Radford University Greenhouse Gas Inventory Update

Fiscal Years 2011 and 2012

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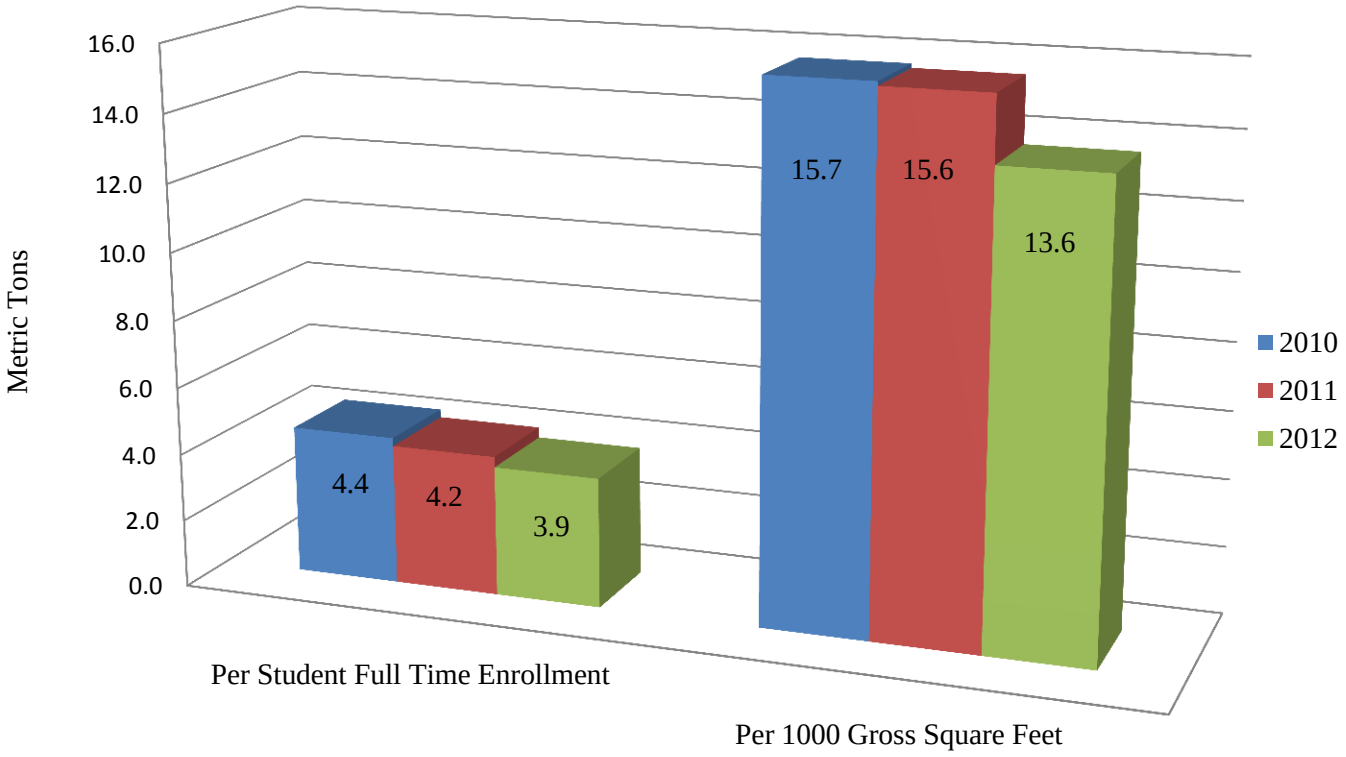
Julio Stephens, SustainABILITY Coordinator
Shannon Mullen, Graduate Research Assistant

Summary

As a signatory of the American College and University's Presidents Climate Commitment (ACUPCC), Radford University previously reported its first publically available greenhouse gas (GHG) inventory in January of 2011. That inventory serves as the baseline for the current inventory update and the development of the university's Climate Action Plan (CAP). The current inventory update covers the time period from July 1, 2010 to June 30, 2011 (FY2011) and July 1, 2011 to June 30, 2012 (FY2012). The net GHG emissions totaled **36,816.4** and **35,308.9** metric tons of carbon dioxide equivalent (MTCO2e), respectively, compared to **37,749.6** in FY2010.

