

CAMPUS CARBON FOOTPRINT 2017-2018 EXECUTIVE SUMMARY

WATERSHED INSTITUTE FOR COLLABORATIVE ENVIRONMENTAL STUDIES

CALCULATED BY HONORS 389: TAKING THE MEASURE OF SUSTAINABILITY
Report written by Lillian Strehlow, campus carbon footprint intern
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University of Wisconsin
Eau Claire



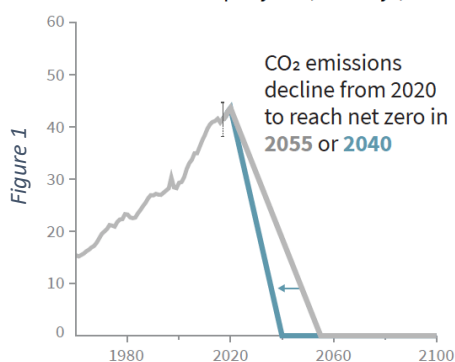
Background

In 2007 Chancellor Brian Levin-Stankevich signed the American College & University Presidents' Climate Commitment, establishing the goal of net zero campus carbon emissions. UW-Eau Claire has since been held to the standard of reporting its carbon footprint biannually to Second Nature reporting, while working towards this goal.



In fall of the 2018-2019 academic year, honors students at UW-Eau Claire enrolled in the course *Honors 389: Taking the Measure of Sustainability* spent their semester calculating the 2017-2018 campus carbon footprint and learning frameworks for approaching carbon reduction. This work was continued in the spring semester by Lillian Strehlow who, through funding provided from the Student Office of Sustainability, took on the role of the campus carbon footprint intern.

b) Stylized net global CO₂ emission pathways
Billion tonnes CO₂ per year (GtCO₂/yr)



The 2017-2018 report can be summarized as especially pivotal due to: the addition of UWEC-Barron County, changes to the carbon calculator SIMAP, the new requisite of conducting an annual carbon footprint report, the city and county of Eau Claire joining UWEC in striving for carbon neutrality by 2050, and urgent reports by the Intergovernmental Panel on Climate Change (IPCC).

The IPCC Summary for Policy Makers, published on the 6th, October 2018¹, features figure 1, which represents necessary reductions in carbon emissions to limit Climate Change to 1.5°C. The graph below depicts UW-Eau Claire's path to carbon neutrality by 2050, as established in UW-Eau Claire's Climate Action Plan and ratified by all UW-Eau Claire Governing bodies.

With the vital academic leadership of faculty such as Dr. James Boulter and Dr. Karen Mumford, the continued efforts of Honors 389 students, the consultation of UW-Eau Claire's new sustainability analyst Tony Rongstad, the funding and support of the Student Office of Sustainability, the Watershed Institute for Collaborative Environmental Studies, and continued administrative support, this report can be utilized as a benchmark in our continued work towards carbon neutrality by 2050.

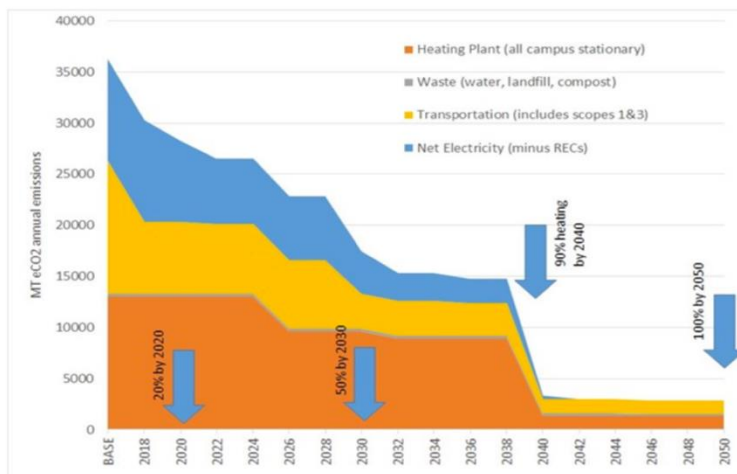


Figure 8: Potential reductions of emissions sources based on the decision modeling exercise

¹ IPCC, 2014: Summary for Policymakers. In: Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Edenhofer, O., R. Pichs-Madruga, Y. Sokona, E. Farahani, S. Kadner, K. Seyboth, A. Adler, I. Baum, S. Brunner, P. Eickemeier, B. Kriemann, J. Savolainen, S. Schlömer, C. von Stechow, T. Zwicker and J.C. Minx (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

*UWEC's 2017-2018 carbon footprint:
35,397 Metric Tons of Carbon Dioxide Equivalent (MTCO₂e)*

What does that mean?



