

Minnesota State University, Mankato

Summary

Carbon Footprint Update Report 2018

September 23, 2019

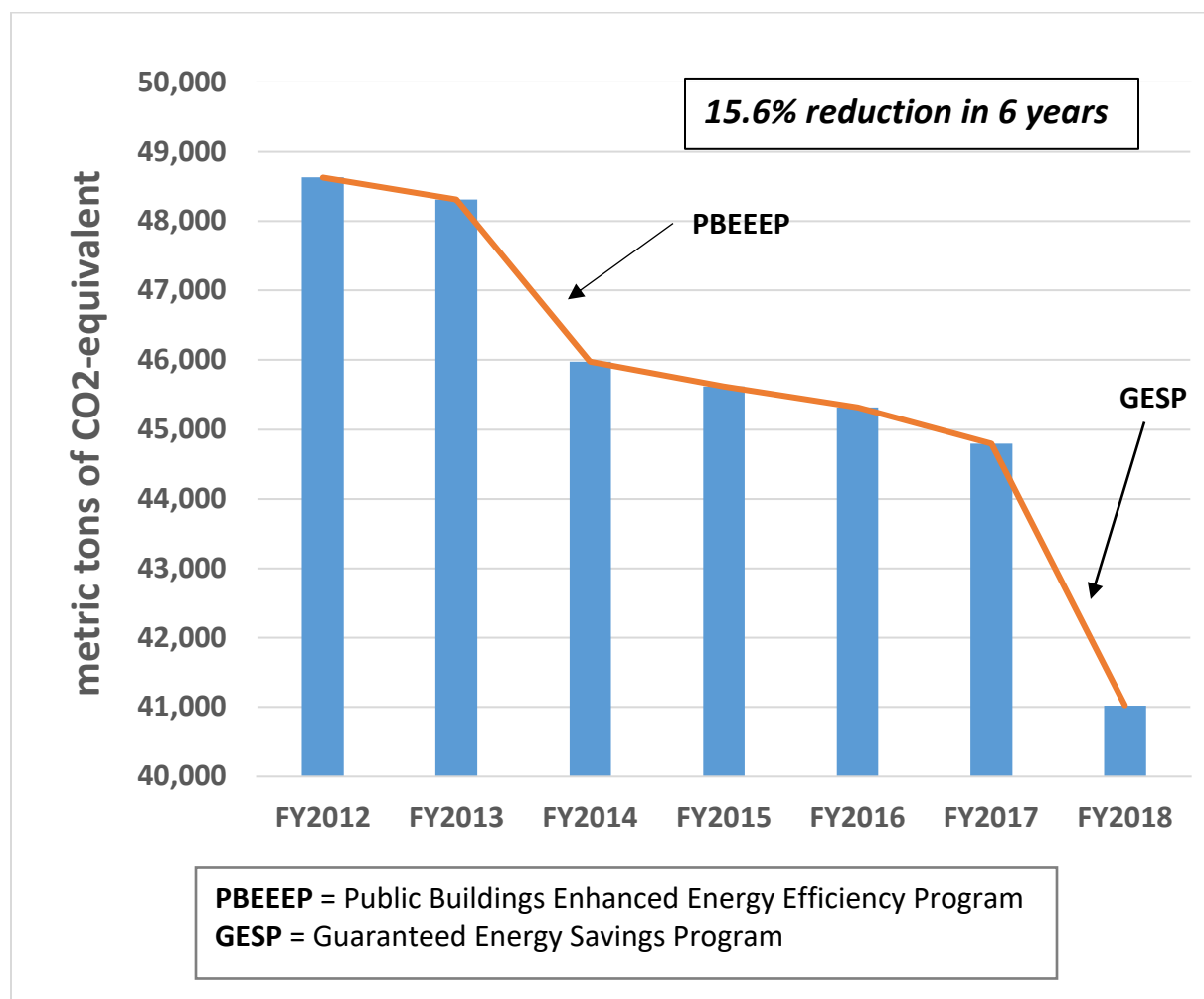
Prepared for the Environmental Committee by

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### The takeaway

All of MNSU's yearly carbon footprints are shown in Figure 1-S, starting with the 2011-12 academic year (FY 2012), the baseline year. Note that in the Figure the origin of the vertical axis is at 40,000 metric tons of CO<sub>2</sub>-equivalent (not zero) in order to emphasize the trends in the data.

