



## **Luther College Climate Action Plan**

Drafted by  
Luther College Center for Sustainable Communities  
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Reviewed by  
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December 21, 2020

Approved by  
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## Executive Summary

As a college of the church, striving for sustainability is anchored in our call to be good stewards of God's creation and responsible citizens in the global community.

In 2007, Luther College became a charter signatory of the American College and University Presidents' Climate Commitment. The two core components of this commitment are to make sustainability a part of every student's learning experience and to achieve carbon neutrality. In May 2012, the Board of Regents approved a detailed Climate Action Plan that addressed both components, including targets to reduce Luther's carbon footprint 50 percent by the end of 2015, 70 percent by 2020, and to achieve carbon neutrality by 2030. The Board of Regents reaffirmed these goals in the college's [current strategic plan](#) in February 2018.

Luther has worked hard to live up to its commitments. Recently, the Association for the Advancement of Sustainability in Higher Education (AASHE) ranked Luther in the top ten baccalaureate colleges in the United States in their [2020 Sustainable Campus Index](#). One of the reasons for Luther's 8<sup>th</sup>-place ranking is its progress in reducing greenhouse gas emissions.

To date, Luther College has reduced its carbon footprint 55.8 percent from its peak emissions in Fiscal Year 2004. The vast majority of Luther's emission reductions are due to major investments in energy efficiency that have reduced the purchase of carbon-intensive electricity by 37.8 percent. Additional investments in renewable energy and recycling systems have reduced emissions further.

The primary obstacle to achieving carbon neutrality by 2030 are emissions from the combustion of heating fuel in the college's central steam plant, which now constitute 40.8 percent of Luther's remaining carbon footprint. In 2018, Luther College selected MEP Associates "to develop an energy master plan that articulates a pathway, including detailed systems design, to achieve carbon neutral energy systems by 2030."

MEP developed a Business-As-Usual (BAU) scenario and two major alternatives. One would replace the current natural gas-fueled steam heating system with a 1,200 ton Ground-Source Heat Pump (GSHP) system. The other option would retain some existing chiller and steam heat capacity while installing a smaller 450 ton GSHP system. All three alternatives require a significant capital investment over a 50-year period from \$20,742,732 to maintain BAU to \$29,464,074 to shift almost entirely to geothermal energy.

In addition, due to the carbon intensity of the electricity Luther purchases from the grid, the college will have to purchase or otherwise acquire carbon offsets to achieve carbon neutrality. A recently concluded study has determined that the flaring of landfill gas at the Winneshiek County Landfill could provide sufficient carbon offsets for Luther to achieve carbon neutrality well before 2030.

We look forward to studying all of these possibilities further as we strive to achieve our goal of carbon neutrality by 2030.

## I. Introduction

Since its founding in 1861, Luther College's mission has been, in part, to provide students with "an education that disciplines minds and develops whole persons equipped to understand and confront a changing society."<sup>1</sup>

The challenges of the 21<sup>st</sup> century are manifold. Socially, racism continues to be a scourge that denies and denigrates the gifts of far too many. Economically, the unrelenting expansion of wealth and income inequality is taking its toll on human health as well as civil order. Environmentally, accelerating rates of habitat destruction, pollution, and climate change imperil the ecological systems that sustain the diversity of life on Earth.

Put simply, the present order is not sustainable.

As a college of the church, striving for sustainability is anchored in our call to be good stewards of God's creation and responsible citizens in the global community. At Luther, we define sustainability broadly as integrated action to address environmental, economic, and social challenges to ensure a more just, equitable, and ecologically healthy world. Sustainability must be more than another program or task to accomplish; it must be woven into all areas of college life—our curriculum, our physical plant and institutional policies, our relationship with each other as students, faculty, and staff, and our mutually beneficial relationship with the city in which Luther is located, Decorah, Iowa.

While Luther has always been committed to addressing issues that now fall under the broad umbrella of "sustainability," this terminology became explicit when Luther became a charter signatory of the American College and University Presidents' Climate Commitment in January 2007. The two core components of this commitment are to make sustainability a part of every students' learning experience and to achieve carbon neutrality. In May 2008, Luther's Board of Regents folded this commitment into a new five-year strategic plan (2008-2012). One of three strategic imperatives in that plan was titled "Connecting Sustainability, Stewardship, and Global Citizenship." Key goals included:

- Create a Center for Sustainable Communities to be a catalyst for change locally and regionally.
- Model stewardship and sustainability in all college operations to reduce Luther's environmental impact and mitigate operational costs.
- Design and implement a campus land use plan that affirms land stewardship, sustainability, and landscape designer Jens Jensen's original vision for the Luther campus in 1911.
- Reduce Luther's carbon footprint by 50 percent and develop a plan to achieve carbon neutrality.
- Nurture connection to place in all stakeholders.

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<sup>1</sup> Luther College Mission Statement, <https://www.luther.edu/about/mission/>.

- Continue sustainable and strategic enhancements of the plant and facilities with a focus on student learning, energy payback, campus needs, and economic return.

All of these goals have been achieved in various ways. For example, the [Stewardship Plan for Luther College Natural Areas](#) was approved by the Board of Regents in October 2010. In May 2012, the Board of Regents approved a detailed [Climate Action Plan](#) that instructed the college to reduce its campus carbon footprint 50 percent by the end of 2015, 70 percent by 2020, and to achieve carbon neutrality by 2030. Key to implementation of these initiatives was the establishment of Luther's [Center for Sustainable Communities](#) (CSC) in 2013 to coordinate all of Luther's sustainability efforts on campus and to promote sustainability throughout the region.

More recently, Luther's Board of Regents chose to renew their commitment to the college's Climate Action Plan and the 2030 goal of carbon neutrality when they approved the college's [current strategic plan](#) in February 2018. The following pages outline how Luther intends to achieve carbon neutrality by 2030 and integrate sustainability into the learning experience of every student.

