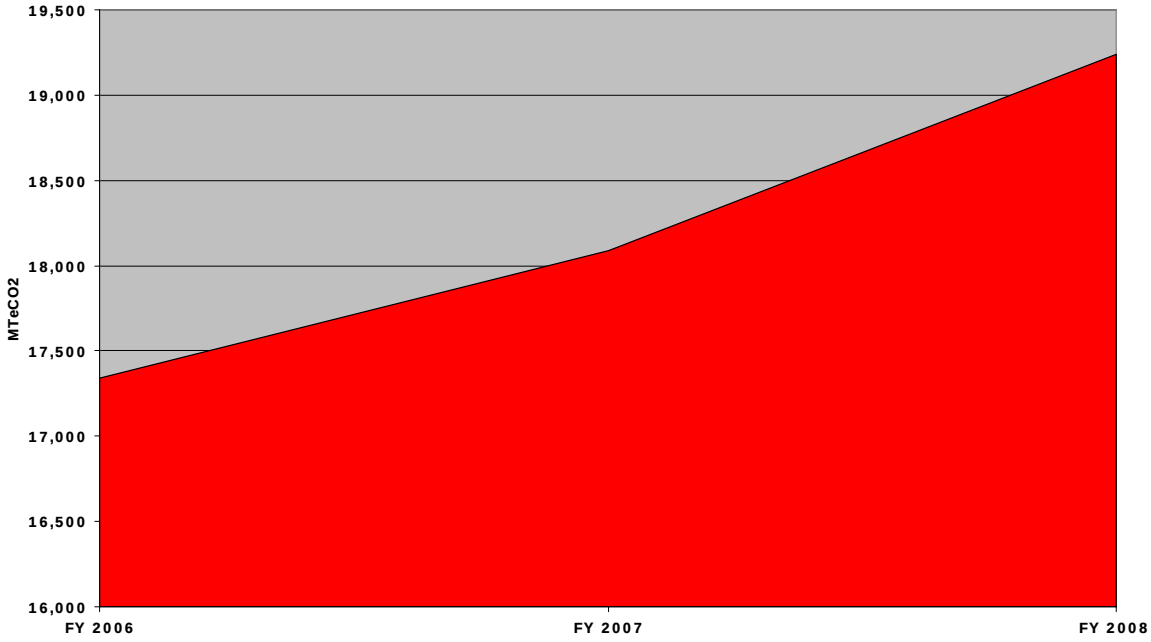

Figure 2. Greenhouse Gas Total Emissions at Wilkes University ($MTeCO_2$). Source: Clean Air-Cool Plant Greenhouse Gas Campus Calculator Version 5.0 (FY 2006 – 2008).