Figure 1-S.



Over this seven-year period MNSU's carbon footprint fell by 15.6%, from 48,630 metric tons of carbon dioxide equivalent (mt CO<sub>2</sub>-eq) to 41,025 mt CO<sub>2</sub>-eq.

There are three principal causes of this decrease:

- **The Public Buildings Enhanced Energy Efficiency Program (PBEEEP)**, a program of the Minnesota Department of Commerce brought to campus by Facilities Management. The PBEEEP project, implemented in the spring of 2013, made the operation of the heating-

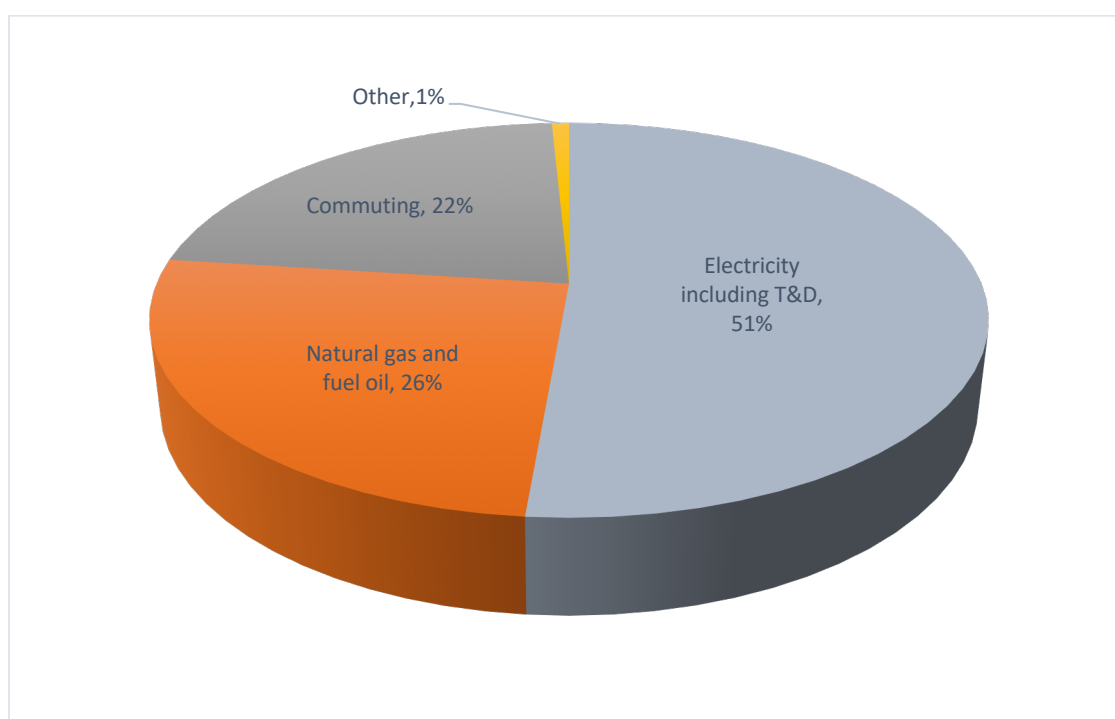
ventilation-air conditioning (HVAC) systems of some campus buildings more energy-efficient, which has decreased GHG emissions by 1,393 metric tons of CO<sub>2</sub>-eq (2.9% of the FY 2012 footprint) every year since implementation. At a net cost of \$13,000 to MNSU, PBEEEP is saving the University \$119,000 a year in energy costs.

