The Sustainability Institute   Research Institutes, Centers and Programs

2008

Greenhouse Gas Emissions Inventory FY 06-07 Annual Report

UNH Sustainability Institute

UNH Greenhouse Gas Inventory

Fiscal Year 2006–2007

Greenhouse Gas Emissions Update

This inventory update summarizes the anthropogenic greenhouse gas (GHG) emissions generated by the University of New Hampshire (UNH)'s Durham campus from fiscal years 2006–2007. It is a supplement to the three previously published inventory reports (2001, 2003, 2005), and extends UNH inventory records through Fiscal Year (FY) 2007, which ran July 1, 2006 to June 30, 2007.

KEY INDICATORS

TOTAL EMISSIONS

Scope	eCO2
Scope 1 & 2	59,600 MT
Scope 3	16,900 MT
Gross	**76,500 MT**
Offsets	650 MT

PERCENTAGE CHANGE

Base Year	%
1990	13.1%
2001	-3.0%
2003	-12.4%
2005	-7.4%

INTENSITY DEMOGRAPHICS

Indicator	eCO2
per student	5.49 MT
per capita	4.50 MT
per total sq. ft.	14.3 kg

MT = metric ton
eCO2 = carbon dioxide equivalent
kg = kilogram

Summary
Overall Emissions & Trends

UNH GHG emissions have risen from 1990–2003 and have since been declining. Since the last publication of the inventory in 2005, there has been a 7.5% reduction in emissions due primarily to the installation of a electricity and steam co-generation (combined heat and power) facility on campus, as well as reductions in transportation emissions. Despite the decline from the 2003 peak, emissions remain at 13% above 1990 levels.

Total emissions and offsets are shown in the sidebar, as well as other key indicators. The breakdown of FY2007 emissions by source is shown in the pie chart on the right.

Emissions are expected to decline in FY2008 as well as more of the co-generation plant's fuel needs are met by natural gas and then by landfill gas in the following fiscal year (FY09). *(Note: UNH's fiscal year runs July 1 to June 30.)*

Scope 1 Emissions
On-Campus Sources

Scope 1 emissions accounted for the largest portion of total emissions in FY2007. They include all sources related to heating and cooling on campus, electricity produced by the on-campus co-generation plant, university-owned vehicles, and agricultural activities.
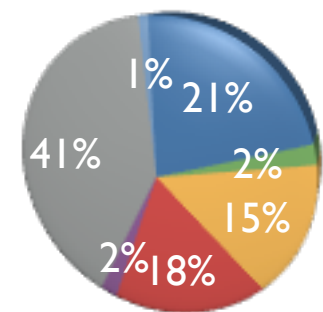

FY2007 Emission Proportions by Source. "Other" sources include: refrigerants and solid waste disposal.

Co-Generation Plant

The UNH co-generation (or combined heat and power) plant began operating in FY2006. The co-gen plant is dual-fueled; it can operate on either distillate (#4) fuel oil or natural gas, and provides heating, cooling, and electricity to the majority of campus buildings. Electricity use is discussed under scope 2 emissions.
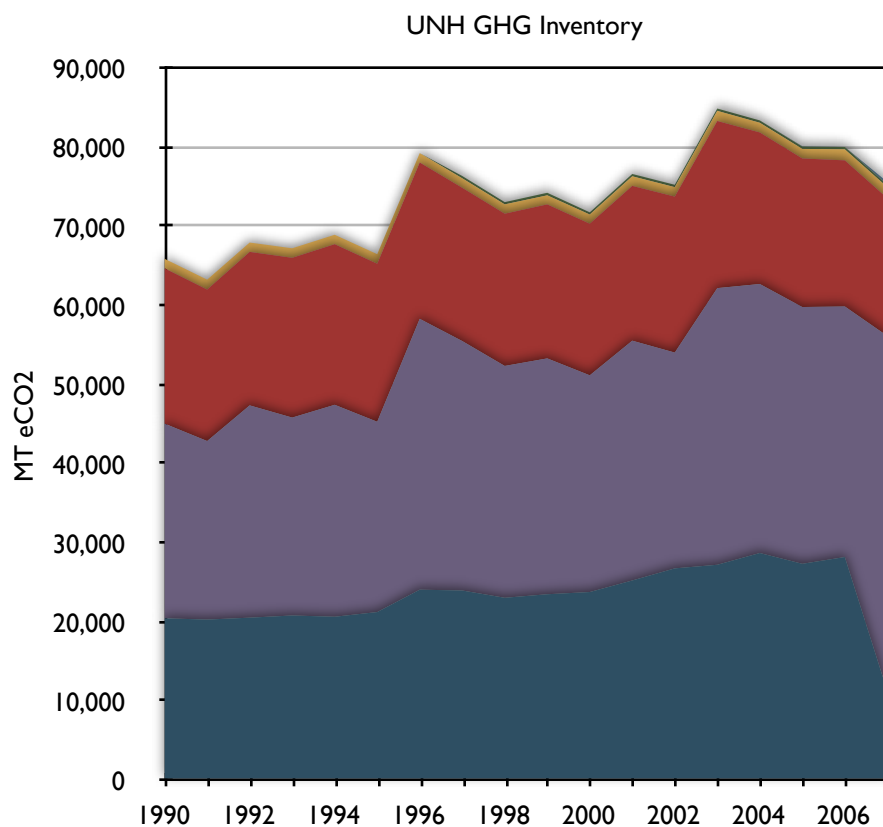
UNH GHG Inventory

The superior efficiency of the plant, its use of less carbon intensive fuels like distillate (#4) fuel oil or natural gas instead of carbon intensive residual (#6) fuel oil, and the subsequent reduction in electricity needed to be purchased have lead to significant reductions in overall UNH emissions.