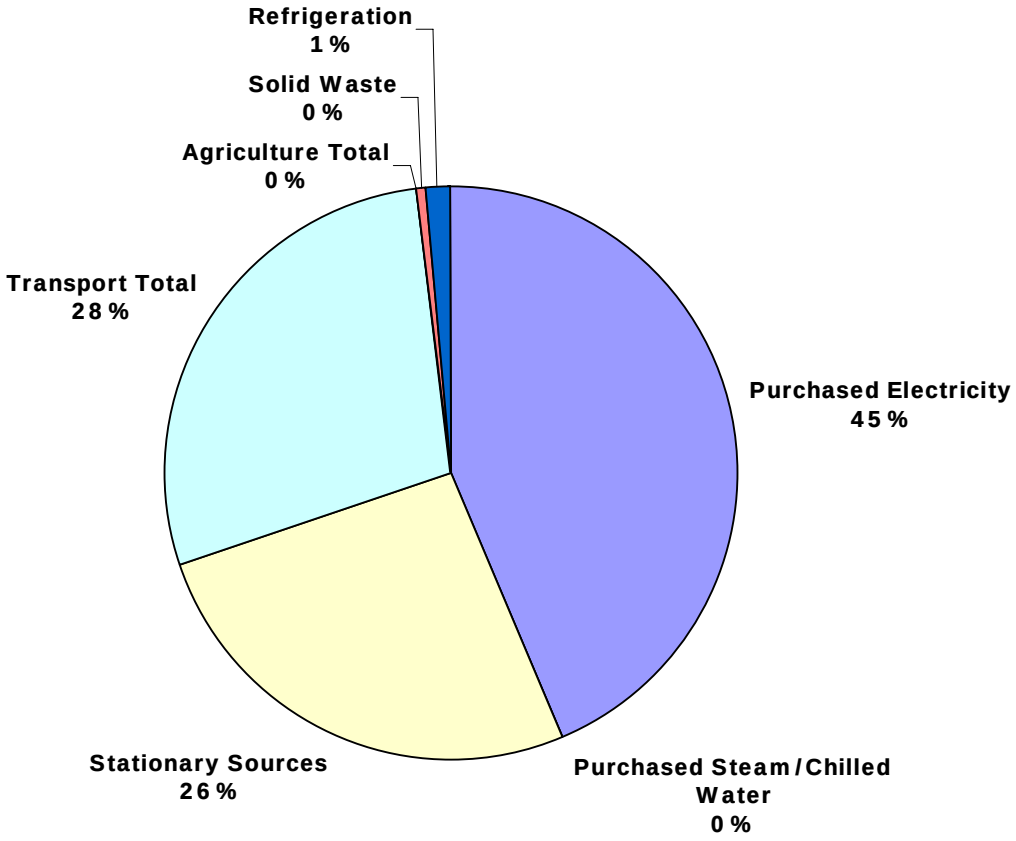

Figure 3. Overview of Annual Emissions at Wilkes University – FY 2008. Source: Clean Air-Cool Plant Greenhouse Gas Campus Calculator Version 5.0.

5.0 Recommendations

Increasing energy efficiency campus-wide will be a critical component for Wilkes University to focus on as it implements emission reduction programs.

- Utility usage (purchased electricity and stationary sources) and greenhouse gas emissions have increased as the student population and campus square footage have expanded.

- Total emissions have steadily increased for the past 3 FY.

- Student emission rates have remained constant for the past 3 FY.

Specific recommendations for offered for the following sectors:

Utility (Purchased Electricity and Stationary Sources)

Recommend:

- Optimizing methods for the estimation and tracking of utility usage in individual buildings on campus.
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Other

Recommend:

- Continue to phase-out equipment and replace with ENERGY STAR and non-HCFC containing models.

6.0 References

1. Clean Air Cool Planet. 2006. "Campus Calculator User's Guide." Accessed November 18, 2007 at http://www.cleanair-coolplanet.org/toolkit/content/view/43/124/

2. Lord, Jason. 2005. "Carleton's Green House Gas Emissions at Carleton College: A Complete Inventory for 2004-2005 with Extrapolation Back to 1990." Accessed June 5, 2008 at http://www.aashe.org/resources/ghg_inventories.php

3. Linstroth, Tommy and James Neff. 2003. "College of Charleston Greenhouse Gas audit: 1993-2001." College of Charleston Discussion Paper, Master of Environmental Studies Program. College of Charleston. Accessed June 5, 2008 at http://www.aashe.org/resources/ghg_inventories.php

4. Thomas, Elizabeth. 2005. "Greenhouse Gas Emissions at Smith College: A Comprehensive Inventory from 1990-2004 and Suggestions for Future Emissions Reductions." Accessed June 5, 2008 at http://www.aashe.org/resources/ghg_inventories.php

5. University of New Hampshire Climate Education Initiative, University of New Hampshire Office of Sustainability Programs, Clean Air – Cool Planet. 2004. "University of New Hampshire. Durham Campus. 1990-2003 Greenhouse Gas Emissions Inventory." Accessed June 5, 2008 at http://www.aashe.org/resources/ghg_inventories.php

6. Rusina, Heidi, Kim Trimiew, Zora Tucker, and Kyle Brown. 2007. California State Polytechnic University, Pomona. "Greenhouse Gas Emissions Inventory Report 1995 -2005." Accessed June 5, 2008 at http://www.aashe.org/resources/ghg_inventories.php

7. Hummel. Sam and Matthew Barkley. 2004. "Duke University Greenhouse Gas Inventory 1990-2003." Accessed June 5, 2008 at http://www.aashe.org/resources/ghg_inventories.php

8. Wilkes University. Office of Institutional Research and Strategic Planning. "2005 – 2006 Fact Book." November 2005.

9. Wilkes University. Office of Institutional Research and Strategic Planning. "2006 – 2007 Fact Book". November 2006. Accessed April 22, 2008 at http://wilkes.edu/Include/aboutwilkes/fso/fact%20book%202006-07.pdf

10. Wilkes University. Office of Institutional Research and Strategic Planning. "2007 – 2008 Fact Book". November 2007. Accessed April 22, 2008 at http://wilkes.edu/Include/aboutwilkes/fso/fact%20book%202007-08.pdf