- **The [Guaranteed Energy Savings Program \(GESP\)](#)**, also a program of the Minnesota Department of Commerce brought to campus by Facilities Management. The GESP project, implemented for the most part in 2017, also made energy-savings improvements, primarily by switching out fluorescent light bulbs for LEDs across campus. These improvements decreased greenhouse gas emissions by 4,434 metric tons of CO<sub>2</sub>-eq (9.1% of the baseline FY 2012 footprint) a year. The \$8 million cost of the project is being paid for with the savings in the University's electricity and heating costs of \$400,000 a year.
  - For this achievement, MNSU has received a [2018 Clean Energy Community Award](#) from the Minnesota Department of Commerce (one of seven communities so honored) and a [2019 Environmental Initiative Award](#) from the Environmental Initiative of Minnesota (MNSU was the state-wide award winner in the Sustainable Leadership: Large Employer category).
- Changes in commuting patterns of students, faculty and staff decreased emissions by 1,372 metric tons of CO<sub>2</sub>-eq (2.8% of the FY 2012 footprint). The principal change was more students and faculty walking to campus rather than driving their cars.

### What is a carbon footprint?

MNSU's carbon footprint is an accounting of all the greenhouse gases (GHGs) which are emitted in one year as a result of activities at the University. Principal activities for which the University is responsible are: the use of electricity; the combustion of natural gas and fuel oil for heating buildings and for hot water; and tail-pipe emissions from the cars and other vehicles used by students, faculty and staff for commuting back and forth to and from campus daily. MNSU's GHG emissions by source are shown in Figure 2-S.

**Figure 2-S.**



In the figure, "Electricity including T&D" means the total electricity used on campus plus the electricity lost in transmission and distribution between the power plant and the campus. The percentages of the major sources have changed very little over time. For the first footprint in FY 2012, they were: electricity, 54%; natural gas and fuel oil, 23%; and commuting, 22%. Other minor sources of GHG emissions (<1%) are: tailpipe emissions from University fleet vehicles, fertilizer use, solid waste disposal in the landfill, and waste water treatment.

### **What does CO<sub>2</sub>-equivalent mean?**

Although carbon dioxide is the biggest contributor to global warming, it is not the only greenhouse gas. The most important greenhouse gas is water vapor, but the amount of water vapor in the atmosphere is beyond human control. Others tracked by the University of New Hampshire Campus Carbon Calculator, the computer platform used to calculate MNSU's carbon footprints, are methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O). Both are much more effective at trapping heat in the atmosphere than CO<sub>2</sub>: The global warming potential (GWP) of CH<sub>4</sub> is 25 times greater than that of CO<sub>2</sub>, while that of N<sub>2</sub>O is 298 times greater. Carbon dioxide, however, is much more prevalent in the atmosphere, where it is present at a concentration of about 400 parts per *million*, compared to about 2000 parts per *billion* for CH<sub>4</sub> and 300 parts per *billion* for N<sub>2</sub>O. When accounting for the warming effects of CH<sub>4</sub> and N<sub>2</sub>O, the amounts of these gases emitted are converted into their CO<sub>2</sub> equivalent amounts by multiplying by their respective GWPs. CO<sub>2</sub> is by far the largest contributor to atmospheric warming by MNSU, accounting for more than 99% of the University's CO<sub>2</sub>-equivalent emissions.

### **How much is a metric ton of CO<sub>2</sub>?**

One metric ton is 2,240 pounds; in metric units, a metric ton is 1,000 kilograms or 1 million grams. According to the Environmental Protection Agency (EPA), 8,887 grams of CO<sub>2</sub> are produced when a gallon of gasoline is burned. So when a motor vehicle burns 112 gallons of gasoline it produces one metric ton of CO<sub>2</sub>. The EPA estimates in its [Greenhouse Gas Equivalents Calculator](#) that an average passenger vehicle driven a distance of 11,500 miles in a year (the average vehicle miles traveled in a year) produces one metric ton of CO<sub>2</sub> in about two and a half months.

### **Why is it important to know MNSU's carbon footprint?**

According to the [Intergovernmental Panel on Climate Change \(IPCC\) 2018 report](#), anthropogenic emissions of CO<sub>2</sub> need to fall by 45% from 2010 levels by 2030 and reach zero by 2050 to avoid planet-wide catastrophic impacts of climate change. The threats of climate change to the stability of our global civilization has been understood since at least 1989. Since climate change is a global problem, it is the responsibility of all countries, as well as all organizations within a country, including businesses, local governments, and educational institutions, to do their part in addressing this problem.

