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Greenhouse Gas Emissions Inventory Reports: FY 14 Briefing

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Recommended Citation

Andrews, Jennifer, "Greenhouse Gas Emissions Inventory Reports: FY 14 Briefing" (2014). *The Sustainability Institute*. 66.

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Counting Carbon: How UNH Measures Up

What is a carbon footprint?

Here at UNH, we've worked hard to understand our carbon footprint, and to help other colleges and universities do the same.

Back in 1827, a mathematician named Fournier used the term "greenhouse effect" to describe the way that certain gases in the atmosphere act like glass; they let energy in the form of light pass through them, but don't let that energy, once reflected off of the earth's surfaces and changed into heat, to pass back out of the atmosphere into space. Those gases—water vapor, carbon dioxide, methane and nitrous oxides are the most prevalent—he called "greenhouse gasses" because they act like a greenhouse, keeping energy bounded within the earth's atmosphere, and thereby allowing life to flourish here on Earth in a way that it doesn't elsewhere.

For the entire time that life has evolved on the planet, those greenhouse gases (GHGs) have cycled through the earth's atmosphere, oceans, crust, and biota. This cycle is referred to as the "carbon cycle," with "carbon" being a shorthand way of referring to all greenhouse gases. The term "carbon footprint," then, refers to the degree to which human activities alter where in the cycle those greenhouse gases are—because as more of them are concentrated in the atmosphere, we change the energy balance in that cycle and, in turn, change the weather and climate patterns that we experience.

What are the mechanisms that shift GHG's from other parts of the earth system to the atmosphere, in

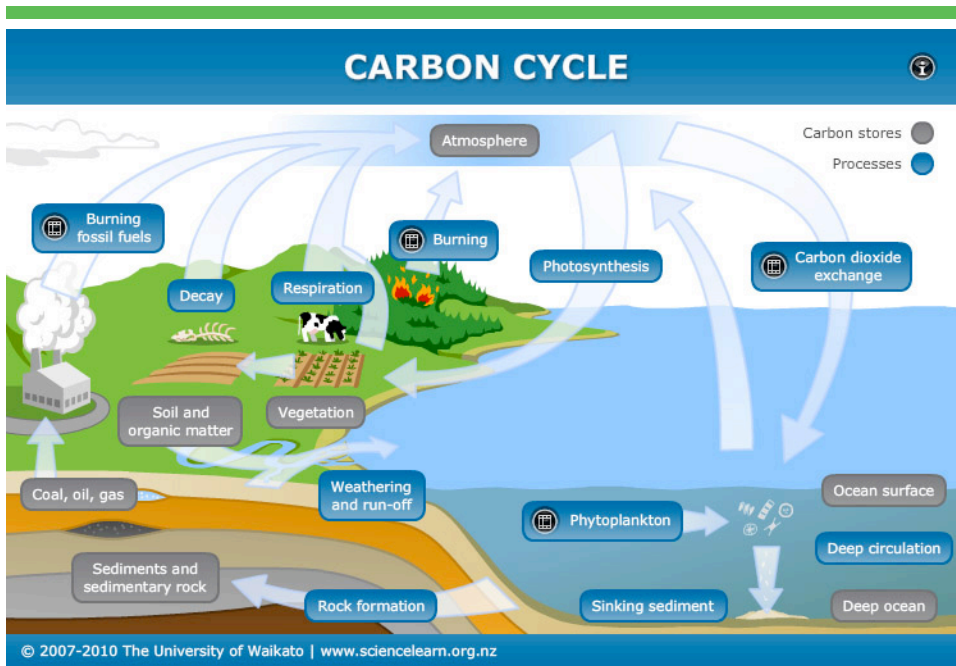
HIGHLIGHTS

- Carbon footprints are a way to understand one's contribution to climate change.
- UNH was one of the first schools in the nation to analyze its first carbon footprint.
- UNH developed the tool that is used by 90% of other campuses around the country to track their carbon footprints.
- The latest (FY '14) update shows that UNH is still on track to the goal set in WildCAP: 50% reductions by 2020 (from 2005 levels).
- It also shows that UNH is outperforming other schools.
- The University has already made a lot of progress by investing in greener fuels and equipment; the big opportunities now revolve around participation by all of our community members.

quantities large enough to make a noticeable impact on observed weather and climate patterns?

1. Coal, oil, and natural gas (i.e. "fossil fuels") combustion: We started burning fossil fuels in large quantities during the industrial revolution, and continue doing now to power our communities and

Sustainability Briefings are a collection of occasional essays, thought pieces, case studies and research briefings through which University of New Hampshire (UNH) faculty, staff and students can connect with larger audiences on the complex issues of sustainability. The collection is sponsored by the Sustainability Institute at UNH, a convener, cultivator and champion of sustainability on campus, in the state and region, and around the world. Learn more at www.sustainableunh.unh.edu.



“Carbon footprint” is a metaphor; it is a way to express the degree to which we leave an impact (i.e. “footprint”) with activities that shift the balance of the carbon cycle.

fuel our vehicles. This takes greenhouse gases that were stored in the ground and releases them into the atmosphere upon combustion. Burning trees has the same impact, but this is considered less problematic because the greenhouse gases stored in trees are already above ground so would have been released into the atmosphere at some (relatively near) point, anyway.