Figure 1. RU Net Emissions (CO2e)



Introduction

Radford University is a coeducational, comprehensive public university offering 69 degree programs in 39 disciplines and two certificates at the undergraduate level; 21 master's programs in 16 disciplines and three doctoral programs at the graduate level; seven post-baccalaureate certificates and one post-master's certificate. With a student body of approximately 9,573 students, Radford University campus sits on approximately 191 acres of land in the City of Radford. Most students live in one of the 15 university residence halls or in private accommodations within walking distance of the campus. Radford University is located on the New River in the foothills of the Blue Ridge Mountains in Southwest Virginia.

As an ACUPCC signatory, RU has committed itself to becoming climate neutral at some point in the future. To address this part of the commitment, RU has initiated efforts to create a comprehensive Climate Action Plan (CAP) that is comprised of multiple areas, including mitigation, education, research, and outreach efforts. The CAP process began in earnest during the Spring 2011 semester with multiple charrettes to gather stakeholder input. Following that semester, two Technical Working Groups (TWGs) gathered the input along with additional research to create the draft CAP. The CAP is expected to be a "living document" in that it will need periodic updates as information, technologies, and support changes. Another campus effort is the United States Green Building Council's (USGBC) Leadership in Energy and Environmental Design (LEED) certification process as a campus standard for new and major renovation capital projects. While there are multiple levels of certification (Certified, Silver, Gold, and Platinum), RU has determined that the Silver level is the minimum level for capital projects. Under this new campus standard, Jefferson and Madison Residence Halls were the first campus buildings to receive LEED certification at any level, and both received Gold certification. Other campus buildings are currently progressing through the certification process and are expected to be certified in the future. These buildings include the new College of Business and Economics (COBE) building and the Moffett and Washington Residence Hall renovation projects. For some of its other campus sustainability efforts, RU has been recognized by outside agencies, which include the 2012 Virginia Governor's Environmental Excellence Award (GEEA) for the installation of a highly efficient magnetic-bearing chiller in Preston Hall that saves energy, greenhouse gas emissions, and money. RU also received a GEEA Honorable Mention in 2012 for its participation in the Campus Conservation Nationals, a national energy and water reduction competition aimed at campus residence halls, where RU residence halls finished in third place in the electricity portion of the competition. Additionally, RU received the Virginia Recycling Association's 'Outstanding University' award in 2012, and has been included in the Princeton Review's Guide to Green Colleges since its initial publication in 2010. For additional information on RU's sustainability efforts, visit the SustainABILITY website (www.radford.edu/rugreen).

The GHG inventory includes emissions from various areas across campus and beyond. These areas are known as 'scopes', and include scopes 1, 2, & 3. Scope 1 emissions are from direct sources on campus and include items like stationary and mobile fuel usage, refrigerants, and fertilizer. Scope 2 emissions are from indirect sources, but are linked to the operations of campus, and include purchased electricity, steam, and chilled water. Scope 3 emissions are considered "upstream" emissions; they are also linked to the necessary operations of campus. Possible scope 3 emissions include: directly financed travel, commuting, solid waste, etc. Figure 1 shows RU's net annual emissions, in metric tons, per student full time enrollment and per 1000 gross square feet for the last three fiscal years. As evidenced by Table 1, RU's scope percentages have not fluctuated much in the last three years.