With the same amount of energy, you could charge more than 2X the number of smartphones on the planet.



It would require 585,297 tree seedlings grown for 10 years to sequester this one year of emissions from UWEC.

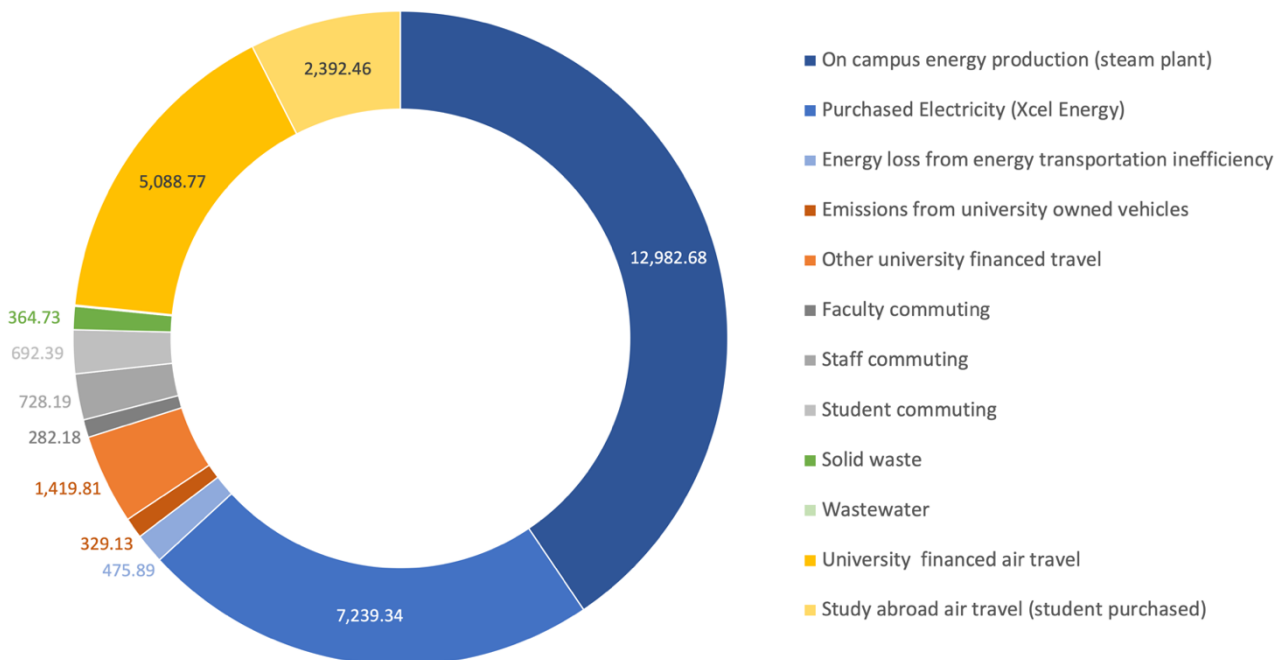


In an average car you could drive 86,545,232 miles (over 3,400 trips around the earth)