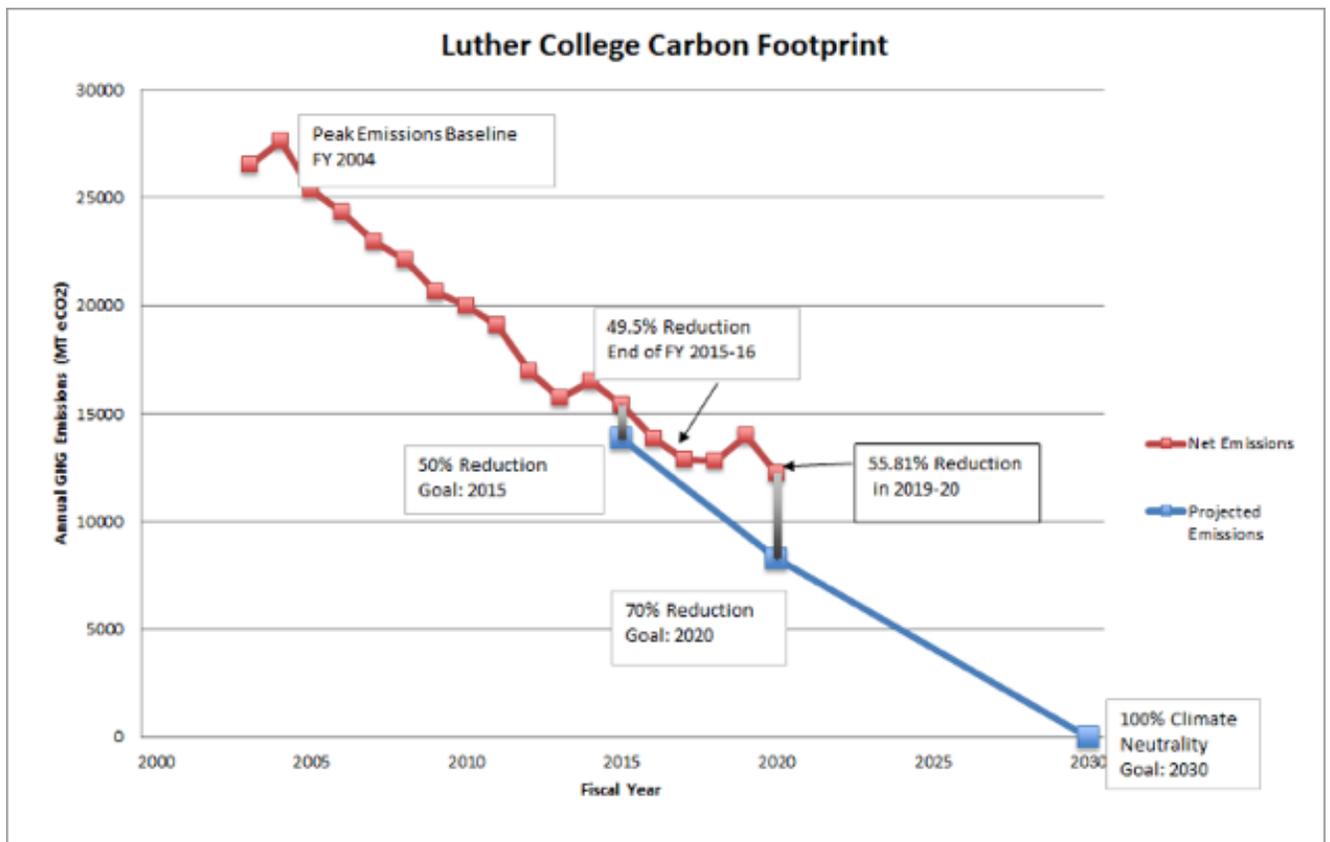
## **II. Greenhouse Gas Emission Reductions**

Luther College has calculated its carbon footprint for each fiscal year (June 1 – May 31) from 2003 through 2020. More than 80 percent of the college's greenhouse gas emissions are associated with the use of fossil fuels—directly to heat the campus and fuel vehicles and indirectly via the coal and natural gas used to generate the electricity we purchase to power the campus.

At the outset, we used the Clean Air, Cool Planet Carbon Calculator and a custom fuel mix related to our electric utility, Alliant Energy. More recently, Luther has used the University of New Hampshire's Sustainability Indicator Management & Analysis Platform ([SIMAP](#)) to track our carbon footprint information. For greater accuracy and better comparison with other schools, we no longer use a custom fuel mix because it was difficult to calculate. Instead, we have selected our relevant eGrid region (MROW) in SIMAP. All of Luther's data are publicly available online through SIMAP. Initial carbon footprint calculations were completed by Environmental Studies students as part of a class project. More recently, calculations have been completed by Luther's Director of Facilities Services. The annual carbon footprint reports are reviewed by the CSC's Energy and Water Task Group, which is comprised of students, faculty, and staff. All source inputs are referenced to budgets as a way to ensure accuracy in results.

Four graphs on the following pages present important information about Luther's carbon footprint reductions to date.

Figure 1 shows the reduction in Luther’s greenhouse gas emissions from FY2003 through FY2020. Luther has reduced its emissions 55.8 percent over this period of time even while it has increased the amount of conditioned space 7.7 percent from 1,389,226 square feet in FY2003 to 1,495,053 square feet in FY 2020. The largest amount of new conditioned space is associated with the construction of Luther’s LEED-Gold certified [Sampson Hoffland Laboratories](#) in 2008. While steady progress has been made to date, emissions fell less than expected in FY 2020 due to equipment failures on Luther’s wind turbine as well as an unusually large escape of refrigerants.