Table 1. RU's Scope Percentages by Year

	2010	2011	2012
Scope 1	21.9%	21.8%	20.7%
Scope 2	55.3%	58.1%	59.3%
Scope 3	22.8%	20.1%	21.1%

Method

RU again selected the Clean Air-Cool Planet (CACP) Campus Carbon Calculator to assist with the collection, calculation, and analysis of its emissions. The CACP Campus Carbon Calculator is considered the preferred tool of the ACUPCC as it was designed specifically for calculating campus emissions, is consistent with GHG protocol standards, and is commonly used by other universities. While an online version of the calculator has recently been released, RU used the latest Excel-based version of the CACP Campus Carbon Calculator (V.6.85), which incorporated data from the IPCC's Fourth Assessment Reports. The baseline inventory (FY2010) used a different version (V.6.6) so that are some differences due to updates in assumptions.

The organizational boundary selected included all RU buildings under its operational control, or the *control approach*. Our decision on whether to include or exclude certain buildings was based on if the university did or did not pay the utility bills. The temporal boundary selection was based on fiscal year 2011 and 2012 data (July 1st-June 30th). These determinations are consistent with the baseline inventory (FY2010).

Every effort was made to provide the most comprehensive snapshot of Radford University's greenhouse gas emissions, including the most accurate and up to date, obtainable data, available with the resources available. However, some assumptions were still made due to limitations in data, time, or resources. Some of these assumptions include air travel, faculty and student commuting, and weights of paper purchased. The most recent air travel and commuting information was utilized for both FY2011 and FY2012.

- Air Travel- data were collected for half of the most recent fiscal year (July-December 2012) from a university travel partner along with the RU's submitted travel reimbursement forms. Using the travel partner's account summary reports, departure and arrival locations were recorded and distance was calculated by an external website, Travel Math (www.travelmath.com). These figures were entered into a spreadsheet, where the total mileage was computed. Travel reimbursement forms were also recorded and distances were either copied from the provided ticket stubs or calculated by Travel Math. Mileage for both of these sources was summed and multiplied by two to equal a complete fiscal year for entry into the Campus Carbon Calculator. Completing the rest of the most recent fiscal year's air travel is expected to be finalized in the future, and additional tracking efforts are anticipated to take place to reduce the large amount of manual data entry required.
- Faculty, Staff, and Student Commuting- data from Auxiliary Services were collected for academic year 2011-2012 by a professor in the Geography Department. Faculty commuting data included the faculty, staff, and adjunct information. These figures included the number of commuters, fuel efficiency (MPG), percentage of personal versus carpool use, trips per week, weeks per year, miles per trip, total distance (miles), and fuel consumption of gasoline (gallons).
- Paper Purchased Weights- paper purchasing data were collected from RU's Procurement & Contracts Department. The paper figure is limited to general purpose/copier paper purchases from different suppliers and does not include every type of paper utilized within a year by the university. Discrepancies and missing data were collected by contacting the companies who provided the paper. Previously, a single ream of paper was weighed at 4.75lbs., which was used to calculate the estimated total pounds of paper.

The greenhouse gas inventory process began with the data collection phase and the recognition that some data were not readily accessible or did not exist at all. It is for this reason that some data were collected over multiple years, while other data collected were for the most recent fiscal year only. The next phase of the inventory included calculating the greenhouse gas emissions. As data were collected, they were entered into the CACP calculator to determine the relative amount of emissions. The final phase of the inventory included analyzing and summarizing results. Analyzing the data attempts to explain what actions are contributing to the most emissions and where they come from. By summarizing the inventory and emissions results, the university is able to educate individuals and take the steps necessary to reach its goal of climate neutrality.

Inventory Results

While campus square footages and student populations included in the inventory update have increased over the FY2010 inventory, approximately seven and eight percent, respectively, the net greenhouse gas emissions have decreased by over six percent. Reductions are shown in Table 2 from the FY 2010 baseline for the following categories: Other On-Campus Stationary (natural gas), Direct Transportation (fuel usage), Refrigerants & Chemicals, Commuting, Directly Financed Air Travel, and Wastewater. The reduction in the commuting emissions are likely due to slight changes in the methodology (better vehicle economy) and the implementation of Radford Transit public system in August 2011. Reductions in natural gas usage (Other On-Campus Stationary in Table 2) are most likely attributed to warmer winter months for this time period.