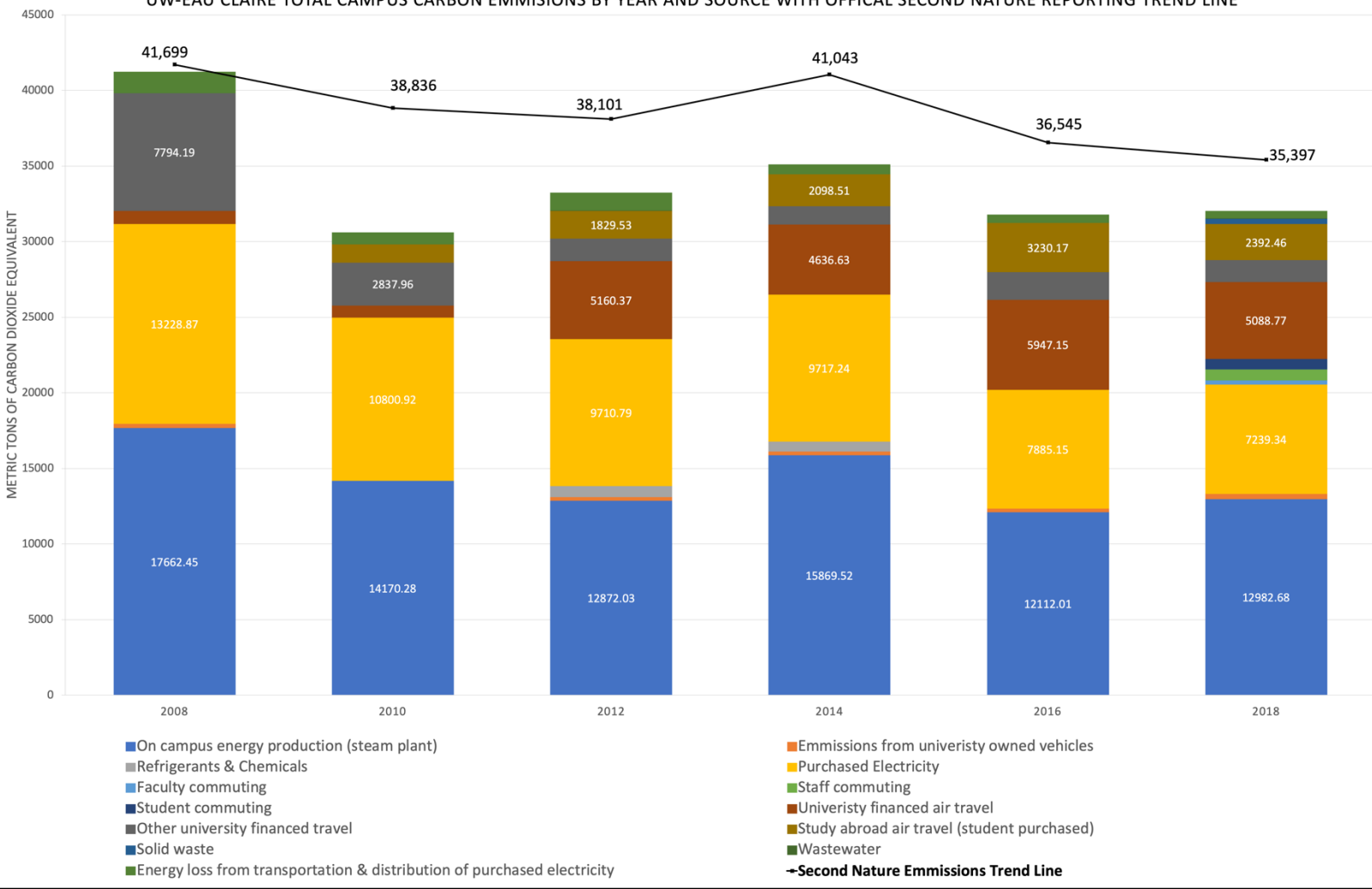
Breakdown of Emissions by source in MTCO₂e (SIMAP)

| On campus energy production (steam plant) | Purchased Electricity (Xcel Energy) | Energy loss from energy transportation inefficiency | Emissions from university owned vehicles | Other university financed travel | Faculty commuting | Staff commuting | Student commuting | Solid waste | Wastewater | University financed air travel | Study abroad air travel (student purchased) |
|---|-------------------------------------|---|--|----------------------------------|-------------------|-----------------|-------------------|-------------|------------|--------------------------------|---|
| 12,982.68 | 7,239.34 | 475.89 | 329.13 | 1,419.81 | 282.18 | 728.19 | 692.39 | 364.73 | 20.96 | 5,088.77 | 2,392.46 |