Other Stationary Sources

The majority of the campus energy needs are now being met through the use of co-generation, but some fuel is still consumed primarily in buildings not connected to the central heating system. Emissions from these sources account for only 30% of total stationary source emissions. The remaining stationery source emissions are attributed to co-generation.

University Fleet

The UNH fleet includes a variety of vehicles powered by both conventional and alternative fuels, such as biodiesel (20% biofuel–or B20), and compressed natural gas (CNG). In addition to the vehicles used in campus operations and

farm activities, UNH's fleet includes the vehicles operated on- and off-campus by WildCat Transit, New Hampshire's largest public transportation system.

In 2007, UNH began using B20 biodiesel. In the first year of use, more than 50% of the total diesel fuel used by the university was B20. These transitions have reduced fleet emissions by close to 500 metric tonnes of carbon dioxide equivalents (MT eCO_2) and continue the long-term decline in fleet emissions from their high of nearly 2,500 MT eCO_2 in the early 1990's to their current level of less then 1,000 MT eCO_2.

Refrigerants & Chemicals

Emissions from refrigerant leaks are not a significant source of emissions, never topping more than 50 MT eCO_2. All historical data could not be verified, but were consistent with FY06–07 data and should be considered reliable.

Fertilizer Application

These data have not previously been tracked consistently. As part of a historical data review, fertilizer use on

campus was investigated from 1990–2007. Although fertilizers are used by UNH Facilities Grounds & Event Support, the horticulture farms, and the Thompson School's greenhouses, the only significant application occurs on the animal science farms. Therefore, the data from those farms was used as a proxy for total university use since some of the other smaller uses were not fully documented.

Until 2007, both synthetic and organic fertilizers were applied, but in 2007 the use of synthetic fertilizers was discontinued. Use and nitrogen content varied greatly from year to year with associated emissions varying from approximately 250 to 300 MT eCO_2. With the adoption of all organic fertilizers this figure has dropped to about 200 MT eCO2. Overall, fertilizer application is not a significant source of emissions at UNH.

Animal Husbandry

UNH farms house swine, horses, poultry, and dairy cattle–including 63

cows now housed at UNH's new organic dairy research farm.

Previous versions of the UNH GHG inventory did not include horses boarded at UNH but not owned by the university (primarily animals brought to campus by equine studies students). This version of the inventory has added those horses as well, which average about 50 per year. This has doubled the number of animals previously accounted for and the associated emissions. However, total emissions from all animal husbandry activity only account for about 1,000 MT eCO$_2$.

Scope 2 Emissions
Purchased Energy

The only energy directly purchased by UNH is electricity produced by the New England electric power grid and distributed though Public Service of NH. All steam and hot water used at UNH is produced on campus and not purchased from an external entity.

Purchased Electricity

UNH's purchases of electricity have dropped drastically due to the electricity now produced on campus at the co-generation plant.

The plant first produced electricity in 2005, but did not approach its full output until FY07. In 2004, UNH was purchasing about 61,000,000 kilowatt hours (kWh). That figure has since dropped to 26,500,00 kWh with close to 40,000,000 kWh generated on campus. Similarly, the associated emissions have decreased from close to 28,500 to 11,000 MT eCO$_2$.

Scope 3 Emissions
Outsourced Activities

Historically scope 3 emissions have accounted for roughly ⅓ of UNH's total emissions and are dominated by commuting activity. In recent years, scope 3 emissions have decreased from their peak of close to 27,000 MT eCO2 in 2003 to just less then 17,000 MT eCO$_2$.

Commuting

The data related to student, faculty, and staff commuting were significantly revised from previous versions of the inventory. The data are based on two transportation surveys conducted by UNH Campus Planning in 2001 and again in 2007. From these surveys, data on the percentage of the campus community commuting by personal vehicle were determined, along with estimates for the number of trips to campus per week and the average commute distance. These data were used to calculate annual Vehicle-Miles Traveled (VMT) for UNH commuters. When these data were combined with average fuel efficiency data from the U.S. Environmental Protection Agency and the U.S. Department of Transportation, the consumed fuel and resulting emissions could be estimated.

For the years 1990–2001, the data from the 2001 survey were used. For the years 2002–2006 linear regression was used to interpolate values based on the two surveys. In all cases commuting emissions were 50% higher than the values reported in previous versions of the inventory.

