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Greenhouse Gas Emissions Inventory FY 08-09 Annual Report

UNH Sustainability Institute

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UNH Greenhouse Gas Inventory



KEY INDICATORS

TOTAL EMISSIONS

Scope	t CO ₂ e
Scope 1 & 2	56,314.1
Scope 3	13,973.6
Gross	70,287.7
Offsets	1,459.7
Sequestration	-2,267.7

PERCENTAGE CHANGE

Base Year	%
1990	-4.9%
2000	-5.8%
2005	-13.3%

INTENSITY DEMOGRAPHICS

Indicator	t CO ₂ e
per student	5.05
per capita	4.97
per 1,000 sq. ft.	11.28

t = metric ton = 2,000 kg
CO₂e = carbon dioxide equivalents

Fiscal Year 2008–2009

GHG Emissions Update Report

This inventory update summarizes the anthropogenic greenhouse gas (GHG) emissions generated by the University of New Hampshire (UNH)'s Durham campus from fiscal years 2008–2009. It is a supplement to previously published inventory reports (2001, 2003, 2005, 2007), and extends UNH inventory records through Fiscal Year (FY) 2009, which ran July 1, 2008 to June 30, 2009.

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 2007, there has been a 4.75% reduction in emissions due primarily to continued improvements in electricity and steam co-generation (combined heat and power) on campus, as well as reductions in transportation emissions.

The later half of FY09 also saw reductions in *gross* emissions due to the completion of the EcoLine landfill gas project; however, some of those reductions were sold as Renewable Energy Credits (RECs) and therefore are not attributed to UNH's *net* emissions profile.

FY09 also saw the first year that UNH reduced emissions below its 1990 level; this is significant as the first year emissions were tracked (using historical data) and as 1990 is used as a baseline for internal carbon reduction agreements such as the Kyoto Protocol.

This update also saw a significant revision of UNH's carbon sequestration.

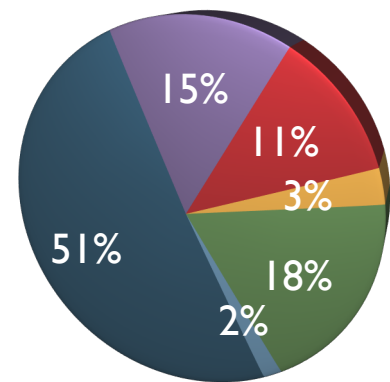
Total emissions and offsets are shown in the sidebar, as well as other key indicators. The breakdown of FY09 emissions by source is shown in the chart below.

Emissions are expected to decline in FY10 as more of the co-generation plant's fuel needs are met by landfill gas. Further reductions are expected in 2015 when the university ceases its sale of RECs and claims the full benefit of the EcoLine reductions.

Scope 1 Emissions

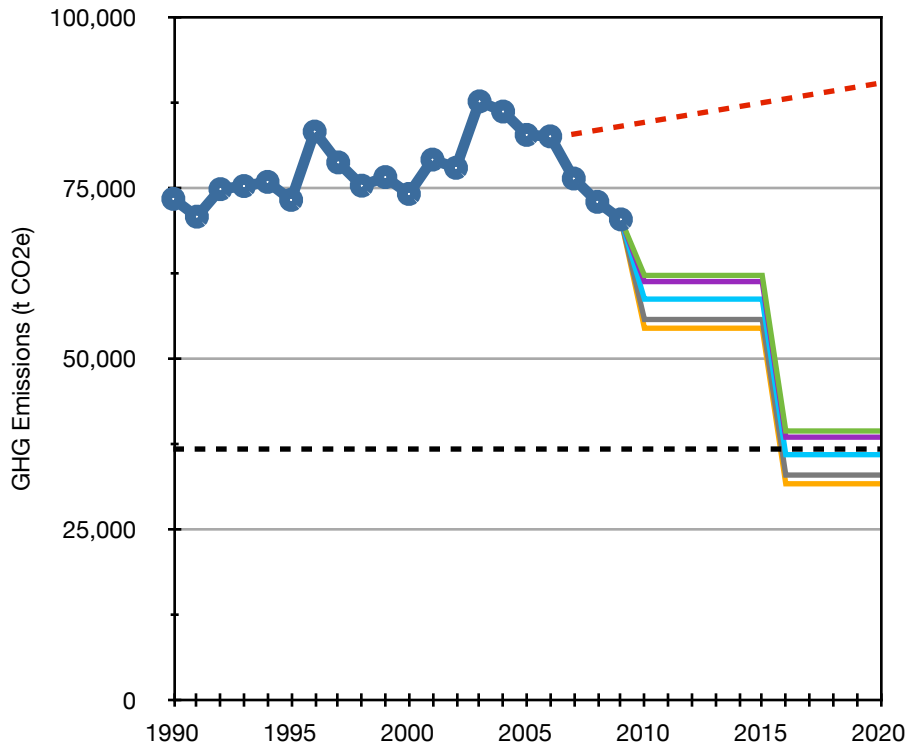
On-Campus Sources

Scope 1 emissions accounted for the largest portion of total emissions in FY09. They include all sources related to heating and cooling on campus, electricity produced by the on-campus co-generation (cogen) plant, university-owned vehicles, and agricultural activities.