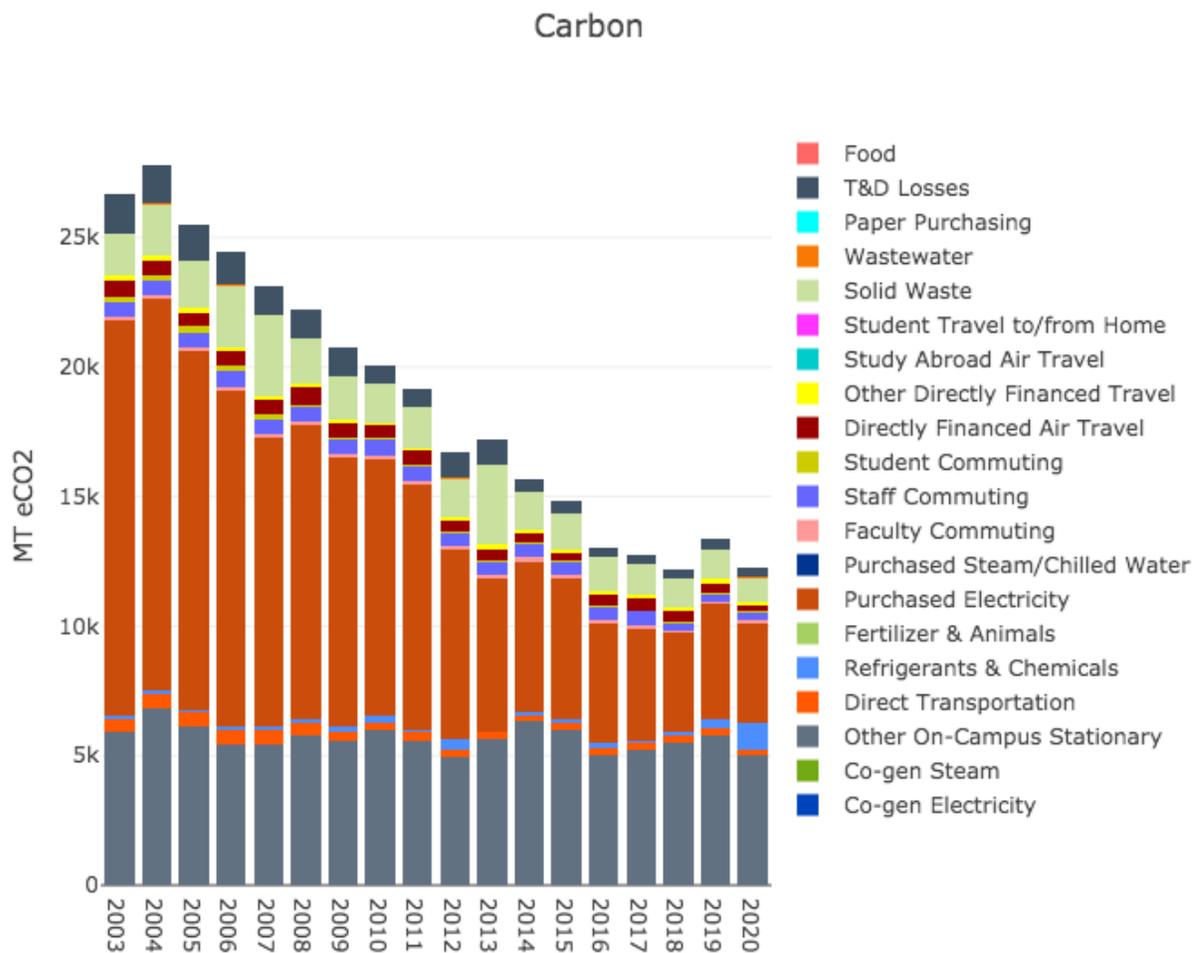


**Figure 1: Luther College Carbon Footprint (2003-2020)**

Source: Luther College

Figure 2 demonstrates the reductions in carbon emissions by primary emission sources. This graph tells many stories but two will have to suffice:

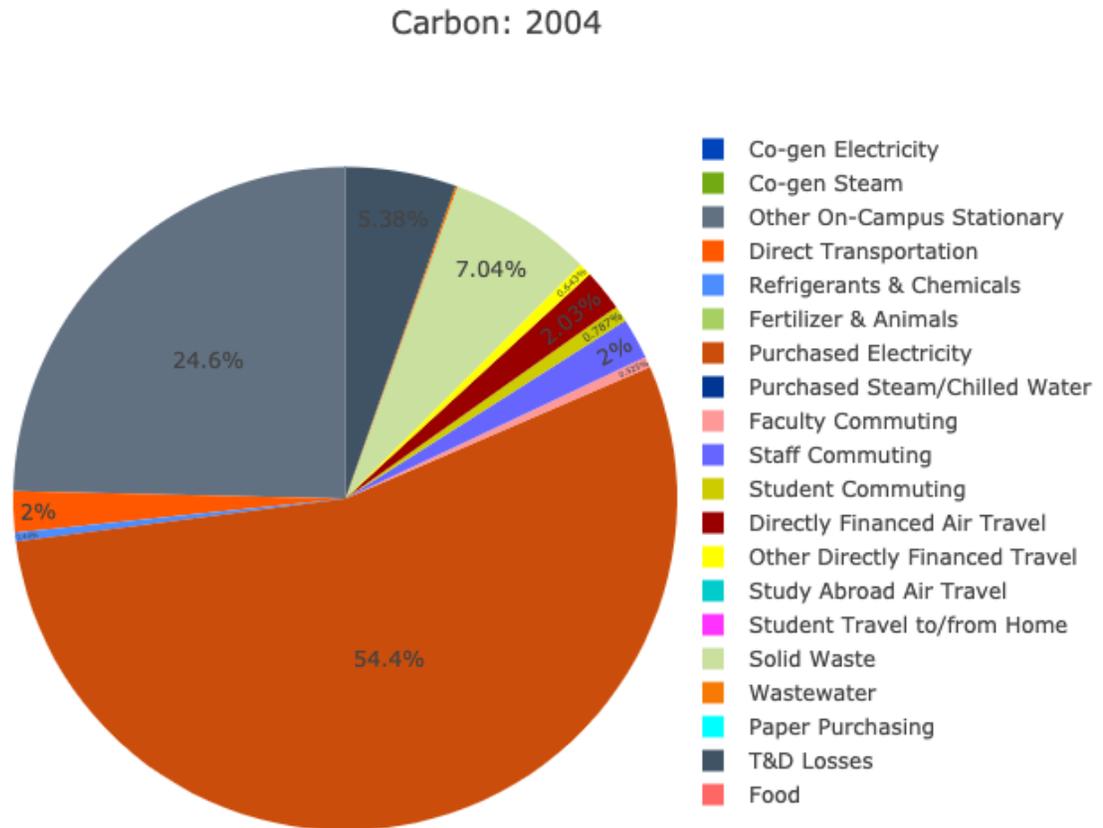
1. The vast majority of Luther’s emission reductions to date are associated with Purchased Electricity as well as related Transmission & Distribution [T&D] Losses. Luther has made major investments in energy efficiency and solar power that have reduced grid purchases 37.8 percent from 17,888,446 kilowatt hours (kWh) in FY 2003 to 11,127,176 kWh in FY 2020.
2. Luther has also reduced emissions from solid waste disposal by expanding its recycling infrastructure and by diverting waste from building renovations. Luther avoids 3 metric tons of carbon dioxide equivalent emissions (MT CO<sub>2</sub>e) for every ton of solid waste that is not disposed of at the Winneshiek County Landfill. Emissions from solid waste disposal have declined almost 70 percent from their peak in FY 2007.