2017-2018 Emmissions Breakdown

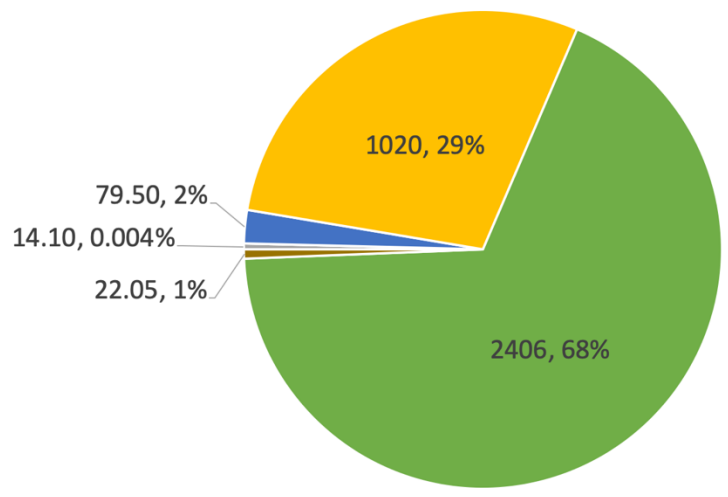


UW-EAU CLAIRE TOTAL CAMPUS CARBON EMISSIONS BY YEAR AND SOURCE WITH OFFICAL SECOND NATURE REPORTING TREND LINE



UWEC Renewable Energy & Carbon Offsets in MTCO2e

Percentages represent percentage of renewables portfolio each sector currently occupies, not the percentage reduction in campus emissions



- McIntire Library Solar Panels
- Xcel Solar Connect (Solar Garden)
- UW System Green Power Purchases
- Solar Water Heater (Davies Roof)
- Windsorce (Xcel Energy)
- Compost

Overview:

The Second Nature trendline records UW-Eau Claire’s official emissions totals in metric tons of carbon dioxide equivalent. More details about the differences between the official reporting and the breakdown of emissions within SIMAP, university offsets, as well as a table of values for each year, can be found in the appendix on pg. 8, titled “Flaws in the Data.”

MTCO_{2e}, or metric tons of carbon dioxide equivalent: all greenhouse gases have different global warming potential (GWP), or in other words, greenhouse gases like methane have varying abilities to trap heat in the earth’s atmosphere. When anthropogenic in source, these gases contribute to climate change. By converting all university emissions to their equivalent in metric tons of carbon dioxide, we can easily compare the sizes of campus carbon emissions.

Major Trends

Two major trends are notable within the graph. The heating plant’s shift from coal to natural gas reduced MTCO_{2e} by 26.5% from 2008 to 2018 (light blue). In the same time frame, Xcel Energy, the campus electricity provider, has diversified their energy portfolio to include more renewable energy, leading to a reduction of MTCO_{2e} from purchased electricity by 45.3% (yellow). These major changes, combined with green campus initiatives, have caused a gradual decrease in campus carbon emissions.

Comparisons:

There are no exact or direct comparisons that can be made when conducting a footprint: universities have different student body sizes, different funding sources, etc. Below are two tables that reveal where Eau Claire sits next to other UW system universities as well as other universities nationwide with similar sized student bodies. Note the different variables at play.

UW System Universities

| University Name | Total Carbon Emissions MTCO _{2e} | % Change total emissions | Total Bldg. Sq. Ft. | Enrollment FTE | RE Energy Generation (kWh) | Carbon Neutrality Date |
|---|---|--------------------------|---------------------|----------------|----------------------------|------------------------|
| University of Wisconsin-Stevens Point | 22,997 | -46.46 | 2,784,834 | 7,814 | 0 | 2050 |
| University of Wisconsin-Eau Claire | 35,397 | -15.11* | 2,611,658 | 9,538 | 19,943 | 2050 |
| University of Wisconsin-Oshkosh | 40,253 | -36.7 | 3,512,891 | 10,102 | 2,110,000 | 2025 |
| University of Wisconsin-Whitewater | 50,880 | 11.59 | 3,054,629 | 10,888 | 10,088 | 2050 |
| University of Wisconsin-Milwaukee | 114,789 | -22.29 | 7,905,871 | 21,303 | 155,850 | None Listed |

*This 15% drop in emissions is misleading. See “Flaws in the Data” for more information.

UW Stout and UW Madison are excluded because they do not maintain current accounts with Second Nature.

FTE enrollment is pulled directly from UW system factbooks, not Second Nature’s website.