APPENDIX A

Summary CA-CP Calculator Results
FY 2006 - 2008

MODULE	**Summary**							
WORKSHEET	**Overview of Annual Emissions**							
UNIVERSITY	**Wilkes University**							
Select Year -->	**2006**	Energy Consumption	CO_2	CH_4	N_2O	Other Chemicals	eCO_2	eCO_2
		MMBtu	kg	kg	kg	kg	Short Tons	Metric Tonnes
Purchased Electricity		89,893	7,536,699	73	139		8,355	**7,580**
Purchased Steam/Chilled Water		-	-	-	-		-	-
Stationary Sources		98,515	5,200,743	520	10		5,749	**5,216**
	Non Co-Gen	98,515	5,200,743	520	10		5,749	**5,216**
	Co-Gen Electric	-	-	-	-		-	-
	Co-Gen Steam	-	-	-	-		-	-
Transport Total		59,296	4,162,842	832	286		4,703	**4,267**
	University Fleet	-	-	-	-		-	-
	Student Commuters	43,436	3,049,392	609	210		3,445	**3,125**
	Faculty/Staff Commuters	15,860	1,113,449	222	77		1,258	**1,141**
	Air Travel	-	-	-	-		-	-
Agriculture Total		-	-	-	25		8	**8**
Solid Waste		-	-	1,741	-		44	**40**
Refrigeration						-	253	**229**
Total		**247,704**	**16,900,283**	**3,166**	**461**	-	**19,112**	**17,339**
Offsets							-	-
	'Green' Electric Credits						-	-
	Composting						-	-
	Forest Preservation						-	-
Net Emissions							**19,112**	**17,339**

MODULE	Summary							
WORKSHEET	**Overview of Annual Emissions**							
UNIVERSITY	**Wilkes University**							
Select Year -->	**2007**	Energy Consumption	CO_2	CH_4	N_2O	Other Chemicals	eCO_2	eCO_2
		MMBtu	kg	kg	kg	kg	Short Tons	Metric Tonnes
Purchased Electricity		93,470	7,836,612	76	145		8,687	**7,881**
Purchased Steam/Chilled Water		-	-	-	-		-	-
Stationary Sources		106,238	5,608,451	560	11		6,200	**5,625**
	Non Co-Gen	106,238	5,608,451	560	11		6,200	**5,625**
	Co-Gen Electric	-	-	-	-		-	-
	Co-Gen Steam	-	-	-	-		-	-
Transport Total		60,990	4,281,722	855	294		4,837	**4,389**
	University Fleet	-	-	-	-		-	-
	Student Commuters	43,109	3,026,430	605	208		3,419	**3,102**
	Faculty/Staff Commuters	17,881	1,255,292	251	86		1,418	**1,287**
	Air Travel	-	-	-	-		-	-
Agriculture Total		-	-	-	27		9	**8**
Solid Waste		-	-	2,576	-		65	**59**
Refrigeration						-	139	**126**
Total		**260,697**	**17,726,785**	**4,068**	**477**	-	**19,938**	**18,087**
Offsets							**(11)**	**(10)**
	'Green' Electric Credits						-	-
	Composting						**(11)**	(10)
	Forest Preservation						-	-
Net Emissions							**19,927**	**18,077**

MODULE	**Summary**							
WORKSHEET	**Overview of Annual Emissions**							
UNIVERSITY	**Wilkes University**							
Select Year -->	**2008**	Energy Consumption	CO_2	CH_4	N_2O	Other Chemicals	eCO_2	eCO_2
		MMBtu	kg	kg	kg	kg	Short Tons	Metric Tonnes
Purchased Electricity		99,793	8,366,729	81	154		9,275	**8,414**
Purchased Steam/Chilled Water		-	-	-	-		-	-
Stationary Sources		91,928	5,006,301	526	14		5,536	**5,022**
	Non Co-Gen	91,928	5,006,301	526	14		5,536	**5,022**
	Co-Gen Electric	-	-	-	-		-	-
	Co-Gen Steam	-	-	-	-		-	-
Transport Total		70,153	5,328,226	945	330		6,005	**5,448**
	University Fleet	3,248	228,046	46	16		258	**234**
	Student Commuters	45,497	3,194,055	638	220		3,609	**3,274**
	Faculty/Staff Commuters	18,215	1,278,780	255	88		1,445	**1,311**
	Air Travel	3,193	627,346	6	7		694	**630**
Agriculture Total		-	-	-	30		10	**9**
Solid Waste		-	-	2,742	-		70	**63**
Refrigeration						-	314	**285**
Total		**261,874**	**18,701,256**	**4,295**	**529**	**-**	**21,210**	**19,241**
Offsets							**(7)**	**(7)**
	'Green' Electric Credits						-	-
	Composting						**(7)**	(7)
	Forest Preservation						-	-
Net Emissions							**21,202**	**19,235**