Between 2001 and 2007 emissions from student commuting decreased from approximately 5,400 to 5,200 MT eCO$_2$. Similarly, faculty and staff commuting dropped from about 12,000 to 10,200 MT eCO$_2$. In the case of students this was primarily due to decreased use of personal vehicles and an increase in carpooling; there was little change in commute distance and a slight increase in the number of trips per week. The reductions in faculty/staff commuting emissions were driven by increases in carpooling and slight reductions in the number of trips per week and commuting distance; the percent commuting in personal vehicles declined slightly, but not significantly.

Solid Waste Disposal

The values for landfilled waste reported in previous versions of the inventory could not be verified. This data is available from 1997 (when the on-campus incinerate was closed) to 2003. An average value of this data was used as an estimate for 2004–2006.

In FY07, sample measurements of front-loaded dumpsters were conducted on 3 occasions. Those data were averaged and added to the annual total from the on-campus trash compactors to develop an estimate of total land-filled waste for 2007.

Long-distance Travel

No emissions from long distance travel, including airline travel, were tracked in this inventory. UNH's Energy Task Force is now considering how best to address airline travel emissions.

Offsets
Sequestration

Two sources of offset are applied in the UNH GHG emissions inventory, both generated through on-campus activities. UNH does not currently participate in any market-based offset activity, such as purchasing Renewable Energy Certificates (RECs) or other retail carbon offsets.

Forest Preservation

Carbon uptake by woodlands in College Woods, Burley-Demeritt Farm, Woodman Farm, and Kingman Farm was counted as an offset in the inventory. These lands total about 750 acres (303.5 hectares). Carbon sequestration is estimated at 2 MT/hectare/year, pending a more detailed study. This results in about 600 MT eCO2 of sequestration each year.

Previous versions of the inventory included only one year of forest offset data, which were also much lower than the current estimates. The methodology used to make this estimate could not be determined and so it was replaced with the current values reported above.
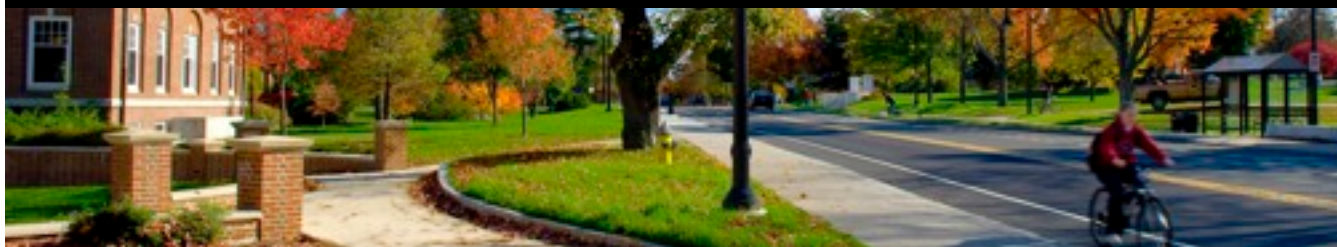
Composting

The composting program at UNH began in 2003 and composts all food scraps in university dining halls, along with some landscaping debris like fallen leaves. This reduces emissions by about 45 MT eCO2 per year.

Next Steps
Future Data Needs

Some of the data used to estimate scope 3 emissions could not be obtained or could be improved. Specific notes are listed below.

Airline Miles

These data are not currently tracked by any entity on campus. It is a requirement of the American College & University Presidents' Climate Commitment (ACUPCC), which UNH signed in 2007, that GHGs inventories track airline emissions. Expenditures on travel are recorded, but travel arrangements are decentralized and handled through each of the 19 different Business Service Centers (BSCs) on campus. Total expenditures on travel can be obtained, but these will include funds spent on lodging and ground transport along with airline travel. In order to make use of GHG accounting methodologies that allow estimation of air miles traveled based on airline travel expenditures, some estimate of the proportion of total travel expenses generated by air travel would need to be developed.

Solid Waste Disposal

A new methodology for collection data on the amount of solid waste that is placed in landfills should be developed.

Because of the anticipated high variability in the amount of waste produced, which will change drastically during student move-in/move out days, major campus events, etc., reporting of actual measured data is expected to be much more accurate than estimates based on data collected over a limited timeframe.

Animal Husbandry

As the site of the first organic dairy research farm, UNH would be in an excellent position to conduct research on the difference between GHG emissions from organic vs. conventional animal husbandry. Some evidence suggests that grass feed ruminants produce lower emissions than grain feed animals, and that open pasture manure management may lower emissions by preventing the anaerobic decomposition that occurs when waste is concentrated in barns and feedlots.

Forest Preservation

The current estimations of forest uptake assume an average annual uptake. Actual carbon uptake in forest ecosystems depends highly on the composition and age of the forest. A survey of the sites included in the inventory to determine their individual carbon sinks would improve the current methodology. Also, only the woodlands on the farms nearest to campus are included in the inventory. UNH holds many woodland areas throughout the state. Carbon sinks for these additional areas could be investigated if the boundaries of the inventory were expanded to include emissions sources on those lands. An investigation of which UNH lands are currently designated as conservation lands should be undertaken to help inform decisions about how to claim and report forest offsets.

UNIVERSITY OFFICE OF
SUSTAINABILITY