UWEC compared to other universities nationwide, who report student FTE enrollment between 9,000-10,000, including % change in total emissions

| University Name | Total Carbon Emissions MTCO _{2e} | % Change in Total Emissions | FTE Enrollment |
|---|---|-----------------------------|----------------|
| Milwaukee Area Technical College | 23,058 | -47.66 | 9,893 |
| Moraine Valley Community College | 25,103 | +1.99 | 9,200 |
| Slippery Rock University of Pennsylvania | 27,326 | -48.99 | 9,062 |
| University of Wisconsin-Eau Claire | 35,397 | -15.11 | 9,538 |
| Radford University | 38,675 | 2.45 | 9,165 |
| William Rainey Harper College | 44,113 | +22.37 | 9,372 |
| Villanova University | 52,988 | -41.92 | 9,942 |
| University of Maine | 60,820 | -14.5 | 9,720 |

Select actions taken to reduce carbon emissions at UW-Eau Claire:

1. On and off campus photovoltaic (solar) investment has led to approximately 59 metric tons of CO₂e reduction in 2017-2018, thanks to the financial support of the Student Office of Sustainability (SOS).
2. Steam plant efficiency updates has led to a 17% reduction in steam use in the last decade, as well as soon to be 100% reduction in coal burning, thanks to the work of facilities management.
3. UW system renewable offsets and the SOS's Windsource investments have contributed 16% and 7% of campus energy demands in 2016-2017, respectively.
4. Diversification of academic programs and the adoption of the RE3 learning outcome across campus has promoted sustainability focused coursework and a series of visiting speakers.
5. The Makerspace, a partnership between the Library and SOS, provides an interface for students to learn and adopt sustainable practices.
6. The Students Promoting Environmental Deeds (SEED) organization within housing and residence life promotes sustainable living within the dorms.

For a more comprehensive list of actions, please see the appendix, pg. 9.

Moving Forward: Achievements & Opportunities

It is exciting to see UW Eau-Claire maintain a gradual reduction in carbon emissions, even as the campus grows into new buildings. With LEED designed buildings in the future we could continue this trend. That growth extends to our administrative body as well, with the creation of the sustainability analyst position and hiring of Tony Rongstad, as well as the appointment of the new vice chancellor of finance John Haven III. Both Tony and John have taken the lead facilitating sustainable initiatives on campus.

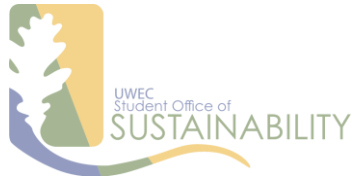
Students also continue to cultivate new relationships and new sustainability-oriented practices on campus. The Student Office of Sustainability is blossoming into a pillar of sustainability under the leadership of several hard-working directors – most recently, Austin Northagen and Lauren Becker. SOS has partnered with the city of Eau Claire to establish a bike share program, a relationship that has potential to flourish as the city and county of Eau Claire implement the goal of carbon neutrality by 2050, an adaptation of the Paris Agreement. These actions parallel the official adoption of the university Climate Action Plan and the accompanying goal of carbon neutrality by 2050, which was ratified by UW-Eau Claire's student senate, university senate, university staff council, and an ad hoc climate action planning team.

For the past 10 years the students of Honors 389 (and its predecessors), interns, faculty, and members of various working groups have conducted and refined the footprint analysis. These 99 carbon footprint alumni will soon be joined by a new cohort of 20 new students, who will conduct the 2018-2019 carbon footprint. Their work will guide future decisions, especially as UWEC begins to include climate action goals within the next iteration of their long-term guiding document, the 2021-2025 strategic plan.

Students, faculty, and staff at UW-Eau Claire have purposely established the framework for a sustainable campus, reductions in carbon emissions, and accompanying programming, but our momentum can only be maintained by the continued work of all campus stakeholders. Challenges such as tackling emissions from air travel and the steam plant remain prominent and may take a cross section of campus administrators and student representatives time to solve. However, immediate changes, such as switching to 100% renewable electricity from Xcel energy (costing only an additional \$150,000-\$200,000 annually) can be pursued.

These actions and the resulting changes they incur align with the voice of the UW-Eau Claire student body, who have deliberately called for sustainability and accountability for our contribution to climate change, as well as the equitable treatment of our peers of color and other marginalized communities. It is our hope that administrators across the UW system continue to listen to our voices and facilitate sustainable actions.

