

Greenhouse Gas Inventory Report

Inventory Year 2023

MAY 2024



# EXECUTIVE SUMMARY

The climate crisis is one of the defining challenges of our time, and it is already having significant impacts on communities globally. Rising temperatures are driving increases in extreme and hazardous weather, natural disasters, food and water insecurity, environmental degradation, sea level rise, economic disruptions, migrations and conflict. Illinois is not immune to these risks, and the cost of unmitigated climate change will be high. Addressing and preparing for climate change is essential for NIU to continue to be able to fulfill its mission as a leader in education and research.

Recognizing the urgency of the climate crisis, NIU has committed to reducing our greenhouse gas emissions. As a signatory to the Second Nature Carbon Commitment, we have committed to achieving net-zero emissions by 2050, with a significant reduction in emissions before the year 2030. Our Sustainability and Climate Action Plan was developed in 2023 to serve as a road map to decarbonizing our campus.

Greenhouse gas inventories are tools used to quantify annual emissions and to serve as a baseline against which future reduction efforts can be measured. This report summarizes the results of NIU’s 2023 greenhouse gas inventory. The inventory calculations were completed using the University of New Hampshire’s SIMAP tool.

In 2023, we released a total of 108,160 metric tons (MT) of CO2e emissions. The majority of these emissions were related to the use of purchased electricity (29.3%), natural gas (33.4%), and transportation (21.8%). Total greenhouse emissions at NIU decreased approximately 8.5% from 2019 to 2023. NIU had moderate declines in the use of natural gas (3.8%) and electricity (9.1%) of this time, likely due to efforts to reduce the campus footprint via the closure of certain buildings (i.e., Adams Hall) and energy conservation measures that were implemented.

NIU’s per capita emissions are average compared to the benchmarked universities in the Midwest. However, many of these institutions include Scope 3 emissions that were not included in the NIU inventories such as faculty and staff travel to conferences and research, purchased goods and services, and indirect emissions tied to financial investments. Internal comparisons of how NIU’s emissions change over time are most valuable to understanding our efforts toward climate mitigation rather than comparisons to peer institutions.

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# Glossary

**Carbon Dioxide Equivalent (CO2e)**
A metric used to compare emissions of various greenhouse gases. It is the mass of carbon dioxide that would produce the same estimated radiative forcing as a given mass of another greenhouse gas. Carbon dioxide equivalents are computed by multiplying the mass of the gas emitted by its global warming potential.

**Emission Inventory**
An estimate of the amount of pollutants emitted into the atmosphere from various sectors over a specific period of time such as a day or a year.

**Global Warming Potential (GWP)**
Represents the relative warming effect of a unit mass of a greenhouse gas compared with the same mass of CO2 over a specific period. Multiplying the actual amount of gas emitted by the GWP gives the CO2-equivalent emissions.

**IPCC**

The Intergovernmental Panel on Climate Change (IPCC) is the United Nations body for assessing the science related to climate change.

**Paris Climate Agreement**

The Paris Agreement is a legally binding international treaty on climate change whose goal is to limit global warming to well below 2, preferably to 1.5 degrees Celsius, compared to pre-industrial levels. The United States is a signatory to this treaty.

**President’s Climate Leadership Network**

The Climate Leadership Network is a signature program of the climate action organization Second Nature that provides resources, networking and national engagement opportunities for signatory institutions. Members of the climate leadership network formalize commitments to the goal of carbon neutrality via carbon, climate or resilience commitments.

**Second Nature**

A climate action and advocacy organization that is committed to accelerating climate action in, and through, higher education. They work primarily with leadership in higher education through the Climate Leadership Network and the University Climate Change Coalition.

**UNFCC**

The UNFCCC is the United Nations Framework Convention on Climate Change, a treaty now signed by 197 countries. Under this convention, signatories agree to stabilize greenhouse gas concentrations “at a level that would prevent dangerous anthropogenic (human induced) interference with the climate system.”

**US Climate Alliance**

An organization representing states that are committed to taking action that addresses the climate challenge. Member states commit to achieve the Paris Agreement’s goal of keeping temperature increases below 1.5 degrees Celsius. Illinois is a signatory to the U.S. Climate Alliance.

# Introduction

Climate change is impacting the residents of Illinois with increasing flooding, heatwaves, summer droughts, more intense rainstorms and other extreme weather events. These changing weather patterns affect the agricultural economy of our state as well as people’s health and well-being. The consequences disproportionately impact communities with already high rates of chronic disease, inadequate resources and exposure to other environmental health hazards. The economic impacts of unmitigated climate change will likely be immense for our region if significant efforts toward reducing greenhouse gas emissions are not made (Wuebbles et al, 2021).

The science is clear that strong and sustained reductions in CO2 emissions and other greenhouse gases will limit the worst effects of climate change and make adaptation to future changes more feasible (IPCC, 2021). Reducing our greenhouse gas emissions will reduce the long-term impact and severity of the weather-related hazards in Illinois and around the world. Additionally, recent efforts to estimate the mortality cost of carbon emissions demonstrate that there is a concrete relationship between metric tons of carbon dioxide emissions emitted and heat-related deaths globally, with each 4,343 metric tons emitted causing one excess heat-related death globally (Bressler, 2021). Reducing greenhouse gas emissions will lead to a reduction in climate change related deaths globally.

Recognizing that the climate crisis is one of the most urgent challenges we currently face, NIU has committed to reducing our carbon pollution. Since the last greenhouse gas inventory report in 2022, NIU has become a signatory to the Second Nature Carbon Commitment. We committed to achieving net-zero emissions by 2050 and a 40% reduction in emissions by 2030. To help us achieve this goal, NIU developed its first Sustainability and Climate Action Plan in 2023. This plan serves as a road map toward reaching our net-zero commitment and to achieving other campus sustainability goals. Our long-term goal is to serve as a regional leader, demonstrating how to achieve positive change related to climate mitigation and resilience.