- Cogen
- Stationary
- Communting
- Electricity
- Mobile
- Agriculture

Projected Greenhouse Gas Reductions



WILDCAP

CLIMATE ACTION PLAN

UNH's Climate Action Plan (CAP) is named WildCAP, after UNH's Wildcat mascot. Adopted in September 2009, this plan is the result of a two-year process coordinated by the ETF. WildCAP calls for greenhouse gas reductions of 50% by 2020 and 80% by 2050.

For more information see <http://rs.acupcc.org/cap/113/> and www.sustainableunh.unh.edu.

- Historical Emissions
- Business As Usual
- 50% Reduction Target
- EcoLine
- Renewables
- Efficiency
- Conservation
- Transportation

FY09 Emission Proportions by Source.

Co-Generation & EcoLine

The UNH co-generation (or combined heat and power) plant began operating in FY06. In the spring of 2009, the EcoLine project was completed, linking the cogen plant to a nearby source of landfill gas. The cogen plant is multi-fueled; it can operate on landfill gas, distillate (#4) fuel oil, or natural gas, and provides heating, cooling, and electricity to up to 85% of campus buildings.

The superior efficiency of the cogen plant, its use of carbon neutral or less carbon intensive fuels 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.

Electricity use is discussed under scope 2 emissions. The sale of Renewable Energy Credits (RECs) from EcoLine are discussed under offsets.

Other Stationary Sources

The majority of campus energy needs are now being met through the use of co-generation, but some fossil fuel is still consumed primarily in buildings not connected to the central heating and cooling system. Emissions from these sources account for only 11% of total emissions.

Mobile Sources

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, the state'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. The use of B20 now accounts for 78% of diesel consumption on campus. These

transitions have reduced fleet emissions by more than 350 metric tones and continue the long-term decline in fleet emissions from their high of more than 2,500 t CO₂e in the early 1990's.

Refrigerants & Chemicals

Refrigerant leaks continue to be an insignificant source of emissions, totaling only 250 t CO₂e in FY09.

Fertilizer Application

Significant fertilizer use only occurs at the animal science farms; as a result, these data are used proxies for the entire university even though small amounts are used by UNH Grounds & Events, the horticulture farms, and the Thompson School's greenhouses.

Only 3,000 lbs. of synthetic fertilizers have been applied at UNH since 2007 in total. Overall, fertilizer application is not a significant source of emissions at UNH.

Animal Husbandry

The only noteworthy change in animal husbandry operations has been

the ending of poultry operations at UNH in FY08. The numbers of pigs, cows, and horses maintained by the university has not varied significantly during this reporting period. Animal husbandry overall continues to be the leading source of agricultural emissions, which overall account for 2% of total emissions.

Scope 2 Emissions

Purchased Energy

The only energy directly purchased by UNH is electricity produced by the New England electric power grid and distributed through 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 since the cogeneration plant became operational in FY06. Since that time, UNH purchases have not topped 25,000 MWh and associated emissions have remained under 12,000 t CO_{2e}, generating 10,298.1 t CO_{2e} in FY09.

Scope 3 Emissions

Outsourced Activities

Historically scope 3 emissions have accounted for roughly 1/3 of UNH's total emissions and are dominated by commuting activity. In recent years, scope 3 emissions have decreased to just 15% of total UNH emissions. At present, only student, faculty, and staff commuting and solid waste disposal are included in scope 3 emissions.

Commuting

Commuting behaviors were last surveyed in 2007 and 2002. Plans are in place to sample community behaviors in 2011. The data contained in this report are extrapolated based on the trend established by the two previous surveys and will be revised when new data become available.

Solid Waste Disposal

Considerable effort has been made since the last inventory report to revise this data set, streamline data collection, and improve reporting. A new waste hauling contract allowed for collection of actual tonnages of waste disposed, and these values no longer have to be constructed from a series of snapshots over the course of the year. However, this system was only in place for FY09 and there are still many difficulties in obtaining consistent data.

Long-distance Travel

No emissions from long distance travel, including airline travel, were tracked in this inventory. A new method for collecting these data is being evaluated, and it is expected that starting in FY10 airline emissions will be reported.

Offsets

Carbon/Energy Market Activity

UNH participates in various markets for carbon and renewable energy created through regional cap-and-trade programs such as the Regional Greenhouse Gas Initiative (RGGI) and the Renewable Portfolio Standards (RPS) enacted by several New England States. The implications of this market activity for the university's carbon profile are discussed below.

Renewable Energy Credits

UNH sells Renewable Energy Credits (RECs) generated through landfill methane capture and electricity generation by the EcoLine project. In FY09, UNH sold 3,452 MWh worth of RECs. This precludes the university from claiming any of the environmental attributes associated with those megawatts. Therefore any carbon reductions from that electricity must be added back into UNH's gross emissions.