2. Agricultural processes: Many animals that we raise as livestock emit methane as part of their digestive process—and their manure also is a major source of methane. As more and more people on the planet eat larger and larger quantities of livestock, these emissions sources continue to grow. In addition, modern agriculture relies a great deal on large quantities of fertilizers, which emit nitrous oxides when applied.

3. Landfills and wastewater treatment plants: Methane results from treating wastewater and from landfilling municipal solid waste.

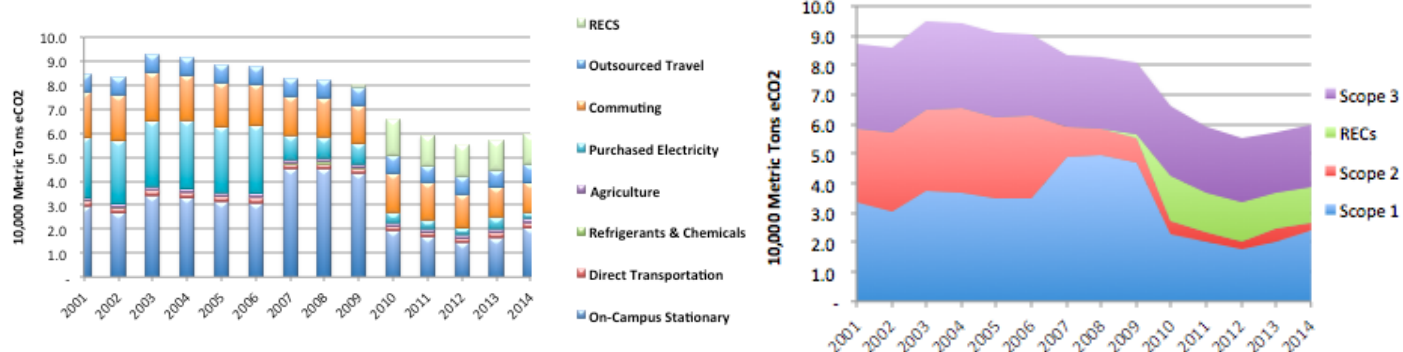
4. Deforestation and land use changes: Living trees sequester a great deal of carbon dioxide as they grow, cutting down forests for development and/or large scale agriculture. This is another major way in which greenhouse gases are “pushed” out of the terrestrial part of the carbon cycle into the atmospheric part.

Measuring the campus carbon footprint

With the advent of the Kyoto Protocol—a 1992 global agreement between countries to work together to reduce humanity’s collective carbon footprint—governments, institutions and organizations began trying to understand and communicate their own emissions. An international standard to help countries measure those footprints was developed by the Intergovernmental Panel on Climate Change; and in 2001, UNH was one of the first universities in the world to take that international standard for countries, downscale it, and apply it to a campus; faculty and staff from the Sustainability Institute (UNHSI) worked with the nonprofit Clean Air-Cool Planet (CACP) to hire and supervise a graduate student to undertake this work.

UNHSI shared the template and methodology that it developed for using the IPCC standards with other campuses in New England that were likewise interested in measuring and reducing their GHGs. If colleges and universities all used one standard tool and methodology for this assessment, it would be easier to meaningfully analyze, compare their results, and learn from each other. From this project, the [“Campus Carbon Calculator”](#) was born; it’s an Excel tool, made publicly available in 2004 by CACP for measuring institutional carbon footprints.

Thousands of campuses in the US, Canada and across the globe have now used the Campus Carbon Calculator to track their carbon footprints, to plan for



FIGURES 2 AND 3: UNH carbon footprint by scope and source, 2001-2014.

effectively reducing their emissions, and to measure their progress. The tool has been continually updated and improved as the science and standards have advanced. In 2011 a beta for a web-based version of the Calculator, called [CarbonMAP](#), was brought online; whereas previously each institution had its own data in its own Excel file on its own campus, the advent of CarbonMAP means that for the first time there is one centralized dataset for campus GHG-related activities—data that can be used for research, and analyzed for trends or lessons that might help all campuses reduce their carbon footprints.

In 2014, the Campus Carbon Calculator “came home” to UNH from where it had been housed at Clean Air-Cool Planet. UNH is now helping to lead a national conversation about how we might continue to improve how the tracking of institutional carbon footprints, and use the results to save money, improve our campuses, and address climate change.

Understanding UNH’s Carbon Footprint

Since publishing its first Greenhouse Gas Inventory (GHGI) report in 2002, UNH has updated it regularly. The University used this carbon footprint to create its [Climate Action Plan, WildCAP](#), in 2009, which established a goal of reducing the institutional carbon footprint 50% from 2001 levels by 2020. The 2014 update captures UNH’s footprint through last fiscal year 2014 (which ended on June 30, 2014). The updated report shows that we have made good progress toward our 2020 goal--though during the past two years that progress has slowed and even stalled in a few areas. We are still well-positioned to meet our goal for 2020, but will require dedicated effort to do so.