UW-Eau Claire Campus Carbon Footprint
Executive Summary
Addendum





Methods: Second Nature is the platform through which signatory universities report their carbon footprint results, but the recommended tool for calculating the carbon footprint is the Sustainability Indicator Management and Analysis Platform (SIMAP). Honors 389 students uploaded the following data to SIMAP.

1. Energy and heating
2. Renewable energy and offsets
3. Transportation
4. Waste

Data (all values in MTCO₂e):

| Year | On campus energy production (steam plant) | Emissions from university owned vehicles | Refrigerants & Chemicals | Purchased Electricity | Faculty commuting | Staff commuting | Student commuting |
|------|---|--|---|-----------------------|-------------------|---|-------------------|
| 2008 | 17662.5 | 275.05 | 0 | 13228.87 | x | x | x |
| 2010 | 14170.3 | x | 0 | 10800.92 | x | x | x |
| 2012 | 12872 | 247.87 | 713.5 | 9710.79 | x | x | x |
| 2014 | 15869.5 | 246.63 | 648.64 | 9717.24 | x | x | x |
| 2016 | 12112 | 218.69 | 0 | 7885.15 | x | x | x |
| 2018 | 12982.7 | 329.13 | 0 | 7239.34 | 282.18 | 728.19 | 692.39 |
| Year | University financed air travel | Other university financed travel | Study abroad air travel (student purchased) | Solid waste* | Wastewater | Energy loss from transportation & distribution of purchased electricity | |
| 2008 | 852.46 | 7794.19 | x | -20.87 | x | 1433.33 | |
| 2010 | 812.63 | 2837.96 | 1201.4 | -46.03 | x | 789.35 | |
| 2012 | 5160.37 | 1491.94 | 1829.53 | -75.79 | 27.61 | 1185.84 | |
| 2014 | 4636.63 | 1222.87 | 2098.51 | -53.16 | 27.86 | 633.16 | |
| 2016 | 5947.15 | 1829.18 | 3230.17 | -0.04 | 23.99 | 525.7 | |
| 2018 | 5088.77 | 1419.81 | 2392.46 | 364.73 | 20.96 | 475.89 | |

x = missing data

*Solid Waste has negative numbers when the total MTCO₂e from compost (a carbon sink) offsets the total MTCO₂e from the rest of solid waste disposal

UWEC Renewable Energy and Carbon Offsets data

| source | McIntire Library Solar Panels | Solar Water Heater (Davies Roof) | Xcel Solar Connect (Solar Garden) | Windsorce (Xcel Energy) | UW System Green Power Purchases | Compost | Total |
|-----------------------------|-------------------------------|----------------------------------|-----------------------------------|-------------------------|---------------------------------|---------|------------|
| MTCO ₂ e | 14.1 | 0.000009 | 79.5 | 1020 | 2406 | 22.05 | 3541.65001 |
| % of renewable portfolio | 0.004% | 0.0000003% | 2% | 29% | 68% | 1% | 100% |
| % of total campus emissions | 0.04% | 0.000000025% | 0.2% | 3% | 7% | 0.1% | 10% |

Flaws in the Data:

There are several flaws in the data that effect our final results. The first is the absence of solid waste data from Haymarket Landing and Aspenson Mogensen Hall, the addition of which would not dramatically increase the carbon footprint due to the relatively small emissions stemming from waste. Despite minimal increases, data on these residences should be included in future iterations of the report.

Secondly, while not historically a component of the campus carbon footprint, construction waste and transportation emissions from the creation of Centennial Hall, The Suites, and the Karlgaard Towers hall renovation is unaccounted for in our footprint, and yet is undoubtedly a campus-based contributor to climate change.

Third, SIMAP (used to *calculate* the initial carbon footprint, but not to *report* it) has two methods to calculate emissions related to electricity. The first is ‘custom fuel mix,’ which attributes UWEC’s electricity emissions to a combination of renewables, nuclear, coal, and natural gas, which is *specific* to the campus electric provider, Xcel Energy. The second is ‘market based,’ which utilizes generalized *regional* data on electricity producers’ emissions. This second way to calculate electricity is less accurate, but is the version required by Second Nature (the reporting platform). This distorts UWEC’s emission trends (the black line) to be higher than reality on Second Nature’s website because Xcel Energy is quickly transitioning to renewable energy, meaning UWEC’s energy footprint is also dropping. This drop *is* reflected in the SIMAP bar graph, which shows our footprint using ‘custom fuel mix’ calculations.