**Figure 2: Luther College Carbon Emissions by Source (2003-2020)**

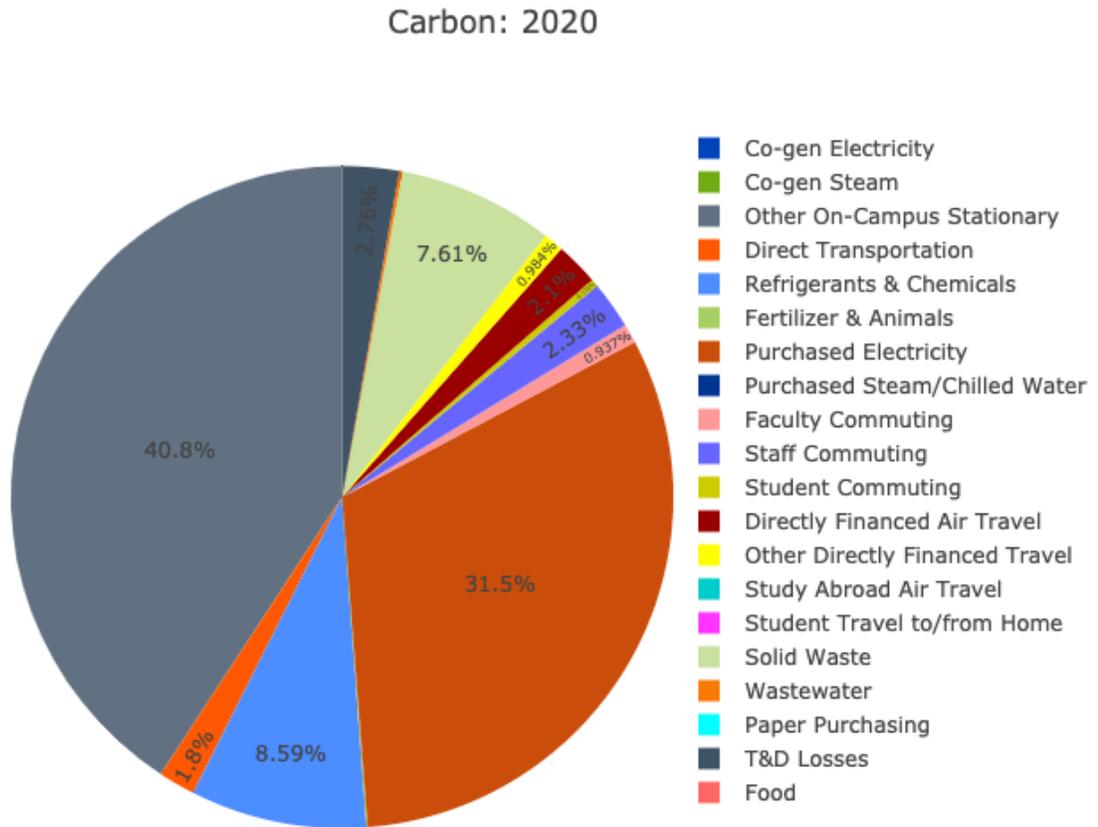
Source: SIMAP

Figures 3-5 demonstrate how Luther’s carbon emissions have changed over time. When Luther started measuring its carbon footprint, Purchased Electricity and related Transmission & Distribution [T&D] Losses constituted almost 60 percent of Luther’s carbon emissions in FY 2004, whereas the emissions from the operation of On-Campus Stationary systems to heat the campus represented only 24.6 percent of total emissions.



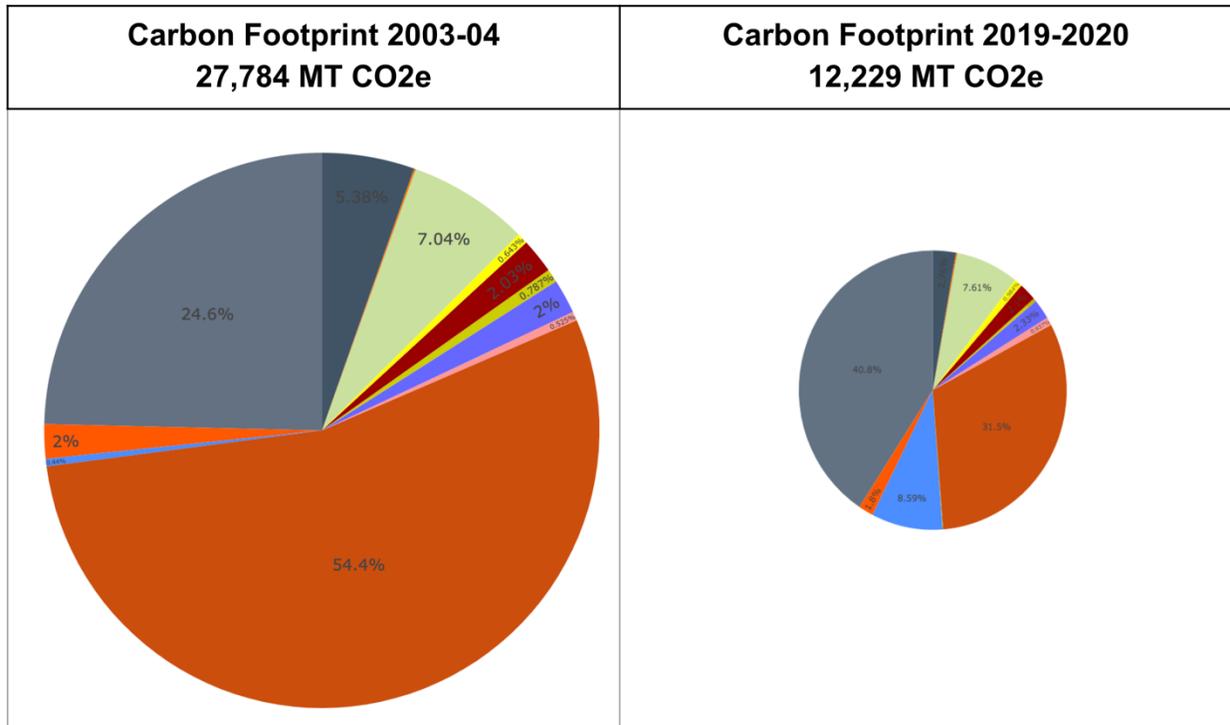
**Figure 3: Luther College Carbon Footprint 2003-04 (Peak Year)**  
**Source: SIMAP**

Today, Figure 4 demonstrates that emissions from On-Campus Stationary systems to heat the campus have increased in proportion and now represent 40.8 percent of Luther’s current carbon footprint while Purchased Electricity and T&D Losses have diminished in proportion to only total 34.3 percent.



**Figure 4: Luther College Carbon Footprint 2019-2020**  
**Source: SIMAP**

Figure 5 provides a side-by-side comparison of changes in the composition of Luther’s greenhouse gas emissions and demonstrates how total emissions have declined 55.8 percent over time.



**Figure 5: Luther College Carbon Footprint 2003-2004 and 2019-2020**  
**Source: SIMAP**

### III. Greenhouse Gas Mitigation Strategies

Luther College has employed a diverse set of greenhouse gas mitigation strategies over the past two decades to achieve its carbon footprint reductions.