The emissions associated with this electricity were calculated in the same way as emissions from purchased

electricity. In effect this is analogous to UNH purchasing additional energy – with the standard carbon mix – from the New England grid to replace the renewable energy it had sold. In FY09, this amounts to 1,459.7 t eCO_{2e} that must be added to the university's gross emissions.

UNH plans to sell RECs through 2015 to help offset the investment in EcoLine and to seed a revolving energy efficiency fund which will be used in the implementation of the UNH Climate Action Plan, WildCAP.

Purchased Offsets

UNH does not purchase any renewable energy credits. The current plans for emissions reductions outlined in WildCAP calls for a 50% reduction by 2020 without the use of purchased offsets.

Offsets

On-Campus Sequestration

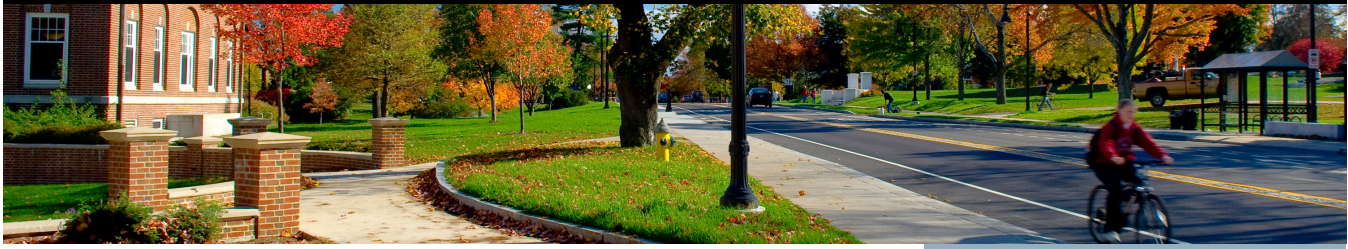
Two sources of offsets generated through on-campus activities are applied in the UNH GHG emissions inventory.

Forest Preservation

Carbon uptake by woodlands in College Woods, Burley-Demeritt Farm, Woodman Farm, and Kingman Farm was calculated in this inventory. These lands total about 750 acres (303.5 hectares) and represent the woodlands immediately abutting core campus.

An extensive student project in FY09 was able to reassess in a more rigorous way the carbon sequestration on UNH's lands. It was determined that calculations in previous versions of the inventory were grossly underestimated. Carbon sequestration is now estimated at 7.33 t/hectare/year. This results in 2,267.7 t CO_{2e} of sequestration each year.

This figure should not be assumed to be directly subtracted from the university's gross emissions, but should be considered as a stock of carbon that



would have to be added into gross emissions if the university were to sell or deforest that land.

Composting

UNH continues its on-campus composting program, which began in 2003. Between 100-150 tons of waste were composted annually in FY08-09, reducing emissions by ~45 t CO₂e per year.

Next Steps

Future Data Considerations

New methods for tracking greenhouse gas emissions, new research, and new data make this inventory an evolving process. Some potential ideas for future improvement are detailed below.

Airline Miles

These data are not currently tracked by any entity on campus. Expenditures on travel are recorded, but travel arrangements are decentralized and handled through each of the 19 different Business Service Centers (BSCs) on campus. The Energy Task Force has been working with the BSCs to determine possible ways to capture these data. The number of people authorized to purchase airline tickets is limited, and most of them do so with a university-issued credit card. It may be possible to work with the credit card provider to obtain a list of these transactions. However, this method may exclude anyone who purchases a ticket in advance and is then reimbursed by the university, a practice which is not widespread but occurs regularly in some of the colleges and academic units. It is expected that data could be obtained and a methodology developed in time for the next inventory update.

Animal Husbandry

No studies comparing the emissions between conventional and organic dairy management practices have yet been undertaken. This could be an interesting topic for future UNH researchers.

Forest Preservation

The methods for accounting forest sequestration in a greenhouse gas inventory are evolving. The question of additionality is becoming more important to the inventorying process. In this update, specific lands out of the total holdings of the university were assessed and their associated carbon captured was determined. However, this value was not directly subtracted from university gross emissions since it most likely is not considered additional due to the fact that it is standing forest and not designated as protected land for the purpose of carbon sequestration.

In future versions of the inventory much greater investigation of these methods could occur. In addition, the possibility of specifically managing some of the large forest areas owned by the university for carbon management and sequestration could be investigated. This would most likely require lands to be conserved under easements and the carbon sequestration verified by a third-party (as if it were being sold on the carbon offset market).

UNH GHGE INVENTORY SERIES

Produced through the collaborative efforts of the UNH Energy Task Force (ETF) and UNH Sustainability Academy, this update to the UNH GHGE inventory series serves as a tool for measuring the university's impact on regional and global climate and for tracking institutional progress in greenhouse gas emissions reductions to inform the decision-making of the university as it strives to respond to unprecedented disruption of the climate system and to meet its obligations under the American College & University Presidents' Climate Commitment (ACUPCC).

Under its Climate Education Initiative (CEI), UNH is committed to being a *Climate Protection Campus* that pursues a sustainable energy future through emissions reduction policies, practices, research, and education.

Discover the sustainable learning community at UNH at sustainableunh.unh.edu.