Another flaw with SIMAP data historically (excluding the 2017-2018 results) is missing commuting data. This is due to SIMAP’s recent change in protocol, whereby commuting totals once calculated by Honors 389 students and uploaded to SIMAP through an excel spreadsheet is now a raw data input to SIMAP, which then calculates UWEC’s commuting emissions. This means SIMAP results (the bar graph) from all years previous to 2017-2018 do not include commuting data. Commuting data *is* included in all Second Nature results.

Lastly, on both SIMAP and Second Nature, the first carbon footprint is misleadingly high due to unfamiliarity with the footprint process and lack of a well-designed transportation survey. This means that comparisons of current and future footprints to the 2007-2008 baseline year are inaccurate (UWEC’s 15.11% drop in emissions according to Second Nature is erroneous).

In some ways these missing pieces of information or flaws within the data collected makes judging our progress a challenge, but in no way should it reflect badly on the original footprint teams; this work is challenging and involves tracking down data from many sources, a campus wide survey, numerous calculations and assuring the data inputs match the descriptions set forward by SIMAP. In 2012 Dr. Karen Mumford created a well written transportation survey, and since then her and Dr. James Boulter’s steady academic leadership has helped bring nuance into the footprint.

Moving Forward: Challenges

The next iteration of Honors 389 will have several challenges to face. They will need to decide if adding student travel to and from home to the university falls under the scope of the campus carbon footprint. They also have to decide how UWEC's new use of the Pablo Center should be accounted for, which could become a convoluted decision. There is also the challenge of tracking down old transportation data to add to SIMAP, which could pose an especially tedious task.

Perhaps most daunting is the addition of UWEC – Barron County. How does this new campus, incorporated as part of UW system restructuring, change the footprint? If this addition now falls under the scope of UW-Eau Claire's footprint there will be new energy and heating data to compile, a second remote campus that will need to complete a transportation survey, and waste and renewable information to amass. There will also be new connections to make, and people passionate about the environment happy to help with this process.

An incomplete list of actions taken to reduce carbon emissions at UW-Eau Claire:

1. Steam plant CO₂ emissions are essentially flat over the past decade, varying with temperature
2. 17% reduction in steam use over the last decade, along with a 28% reduction in annual campus coal use during the same period and an 181% increase in gas use
3. Solar generation, PV and thermal: on-and off-campus
 - 6.9 MT CO₂ offset in 2017 by McIntyre PV; approx. 59 MT estimated for 2018 (McIntyre + Xcel Solar Connect solar garden)
 - 7.1 MT CO₂ offset in 2017 by Davies solar thermal system
4. Windsource purchases, UW System offsets, Xcel fuel mix improvements
 - Windsource: 539 MT CO₂ offset in 2017 (~7% of total campus electricity use)
 - UW System purchases: 1,272 MT CO₂ offset in 2017 (~16% of total campus electricity use)
5. Xcel Energy 2017 power mix
 - 29% wind, solar & hydro
 - 29% nuclear
 - 12% natural gas
 - 30% coal
6. Installation of numerous water bottle refilling stations around campus
7. Numerous bike racks installed in 2018; 3 fix-it stations on-campus
8. Surplus store waste diversion = about 7% of all campus waste
9. Broadening of sustainability through the curriculum (including R3 learning outcome)
10. Proliferation of sustainability focused research projects
11. Measure of campus greenhouse gas emissions by students in an honors colloquium since 2008
12. Green fund resolution from student government: approx. \$1.4 of student segregated fees committed to sustainability initiatives on campus since 2011. The Student Office of Sustainability commands the largest student funded green fund in the state.
13. UWEC is a designated Tree Campus USA thanks to funding by SOS
14. Housing eco-rep program: in partnership with Excel energy student eco-reps visit student housing and teach students about saving energy in the winter
15. The creation of a bikeshare program in 2018-2019 in partnership with the city
16. Charter member of ACUPCC since 2007. Climate action plan with commitment to achieve carbon neutrality by 2050, ratified by all campus governing bodies.
17. ZimRide carpooling: 743 MT of CO₂ eliminated by ride sharing since inception in 2012, thanks to funding by the student office of sustainability