Purchased electricity and the associated Scope 2 Transmission & Distribution losses usage have only increased slightly, and the resulting emissions show a net increase from the FY2010 baseline inventory. This slight increase is likely due, in part, to the campus being more efficient and the regional fuel mix for the university over the same period being slightly less carbon intensive. Other increases from the FY2010 baseline include solid waste and paper categories. Another increase is FY2011 and FY2012 emissions from directly financed rental vehicles by RU; this figure was not included in the FY2010 baseline. There are only offsets identified in the CACP calculator overview table for 2012 as part of the Jefferson Hall renovation project.

Table 2. RU's Carbon Dioxide Equivalent (C02e) in Metric Tons

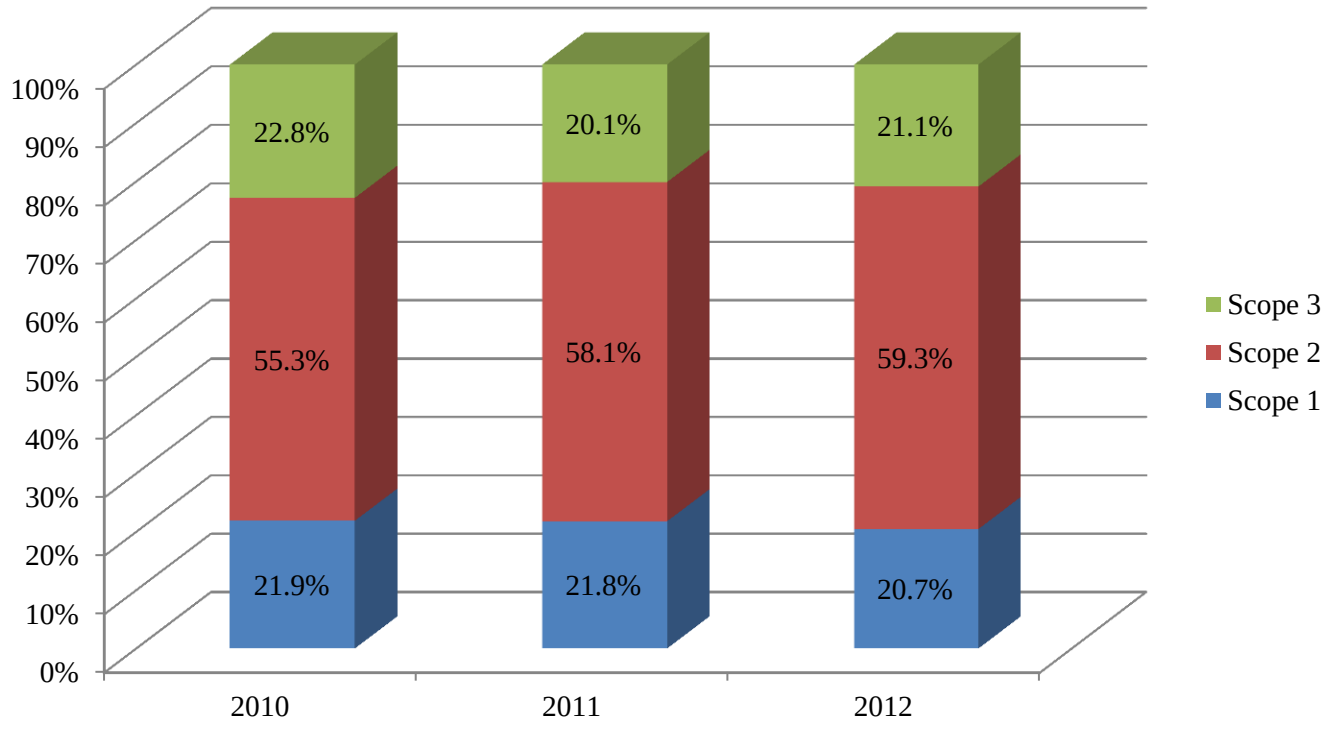
	2010	2011	2012
Scope 1			
Other On-Campus Stationary	7,548.6	7,355.7	6,869.0
Direct Transportation	417.8	492.8	413.9
Refrigerants & Chemicals	249.8	119.5	0.0
Agriculture	39.0	39.0	39.0
Scope 2			
Purchased Electricity	20,874.1	21,405.8	20,937.1
Scope 3			
Faculty/Staff Commuting	2,539.0	2,036.0	2,036.0
Student Commuting	2,629.3	1,838.6	1,838.6
Directly Financed Air Travel	950.9	572.6	572.6
Other Directly Financed Travel	0.0	295.8	290.0
Solid Waste	345.6	434.7	533.6
Wastewater	25.6	21.7	22.3
Paper	65.4	87.1	90.9
Scope 2 T&D Losses	2,064.5	2,117.1	2,070.7
Scope 1	8,255.2	8,007	7,321.9
Scope 2	20,874.1	21,405.8	20,937.1
Scope 3	8,620.3	7403.6	7,454.7
All Offsets	0.0	0.0	-404.8
Net Emissions	**37,749.6**	**36,816.4**	**35,308.9**