#### A. Energy Efficiency and Conservation

The vast majority of emission reductions to date have been via investments in energy efficiency that have enabled Luther to reduce operating costs and emissions at the same time. Key to this work has been wise and intensive use of state-mandated and ratepayer-funded energy efficiency programs offered by our electric utility, Alliant Energy. For example, Luther utilized one of these programs in 2004 to invest \$1.5 million in various energy efficiency measures that had an average 7-year payback and reduced the college’s peak emissions by 15.5 percent. More recently Luther has used a similar program to identify several new energy efficiency opportunities that will cost ~\$1 million to implement, have a 4.5-year payback, and reduce electricity consumption by another 20 percent. The financial performance and environmental impact of many of Luther’s more recent energy

efficiency measures are available online via the [Green Revolving Investment Tracking System \(GRITS\)](#).

Another important strategy to conserve energy has been Luther's adoption, in 2011, of a [Green Building Policy](#) that requires all new building projects to satisfy, at a minimum, [LEED Silver](#) standards. In addition, the policy requires the use of a LEED checklist during remodeling and repurposing projects, striving to incorporate as many LEED points as possible.

Luther also used grant funding to develop an [Energy Conservation Program](#) that strives to reduce energy-related greenhouse gas emissions 2 percent each year by promoting behavior change among students, faculty, and staff.

With regard to transportation fuels, the College's fleet now includes twelve hybrid passenger vehicles, four all electric service vehicles, two all-electric "Gator" grounds vehicles, and one dual fuel gasoline/compressed natural gas pickup. Many diesel vehicles, including lawn mowers, run on a biodiesel blend from our fuel supplier. In the summer, we also utilize filtered fryer oil from the cafeteria in our mower fleet. The College has purchased a replacement 39 passenger (model year 2020) bus that is powered by a diesel engine. We have consequently somewhat increased our use of diesel fuel; however, it is offset by lowering our contracted transportation amount by 41.4%. These initiatives have led to a 67.4 percent decline in the consumption of gasoline and a 24.5 percent decline in diesel fuel consumption from their respective peaks. Luther is committed to shifting its fleet to alternative fuel and ultra-low emission vehicles.

Luther also has a [Bike-Share Program](#) that has helped over 12,000 student riders travel more sustainably over the past decade.

## **B. Renewable Energy**

**Wind.** After seven years of project development, Luther College installed [a 1.6-megawatt \(MW\) wind turbine](#) in the fall of 2011. Located on a bluff west of campus, the wind turbine has come to symbolize Luther's commitment to sustainability. A 1.1-mile underground power line brings the electricity back to campus where it is sold to Alliant Energy for a fixed price under a ten-year power purchase agreement (PPA). The electrons are put to work on campus, however, and the college retains the Renewable Energy Certificates (RECs) associated with the annual power production. Luther has the option to place the power behind the college's meter in 2021 or to maintain the current arrangement under the same financial terms for two more five-year periods. In an average year, Luther's wind turbine generates 3.1 million kWh of electricity. The related RECs currently offset 27 percent of Luther's grid electricity purchases, which totaled 11,127,176 kWh in FY 2020. Luther formed a for-profit subsidiary, Luther College Wind Energy Project, LLC, to access state and federal tax credits, grants, and zero-interest financing which provided more than half of the funding for the \$3.2 million project.

Luther College also purchases all of the RECs from [a community wind project](#) owned by a local investor. The wind turbine is located 65 miles away in St. Ansgar, Iowa. Luther began purchasing the RECs in 2009 as one of several tangible steps it took to implement its obligations under the American College and University Presidents' Climate Commitment, and also in conjunction with meeting LEED standards associated with the construction of the Sampson-Hoffland Laboratories. The 750-kW wind turbine generates power that is sold to Alliant Energy and consumed locally in St. Ansgar. On average, the wind turbine generates around 1.8 million kWh of electricity per year. Luther uses the RECs to offset greenhouse gas emissions associated with the college's grid electricity purchases. When combined with the RECs from Luther's wind turbine, this is an important reason why the emissions associated with Luther's grid purchases have declined significantly.

**Solar.** In 2012, Luther partnered with a local investor to lease a 280 kilowatt (kW) solar photovoltaic (PV) array to power [Baker Village](#)—a student housing complex that consists of four townhouses and a commons building that serve up to 112 students. Built in 1999, Baker Village utilizes a geothermal energy system for heating and cooling. As an all-electric facility, it was an ideal candidate for solar power. Today, Baker Village is the first part of the Luther Campus that is carbon neutral. Due to net metering, geothermal energy from the earth and electrical power produced from the sun provide all of the energy utilized at Baker Village.

In 2015, Luther partnered with another local investor to install an [882 kW solar PV array](#) in three different locations on campus, including on the roof of Preus Library. The 1.1 million kWh annual production from these arrays helps power Luther's main campus. After the Iowa Supreme Court ruled that third party power purchase agreements are a legal option, Luther contracted with the investor to purchase all of the power from these arrays under a ten-year, fixed-price, PPA. Luther expects to save \$1 million in electricity purchases over the 25-year-rated life of the panels.

In 2020, Luther partnered with a third local investor to install another [950 kW solar PV array](#) in a field on the northern edge of campus near the other large arrays described above. This system also includes a 370 kW lithium-ion energy storage system. [A study by the National Renewable Energy Laboratories \(NREL\)](#) confirmed that Luther was a good candidate for an energy storage system due to its high demand and transmission charges, which now represent more than 50 percent of Luther's annual electricity expense of approximately \$1 million in FY 2020. Luther purchases the power from this facility under a ten-year, fixed-price, third party PPA and expects to save another \$1 million in electricity savings over the life of the system.

Luther's plan is to purchase each of these large solar systems from the local investors after they are fully depreciated. The purchase of the 280 kW Baker Village array was completed in 2019.

Luther also owns three smaller solar PV arrays deployed at the [Sustainability House](#), the [President's House](#), and at the [Shirley Baker Commons](#). All of these systems are net metered and were funded primarily with donations.

While all of Luther's investments thus far have been in solar PV systems to generate electricity, the college designed the roof of the recently constructed [Aquatic Center](#) to hold a solar hot water system to heat the pool in the future.

**Biomass.** Luther College operates the [Korsrud Heating Plant](#), which was built in 1947 as an update to the old campus heating system that had burned coal and fuel oil. Today, the centralized steam system includes three Cleaver-Brooks boilers operating at 60 pounds per square inch (psi). Two of the boilers are 1,000 horsepower (hp) water tube boilers. The third boiler is a 600 hp fire tube boiler, installed in 2004, that includes an economizer, oxygen control, and other energy savings controls. The central steam system relies on natural gas with #6 fuel oil as a backup.