Accordingly, in 2012 the MNSU Administration provided funds to Facilities Management to hire the consulting firm Sebesta to determine the carbon footprint of the University. The intent was to first determine what the University's greenhouse gas (GHG) emissions were, then to develop strategies for reducing the emissions. Sebesta completed the footprint for the 2011-12 academic year (FY 2012) and presented their work at an Environmental Committee meeting in Spring 2013.

The Environmental Committee subsequently obtained Strategic Priorities Initiative funding from MNSU to retain Sebesta to help to formulate strategies and action steps to reduce the University's GHG emissions; in other words, to develop a climate action plan (CAP) for the University. In partnership with the Urban and Regional Studies Institute (URSI), the Environmental Committee developed the CAP over the 2014-15 academic year. The Environmental Committee also took on the responsibility of producing annual updates to the carbon footprint.

Yearly carbon footprints are primarily a tool to track and report the successes of strategies in the CAP in reducing MNSU's greenhouse gas emissions. The first carbon footprint update report (CFU 2016) came out in May 2017; this report (CFU 2018) is the second.

In addition, generating and reporting on MNSU's carbon footprints highlights the energy and commuting databases used in their development that are unique to MNSU, databases that can be used by faculty and students for applied research projects.

Finally, by undertaking these actions, MNSU has demonstrated its leadership as a university in confronting the challenge of climate change. For its leadership, as has been mentioned previously, MNSU has received a [2018 Clean Energy Community Award](#) and a [2019 Environmental Initiative Award](#). Universities that are seen as leaders in sustainability issues are more attractive to prospective students, prospective faculty, and prospective donors. MNSU should proudly promote its sustainability successes.

## What else is in the Carbon Footprint Update Report 2018?

Table 1-S shows the greenhouse gas emissions due to each of the major sources for all of the carbon footprints calculated to date.

Major Emission Sources	Natural Gas and Fuel Oil	Electricity	T&D <sup>1</sup>	Total Electricity	Commuting			Total Carbon Footprint <sup>2</sup>
					Fac/Staff	Student	Total Commuting	
<b>FY2012</b>	10,970	24,864	1,537	26,401	2,716	8,086	10,802	<b>48,630</b>
<b>FY2013</b>	10,893	24,728	1,528	26,256	2,797	7,943	10,740	<b>48,315</b>
<b>FY2014</b>	10,545	23,213	1,435	24,648	3,053	7,420	10,473	<b>45,978</b>
<b>FY2015</b>	10,283	23,093	1,427	24,520	2,502	7,901	10,403	<b>45,618</b>
<b>FY2016</b>	10,283	23,931	1,479	25,410	2,806	6,548	9,354	<b>45,316</b>
<b>FY2017</b>	10,283	22,745	1,406	24,151	2,792	7,188	9,980	<b>44,792</b>
<b>FY2018</b>	9,389	20,597	1,273	21,870	3,013	6,417	9,430	<b>41,025</b>
<b>% change 2012-16</b>	-6.3%	-3.8%	-3.8%	-3.8%	3.3%	-19.0%	-13.4%	<b>-6.8%</b>
<b>% change 2012-18</b>	-14.4%	-17.2%	-17.2%	-17.2%	10.9%	-20.6%	-12.7%	<b>-15.6%</b>

<sup>1</sup>Transmission & Distribution losses from the power plant to MNSU

<sup>2</sup>The total carbon footprint also includes minor contributions (<1% of the total) from fleet vehicles, fertilizer use, solid waste disposal, and waste water treatment.

In this table, the yearly natural gas consumption used to calculate the natural gas and fuel emissions in the second column has been *weather-normalized*. This means that the yearly natural gas consumption values have been adjusted to what they would have been had the winters for each of these years had been just as severe as for the baseline year, FY 2012. This adjustment is made to eliminate the year-to-year variations in natural gas use due to variations in the weather. Any changes in weather-normalized footprints from year to year are therefore due only to actions taken on campus.

**A recommendation**

MNSU has made great strides in meeting the goals set forth in its Climate Action Plan. Yet more remains to be done. The threat of a changing climate is real, and will have devastating effects on the lives of our children and grandchildren unless we as a society take further action now.

We recommend that MNSU continue its environmental leadership by addressing the fourth strategy in its Climate Action Plan: renewable energy. We strongly recommend that MNSU consider with all due speed options for the production of renewable energy on campus.