Table 3 and Figure 2 show that RU's scope percentages have changed very little over the past three fiscal years. This is largely due to the fact that over 75% of the emissions are attributed to scope 1 and 2 operations that require large investments over time to have a significant impact.

Table 3. RU's Percentage of GHG Emissions by Source

	2010	2011	2012
Scope 1	**21.9%**	**21.8%**	**20.7%**
On-Campus Stationary (Natural Gas)	20.0%	20.1%	19.5%
Direct Transportation (Fleet Fuel)	1.1%	1.3%	1.2%
Refrigerant & Chemicals	0.7%	0.3%	0.0%
Agriculture	0.1%	0.1%	0.1%
Scope 2	**55.3%**	**58.1%**	**59.3%**
Purchased Electricity	55.3%	58.1%	59.3%
Scope 3	**22.8%**	**20.1%**	**21.1%**
Faculty/Staff Commuting	6.7%	5.5%	5.8%
Student Commuting	7.0%	5.0%	5.2%
Directly Financed Air Travel	2.5%	1.5%	1.6%
Other Directly Financed Travel	0.0%	0.8%	0.8%
Solid Waste	0.9%	1.2%	1.5%
Wastewater	0.1%	0.1%	0.1%
General Purpose/Copier Paper	0.2%	0.2%	0.2%
Transmission & Distribution Losses	5.5%	5.8%	5.9%
All Offsets	-0.0%	-0.0%	-1.1%

Figure 2. RU's Percentage of GHG Emissions by Source



Directly comparing the total emissions inventories of other institutions to RU should be done with extreme caution due to the fact that no two institutions are exactly alike. Comparing RU's net 2012 emissions (35,308.9 MTCO2e) to the ACUPCC Master's Institutions average (26,979.2 MTCO2e) shows that RU is still slightly higher overall, however, RU's normalized figures are less than the average (see Figure 3). RU's Scope 1 and 3 emissions are lower and Scope 2 emissions are significantly higher than the ACUPCC average (see Figure 4). This can likely be attributed to the amount of coal, while reducing, is still a majority of the regional fuel mix.