In 2008, Luther used grant funds to hire an engineering firm to study whether the college could use biomass as a heating fuel in the college's heating plant. The study focused on a 400 hp wood-fired boiler that would supply approximately 59,502 MMBtu of steam heat, displace approximately 62 percent of the college's natural gas consumption, and reduce Luther's peak emissions by 14.2 percent. Luther decided not to pursue this option due to concerns about sourcing sufficient biomass in the area, material handling requirements, and air pollution concerns.

**Biogas.** In 2014, Luther secured funding from the Iowa Energy Center to study the beneficial use of landfill gas (LFG) from the Winneshiek County Landfill, which is approximately 12 miles southeast of campus. According to the [Environmental Protection Agency \(EPA\)](#), the landfill is the largest single source of greenhouse gas emissions in Winneshiek County but it is not required to have a LFG collection and flare system. Two of the options studied involved piping or trucking the LFG back to campus for combustion in Luther's heating plant but neither was economical. Another major option involved collecting and cleaning the LFG for electric power generation. The electricity would be sold to the local rural electric cooperative and Luther would retain the Renewable Energy Certificates. This option was not economical in part due to the fact that the landfill did not have access to three-phase power on site. The final option involved installing a landfill cap and flare system, which would destroy up to 21,200 MT CO<sub>2</sub>e per year. Unfortunately, this option also was uneconomical due to the low market value of carbon offsets at that time.

In 2016, Luther hired a professional engineering firm to study the feasibility of producing pipeline quality biogas from agricultural waste in Winneshiek County. The study was funded by a portion of a grant from the Margaret A. Cargill Foundation that had been allocated to Luther's Climate Action Fund. Biogas used for transportation fuel now counts as an advanced biofuel under the federal Renewable Fuel Standard and also meets the Low Carbon Fuel Standard in California and Oregon. The assumption going into the study was

that Luther would be a minority investor in a biogas production facility and would acquire majority interest after profits from the sale of the biogas had paid off the facility investment costs and the primary investors had secured their preferred rate of return. After reviewing the results of the innovative study, it did not appear to be in Luther's best interests to pursue this matter due to the college's relatively low tolerance for financial risk.

In 2020, Luther collaborated with the Winneshiek County Landfill, Winneshiek County Economic Development, and a local philanthropist to share the cost of an update to the 2014 study. This was justified because the landfill now has three-phase electrical service, its service life has been extended by 20 years to 2044, and the landfill has acquired additional property that could host a business that might utilize heat and/or power produced from the landfill gas. The study determined that simply flaring the landfill gas would destroy up to 33,500 MT CO<sub>2</sub>e per year, which is almost three times Luther's net greenhouse gas emissions of 12,229 MT CO<sub>2</sub>e in FY 2020. If Luther funded the \$859,270 projected cost to install the landfill gas collection and flaring system, Luther would achieve carbon neutrality well before 2030 and might be able to sell surplus carbon credits to help pay for the system. Alternatively, Luther could collaborate with other schools to fund the system and share the carbon offsets. Carleton College has expressed some interest in this possibility. Further study is needed, however, to determine more precisely the composition of the landfill gas, the flow rate, and the feasibility of installing a gas collection system in as many cells as possible.

### **C. Additional Strategies**

***Carbon Sequestration.*** Luther College owns approximately 1,000 acres of land, roughly two thirds of which are natural lands in forest, prairie, wetland, and savanna. Luther students and faculty are studying options for maximizing carbon sequestration on college lands and the college has established the Land Use Council to implement its Land Stewardship Plan. However, none of the carbon sequestered in Luther's natural areas is currently counted in Luther's annual carbon footprint reports.

***Solid Waste Reduction.*** As noted above, Luther has succeeded in diverting a significant amount of waste from the Winneshiek County Landfill through improved recycling and composting, increased education, and various waste reduction events. For example, student-led waste reduction programs have reduced move-out waste at the end of the academic year by 60 percent over the last five years.

***Local Foods.*** Luther has been working on sustainability in food service for many years with a particular emphasis on local foods. Currently, 25 percent of the food served in Luther's dining facilities is grown by local farmers and by our students at the college farm. Supporting our local food system has many benefits including carbon emission reductions from reduced transportation and alternative farming methods. All food on cafeteria trays is run through a pulper and composted on the college farm. In addition, our "Caf to Community Program", conducted in partnership with Luther's dining services contractor,

Sodexo, donates 10,000 pounds of food to local food pantries each year with the assistance of 80-100 hours of volunteer time by students, faculty, staff, and other members of the Decorah community.

***Climate Action Fund.*** Last but not least is a [Climate Action Fund](#) that was established by the administration in 2015 to finance initiatives that help Luther achieve the goals in its Climate Action Plan. It is a revolving fund. Money in the fund has been used primarily to finance energy efficiency measures and the energy cost savings are returned to the fund on an annual basis. In a few instances the fund has been used to provide cost-match in grant applications for feasibility studies related to various renewable energy projects. Most recently a portion of the fund was used to purchase the 280 kW solar array that serves Baker Village.

## **IV. An Energy Master Plan to Achieve Carbon Neutrality by 2030**

### **A. Introduction**

While Luther has made significant progress in reducing its carbon footprint, it will not achieve carbon neutrality so long as the college continues to burn natural gas in the Korsrud Heating Plant. Emissions from stationary sources (4,986.8 MT CO<sub>2</sub>e) constituted 40.8 percent of Luther's carbon footprint in FY 2020.

In 2018, Luther College issued a Request for Proposals (RFP) to develop an energy master plan for the college. The goal was "to develop an energy master plan that articulates a pathway, including detailed systems design, to achieve carbon neutral energy systems by 2030, improve resiliency to power outages in the immediate future, manage campus electrical demand, leverage market incentives, and maintain comfort and reliability." Several engineering firms responded to the RFP. Luther selected MEP Associates due to their well-earned reputation in the field and for their recent work with Carleton College on a similar energy master plan for their campus.

### **B. Alternatives**

MEP began by developing a Business-As-Usual (BAU) case to show both the costs and level of carbon emissions for the existing campus should no major changes be made in the natural gas-fueled thermal energy system that heats the campus. MEP's subsequent analysis identified four potential alternatives (A-D) aimed at reducing energy and carbon emissions. Two options were selected for further study:

- Option B replaces almost all of the current heating system with a 1,200 ton Ground-Source Heat Pump (GSHP) system that would both heat and cool campus buildings.