The major elements of the UNH carbon footprint that

we have direct control over (these are referred to as “Scope 1” and Scope 2” emissions), are the following:

- Burning fuel to power and heat campus buildings (“on-campus stationary”)
- Buying electricity, which is produced in part by burning fossil fuels
- Burning fuel in our campus fleet vehicles
- Managing livestock on our campus dairies
- Applying fertilizers at our farms

We also measure and report some contributors to our carbon footprint that the University itself has less control over, because they come from the university community members individually. These (called “scope 3” emissions) include:

- Emissions from commuting to and from campus by are students, faculty and staff
- Emissions from business travel by our faculty and staff
- Emissions from air travel by UNH students studying abroad
- Emissions from trash disposal

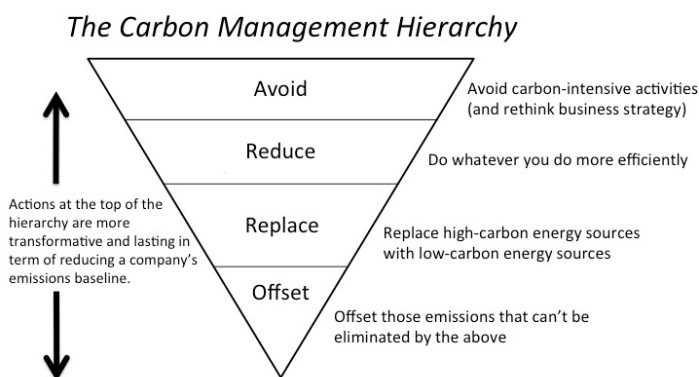
We report these categories of emissions because we know they have a significant impact; because protocols exist for measuring them in a standardized fashion; and because as a signatory to the [American College and University Climate Commitment](#), these are the categories we are asked to report. We could also measure and report other such indirect contributors to our carbon footprint—for example, the GHGs emitted in the process of producing and

transporting the food that we serve on campus, or the GHGs associated with actually producing the fuels that we use—but because those are not currently standard categories for campus GHG reporting, we do not yet choose to do so.

Since many other universities also measure and report GHGs, another way to understand our carbon footprint is in a comparative context; that is, not only how are we doing relative to our own goals, but how are we doing compared to other similar campuses. In that respect, UNH can be proud: our emissions per square foot and per capita are significantly lower than the average doctorate-granting institution in the U.S.

Priorities for Carbon Footprint Reduction

There are four ways to reduce your carbon footprint, as represented in the graphic below:



The emissions profile of UNH tells an interesting story. Much of our progress in reducing our emissions to date focuses on very large and centralized investments, first in changing our campus heating plant to a co-generation plant that produces electricity as well as heat, and then in the EcoLine pipeline. We are not alone; one recent analysis found that, on average, US campuses have reduced their energy-related carbon footprints by 7% overall—and that fully 6% of the total 7% came from fuel switching—which is the “Replace” part of

Metric tons eCO2 per FTE Metric tons eCO2 per 1000 ft²

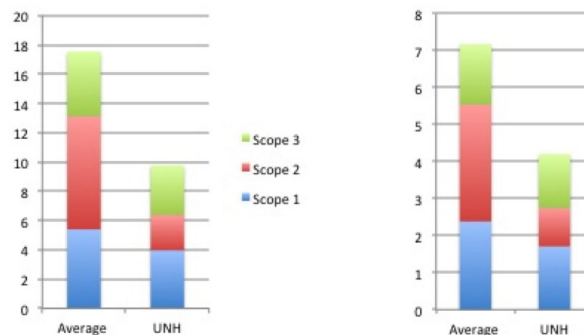


FIGURE 4: UNH compared to 125 other doctoral granting institutions in the US

the “Carbon Management Hierarchy.” The next big question for UNH, as for other campuses across the US, is how to tackle the demand side of the equation—the top-most part of the hierarchy which requires Avoiding or Reducing the activities that result in GHG emissions (i.e. by video-conferencing or telecommuting as a way to avoid commuting or business travel-related emissions; by continuing to make our buildings as efficient as possible; and by changing our behaviors to conserve energy).

This is an opportunity for every member of the UNH community to play a part. every day, because energy (for heating, cooling, electricity, transportation, and “embedded” in every single item that we buy), food and waste are such ubiquitous aspects of our day-to-day lives. The good news is that many of the things that result in lower carbon footprints also result in economic savings, better health, and more social justice. When you take the bus or ride your bike instead of driving; when you eat lower on the food chain and/or reduce the amount of food you waste; when you opt for energy or fuel efficient purchases, you will be reducing your carbon footprint—and UNH’s. Only with engagement from all of our students, staff and faculty will we meet our goal of reducing our carbon footprint by 50% by 2020, and 80% by 2050.

Author

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Jenn comes to UNH from Clean Air-Cool Planet, where she worked for 13 years promoting practical climate solutions for colleges and universities as well as municipalities and businesses. During her tenure there she helped to launch, oversee and continually develop the Campus Carbon Calculator, to the point where it has become an indispensable carbon management and sustainability tool for hundreds of colleges and universities nationwide.