Figure 3. RU & ACUPCC Average Net Emissions (CO2e)

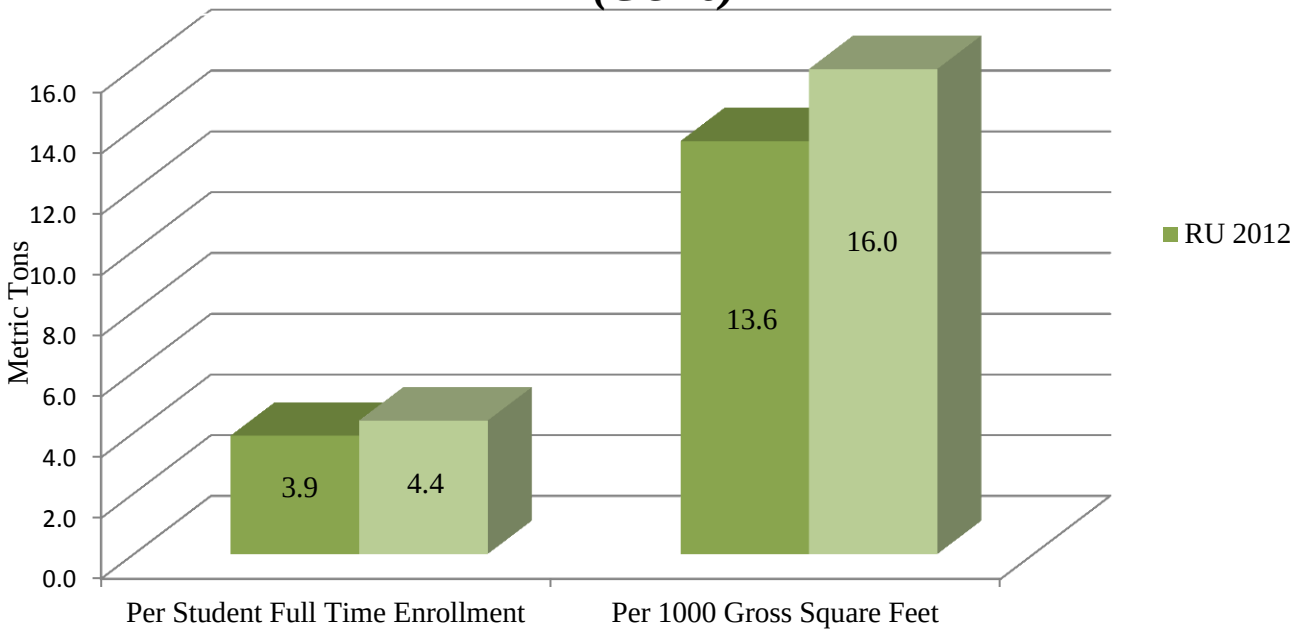
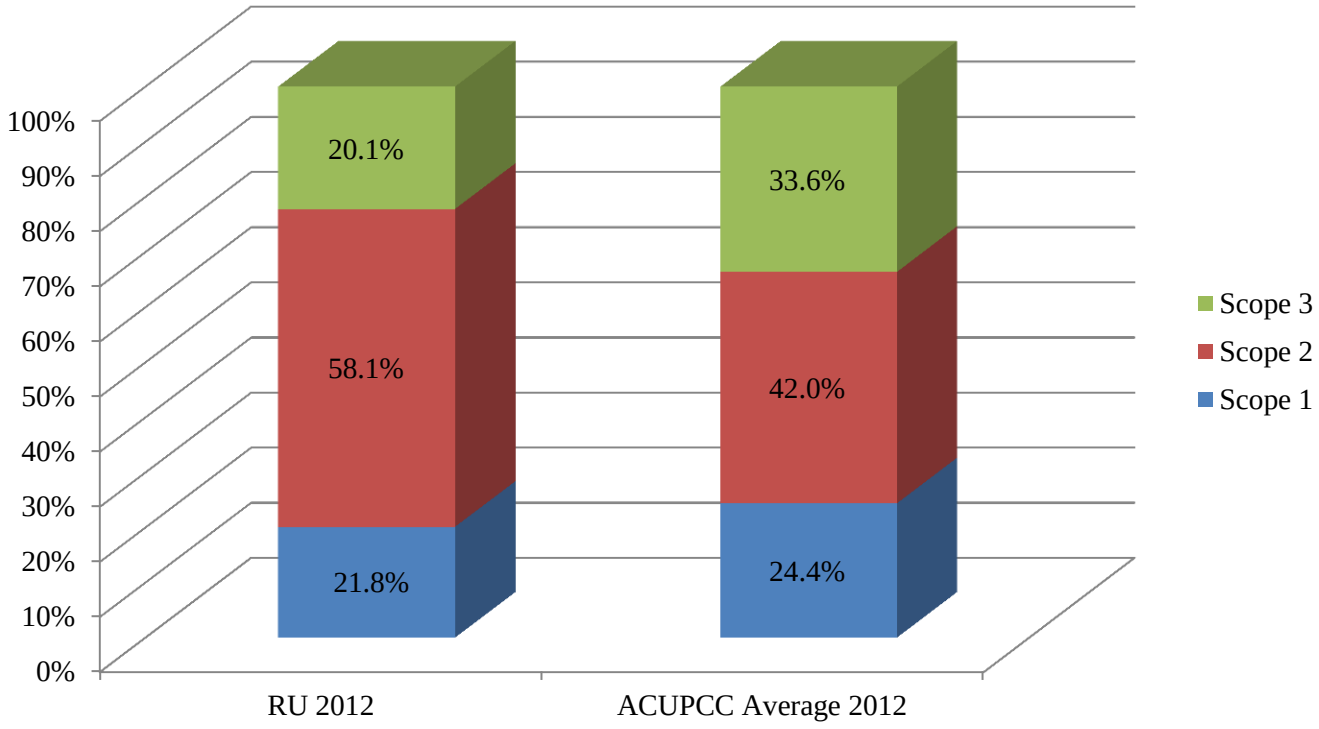