- Option D retains some existing chiller and steam heat capacity while installing a smaller 450 ton GSHP system and comes in two versions—with or without a solar thermal array

Both options include a transition from the existing district steam water system to a district low temperature hot water system with a ground source heat pump energy plant and a district chilled water system. MEP developed a detailed, year by year roadmap for the implementation of each option, which was coordinated with the college's long-term plan for renovations and additions.

The annual energy use and carbon footprint associated with heating, ventilation, and air conditioning (HVAC) were modeled for both options as well as the BAU case. Cost estimates for building conversions, new geothermal energy plants, geothermal exchange fields, and new campus heating and cooling distribution utilities were developed. Operations and maintenance costs for existing equipment was developed and coordinated with Luther College facilities staff. A Life Cycle Cost Analysis (LCCA) was performed for all options comparing the net present value of capital costs, utility costs, operations and maintenance expenses, a voluntary social cost of carbon fee (\$75 MT CO<sub>2</sub>e), as well as the cost of carbon offsets (\$15 MT CO<sub>2</sub>e) to achieve carbon neutrality over a 50-year study period.

MEP assumed a phased approach over 10 years for all three alternatives. This would allow for lessons learned from previous phases to inform the subsequent phase. It would also offer the opportunities for adjustments if the financial climate changes.

### **C. Financial and Carbon Reduction Comparisons**

Option B represents the largest HVAC carbon emissions reduction, with a 67.2 percent decline in overall carbon emissions and a 99 percent decline in natural gas carbon emissions. However, even though the carbon emissions from burning natural gas are almost entirely avoided due to the large investment in ground source heat pumps, the increased use of grid-purchased, carbon-intensive electricity from the MROW eGrid region results in only a 62.7 percent overall reduction in emissions. While Option B provides the largest carbon emissions reduction, it has the lowest net present value savings compared to the BAU.

Option D has the highest net present value savings compared to BAU since it involves the installation of fewer ground source heat pumps. Compared to Option B, Option D provides a lower HVAC carbon emissions reduction, with a 55.2 percent overall carbon emissions reduction and a 69.7 percent natural gas carbon emissions reduction. Option D with solar thermal further reduces the campus natural gas carbon emissions to 72.3 percent.

Since the original goal for this study was to achieve carbon neutrality, Option B would allow for near carbon neutrality for the campus heating and cooling systems if it were possible to

source electricity from renewable energy systems. Should funding for Option B not be available, and especially if it is not possible to source green power, then Option D still presents a significant reduction in overall carbon emissions, with less capital investment.

Absent access to 100 percent green electricity, however, all of the alternatives would require the annual purchase of carbon offsets to achieve carbon neutrality. At an assumed average annual cost of \$15 MT CO<sub>2</sub>e, the carbon offset costs range from \$551,079 if Luther implements Option B to \$1,143,890 if Luther maintains BAU. As noted earlier, it may be possible for Luther to source these carbon offsets locally from the Winneshiek County Landfill—and likely at a much lower cost.

The primary challenge with the proposed Energy Master Plan is the large capital costs associated with each of the alternatives. They range from \$20,742,732 to maintain BAU to \$29,464,074 to shift almost entirely to geothermal energy in Option B.

#### **D. Next Steps**

The final draft of MEP Associates' proposed Energy Master Plan was reviewed in early October 2020 by the Energy and Water Task Force of Luther's Center for Sustainable Communities as well as Luther's [Sustainability Council](#); both are comprised of students, faculty, and staff.

Given the uncertainty caused by the Covid-19 pandemic and other financial challenges facing the college, the Sustainability Council made the following recommendations to the Facilities and Sustainability Committee of the Luther College Board of Regents:

- Receive and discuss the Energy Master Plan report at their committee meeting on October 22, 2020.
- Defer any action on the report for six months until the Board's meeting in May 2021, and revisit it every six months if no action is taken until major decisions have to be made regarding building renovations, boiler replacement, etc.
- Before the May 2021 Board Meeting:
  - Confer with the President, the Vice President for Development, and the Vice President for Finance and Administration about integrating capital needs for the Energy Master Plan into the college's next major fundraising campaign and/or financing the preferred option through long term debt.
  - Examine/Test discount and interest rate sensitivity as well as social cost of carbon impacts
  - Examine/Test green power options and grid decarbonization assumptions
  - Receive a rank ordering of preferred options from the Energy and Water Task Group

As we wrap up this portion of Luther's revised and updated Climate Action Plan that has focused on our carbon reduction strategies, it is clear that much has been accomplished and that we have a road map for how the college can achieve carbon neutrality by 2030. While the Winneshiek County Landfill presents the possibility of local carbon offsets, the college continues to make aggressive investments in energy efficiency, and has access to land on the north edge of campus and near the wind turbine that could double or triple the amount of solar power that is already being produced. Another possibility is to partner with our electric utility to establish a Community Solar Garden or to host a large array that would be owned by the utility but Luther would receive the renewable energy certificates from the production. These pilot programs were recently approved by the Iowa Utilities Board. We look forward to studying all of these possibilities further as we strive to achieve carbon neutrality by 2030.

## V. Education

Sustainability and climate education at Luther began in earnest in 2008 when Luther's Sesquicentennial Strategic Plan included a recommendation to "make sustainability a part of every student's learning experience." Since that time, there have been ongoing efforts to integrate sustainability and climate literacy into the curriculum, co-curriculum, and research. Rather than assuming that one strategy was best or sufficient to meet this goal, Luther has been working on education for sustainability on many different fronts. The objective is to integrate sustainability into the learning experience of students in multiple places, not simply to add an additional activity, course, or requirement.

While some of these efforts focus specifically on climate change and Luther's efforts to reduce emissions, we put climate change within the larger category of sustainability education. This strategy creates more connection points for faculty and more clearly illustrates that this is not simply about science, campus operations, or environmentalism. Rather, our sustainability education efforts are holistic with equal emphasis on justice, equity, and social concerns and with opportunities for the humanities and social sciences, not just natural sciences.

The following areas of emphasis help to guide Luther's work on education for sustainability:

**Faculty Development:** Since the faculty own the curriculum and are the cornerstone of any educational initiative, faculty development has been a key element of this strategy. Luther has conducted numerous faculty development workshops and given dozens of small grants to faculty to include sustainability and climate change in their courses. Our goal is to reach at least one third of the full-time faculty and at least one faculty member in every relevant academic department with a workshop or similar experience on sustainability education.