Figure 4. RU's & ACUPCC Percentage of GHG Emissions by Scope



Conclusions, Limitations, & Recommendations

RU has a rich tradition of incorporating sustainability into its campus and will continue to seek progress including the implementation of its Climate Action Plan and the many strategies and initiatives outlined in it for years to come. For the most up to date sustainability related information, visit the SustainABILITY website (www.radford.edu/rugreen).

Due to the slight differences in data collection, reporting, and dissemination from the baseline, there are certain limitations to the comparability of the current fiscal year's data to the baseline from 2010. The major limitation is the comparability of air travel information from the current inventory, which is likely a more accurate representation of the actual miles traveled, as opposed to the baseline inventory. The baseline information was collected from older records (2008), thus decreasing the accuracy and applicability to trends in travel for the 2010 fiscal year.

Recommendations developed from this effort continue to include initiating a more systematic method of tracking the air travel mileage of faculty/staff and students, and study abroad travel. Steps have already been taken to initiate these updates for future inventories. Another recommendation includes taking advantage of any possibilities to include more students in future inventories to ensure educational opportunities are realized. Additionally, RU should continue to conduct periodic research reports relating to the commuting patterns of RU's faculty, staff, and students especially since a new public transit system has been implemented and continues to see expanded growth in ridership and capabilities.

Continuing to report RU's GHG emissions is just one way to benchmark the university's efforts for the coming years. The FY2010 emissions inventory baseline will remain the foundation for the development and implementation of the CAP and subsequent emission inventories. However, as reporting protocols evolve over the coming years, figures will continue to be updated as able along with the subsequent inventories to track RU's mitigation progress.

Acknowledgements

Without the assistance, research, support, and efforts of many individuals, departments, and other structures, this GHG inventory would not have been possible. Thank you to all involved many who are unnamed. If you have questions, feedback concerning this report, or want to find out more about RU's efforts, contact the SustainABILITY office by the website (www.radford.edu/rugreen), by email at rugreen@radford.edu, or visit us on Facebook (www.facebook.com/rusustainability).

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Others not named

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