**Existing Curriculum:** Education for sustainability must be seen as a way to enhance and improve, not supplant, Luther's existing liberal arts curriculum. Thus, we seek all available avenues to integrate sustainability into the curriculum. Using AASHE STARS as our

methodology, we survey all faculty and assess all courses for their inclusion of sustainability. [Luther's 2019 STARS report](#) indicated that 40 percent of Luther's 1,053 courses qualify as sustainability course offerings. Moreover, 75 percent of all Luther academic departments have sustainability course offerings.

We seek to maintain a robust set of sustainability courses and to pursue new avenues for sustainability in the curriculum. Specific opportunities that should be explored include:

- Continue to enhance Luther's Environmental Studies curriculum, especially the inclusion of climate change in applicable courses.
- Work with the Curriculum Committee and other stakeholders to support the current proposal to include "Sustainable Communities" as a category of required courses within a revised Luther general education curriculum.
- Promote sustainability education in the first-year curriculum, especially Paideia I, which is a year-long interdisciplinary introduction to the liberal arts.
- Expand sustainability related offerings in Paideia 450, which is a capstone course taught by an interdisciplinary team that focuses on subject matter that raises important ethical issues.
- Create more opportunities for sustainability education in the January term.

**Co-Curricular Opportunities:** Luther constantly seeks to increase opportunities for student involvement in sustainability projects, activities and events on campus and in the larger community. Specifically, the following initiatives are included in the current strategic plan for Luther's Center for Sustainable Communities:

- Implement sustainability education in the residence halls utilizing students as peer educators or eco-representatives.
- Utilize student educators to do more educational events and initiatives, such as waste challenges, clothing swaps, and move-out and move-in waste reduction efforts.
- Educate and engage the community about our goals for campus operations including zero waste, sustainability in dining, and Luther's Climate Action Plan.
- Educate and engage the community about our goals for campus operations including zero waste, sustainability in dining, and Luther's Climate Action Plan, using posters, stickers, newsletters, and social media.

**Connection to Place:** Since commitment to global issues such as climate change is usually grounded in connection to particular places, Luther has worked to instill a sense of place in our students and to enhance opportunities for outdoor recreation and ecological restoration. The Endeavor Together pre-orientation program provides a connection to place for nearly 200 for incoming students and provides a foundation for more outdoor programming. In addition, Luther has a robust Land Stewardship Program that employs student interns, conducts research and programs, and is working to enhance trails and expand student engagement with Luther's natural lands. President Ward emphasizes Place as one of the signature attributes of Luther College and this should be leveraged for additional work to enhance the connection to place.

**Regional Leadership:** In addition to our work on education for sustainability on our campus, Luther College is committed to working with other schools and organizations on education for sustainability initiatives. Luther faculty must continue current efforts and look for new opportunities to take leadership roles in working on curriculum initiatives with organizations including the Upper Midwest Association for Campus Sustainability (UMACS), the Associated Colleges of the Midwest (ACM), and the Association for the Advancement of Sustainability in Higher Education (AASHE). Luther should also take a lead in working with its sister colleges within the ELCA to identify and build upon the special opportunities that exist within colleges of the church to educate all students about creation care and sustainability. In recent years, the Director of the Center for Sustainable Communities has worked with Luther students to co-edit the [Colleges/Universities](#) section of the Lutherans Restoring Creation website.

## VI. Research

As a residential liberal arts college, Luther places its primary emphasis on teaching, not research. Thus, climate change and sustainability research has not been a primary emphasis in our climate action planning. We do, however, place significant emphasis on involving undergraduates in research and must work to increase opportunities for student and faculty research related to sustainability. What follows are several ways Luther College will promote more research related to sustainability and climate change.

Nearly half (121 persons, or 48%) of faculty and staff researchers are engaged in sustainability research, according to Luther's 2019 STARS report. There are 18 departments or academic programs that include at least one faculty or staff member that conducts sustainability research. Furthermore, 75 percent of research-producing departments are engaged in sustainability research.

**Grants:** Luther utilizes internal and external resources to increase support for sustainability research. Specifically, our goal is to continue supporting at least two summer research projects related to environmental sustainability, as has been done in the past. Past research projects have contributed to at least two books and multiple articles, posters, and scholarly presentations. Luther also aggressively seeks external grants to support faculty pursuing research in this area.

**Environmental Studies:** More than 20 faculty from across the disciplines are affiliated with Luther's interdisciplinary environmental studies program. Many of these faculty are actively engaged in research related to climate change and sustainability. Luther will continue to investigate ways to encourage and support research in environmental studies, including following through on plans to fund an endowed chair in environmental studies.

**Center for Sustainable Communities:** The Center promotes opportunities for faculty in business, political science, economics, and other disciplines to engage in research focused on

fostering a move toward sustainability within our region. By nurturing partnerships between students and faculty on campus and organizations in the region, the Center encourages applied sustainability research with direct relevance to our region.

**Natural Lands:** Luther's 1,000 acre campus includes hundreds of acres of natural lands that provide a plethora of research opportunities for students and faculty in biology, environmental studies, and other disciplines. Faculty in biology and environmental studies conduct research on ecological restoration and carbon sequestration on these lands. Additional climate-related research could be done on Luther and neighboring lands.

## **VII. Outreach**

Luther College has long been committed to community outreach and education on issues related to sustainability, community resilience, and climate change. The College hosts lectures and conferences open to the community as well as working with the city, county, and local organizations on projects. The centerpiece of this community outreach work is Luther's Center for Sustainable Communities; its mission is to promote sustainability and be a catalyst for change on campus and in our region. Strategic partnerships with local businesses, schools, churches, and community groups are crucial to the work of the Center. For example, faculty and students collaborate with external partners to enhance community resilience to locally-specific climate change concerns such as flooding and storm water management. Also notable in this outreach is Luther's work with children in our community. Luther has an active Environmental Outreach program that conducts year-round programming for pre-K through middle school students. Roughly 500 young people are reached each year through these programs that also provide transformative experiences for the Luther students who do the teaching.

## **VIII. Conclusion**

Luther College has a deep and abiding commitment to sustainability. This update to Luther's original Climate Action Plan has attempted to lay out some of the ways the College is meeting this commitment and how it plans to do more in the near future. Our goal is to integrate sustainability into all areas of campus life and to make it a central organizing principle for Luther College. While the specific initiatives outlined in this document represent progress to date and current plans, we will constantly seek new ways to reduce carbon emissions, increase opportunities for sustainability education, model stewardship and sustainability in college operations, and be a catalyst for change within our region. By achieving these goals, Luther College will improve the education of our students while also doing our part to address the challenges of climate change.