Greenhouse gas inventories are essential tools in the climate change mitigation process; by quantifying emissions they serve as a baseline against which to measure future reduction efforts. This report details the results of Northern Illinois University’s 2023 greenhouse gas inventory and describes progress toward our climate commitment goals.

This report begins by covering the scope of the inventory, including study boundaries. Results of the inventory are presented under each category, together with assumptions made during calculations. Discussion of results is followed by recommendations for updating this report in the future. We conclude by providing recommendations for how to use this report for climate action planning at NIU.

# Methods

## Boundaries

This greenhouse gas inventory includes emissions generated by NIU’s main campus in DeKalb, Illinois. The inventory was completed for the calendar year 2023 and focused only on NIU’s main campus.

## Scope of Emissions

The GHG Protocol Corporate Standard classifies an organization’s GHG emissions into three “scopes.” Scope 1 emissions are direct emissions from owned or controlled sources. Scope 2 emissions are indirect emissions from the generation of purchased energy. Scope 3 emissions are all indirect emissions (not included in Scope 2) that occur in the value chain of the reporting company, including both upstream and downstream emissions.”

### Scope 1: Direct Emissions

Includes direct emissions from sources owned and/or controlled by NIU. This includes combustion of fossil fuels in university-owned facilities or vehicles, fugitive emissions from refrigeration and emissions from on-campus landscaping or agriculture.

### Scope 2: Indirect Emissions (Upstream)

This includes indirect emissions from sources that are neither owned nor operated by NIU, but whose products are linked directly to our on-campus energy consumption. At NIU, this includes the purchase of electricity.

### Scope 3: Indirect Emissions (Downstream)

This includes all other emissions that occur in a university’s value chain. At NIU, we included emissions from water and wastewater treatment, solid waste facilities, student and employee commutes, study abroad travel, personal mileage reimbursement travel, and any athletics travel that took place using university fleet vehicles. Scope 3 emissions can also include faculty and student travel (e.g. conferences, research), athletics travel via contracted vendors, purchased goods and services, and financial investments. These sources of emissions were excluded from the 2023 greenhouse gas inventories as the data was not feasible to collect at this point in time.

|  |  |  |
| --- | --- | --- |
| **Scope 1** | **Scope 2** | **Scope 3** |
| * Stationary fuels (natural gas).
* Transport fuels (university fleet).
* Fertilizers.
* Refrigerants and chemicals.
 | * Purchased electricity.
 | * Solid waste.
* Water and wastewater treatment.
* Student and employee commute.
* Study abroad travel.
* Personal mileage reimbursement.
* Directly financed travel.
* Athletics travel (contracted).
* Purchased goods and services.
* Investments.
 |

**Data Sources**

Data was obtained from a variety of sources on campus and in the community.

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| --- | --- | --- | --- |
| **Sector** | **Data type** | **Source** | **Contact Person** |
| Employee commute. | Self-reported commuting behavior including modality and frequency of transportation.  | Behavior, Attitudes, and Knowledge of Sustainability (BARKS) survey. | Professor Colin Kuehl (Political Science/Environmental Studies). |
| Purchased electricity and natural gas. | Total electricity and natural gas usage.  | Architecture and Engineering Services. | Jim Fitzjarrell. |
| Study abroad. | Flight itineraries were used to calculate total miles traveled.  | Study Abroad Office. | Lauren Mock. |
| Transit fleet. | Total annual milage for Huskie Line bus, fuel type and percent of student ridership.  | City of DeKalb transit manager. | Michael Neuenkirchen. |
| University fleet.  | Total vehicle milage and fuel type for all NIU fleet vehicles.  | Transportation Services. | Chris Gilbert. |
| Waste.  | Tons of waste that is generated from NIU. | Waste Management in DeKalb. | Daniel Flores. |
| Water and wastewater treatment. | Emissions from digester gas and discharge from the process of wastewater treatment. | Kishwaukee Water Reclamation District. | Mike Holland. |
| Institutional data. | Total student population/square footage of buildings. | Institutional EffectivenessArchitecture and Engineering. | Gregory Barker and Belinda Roller. |
| Fertilizers. | Total quantity of fertilizers used on an annual basis. | Grounds. | David Holliday. |
| Refrigerants and chemicals. | Total refrigerants and other chemicals used.  | Refrigeration department. | Oliver Penney. |
| University financed travel. | Personal mileage reimbursements. | Accounts Payable Division of IT Services | Julie O’Brien and Paul Watson. |

## Global Warming Potentials

Greenhouse gases vary in their residence time in the atmosphere and how effective they are at blocking heat escaping from the earth-atmosphere system and thus warming it (Gillenwater, 2015). Because of these differences, the global warming potential (GWP) variable was created as a standardized unit of measurement for greenhouse gases and their impacts. These various greenhouse gas emissions are transformed using their global warming potential values (GWPs) into carbon dioxide equivalents (CO2e) so that they can be standardized to create one CO2e value for a process. The GWP of different greenhouse gases is determined based on the current scientific consensus reported in the IPCC assessment reports. This GHG inventory was conducted using the 100-year GWP values from the IPCC’s Fifth Assessment.

|  |  |  |
| --- | --- | --- |
| Gas | Fifth Assessment — 100 year  | Fifth Assessment — 20 year  |
| CO2 | 1 | 1 |
| CH4 | 28 | 84 |
| N2O | 265 | 264 |
| SF6 | 23,500 | 17,500 |
| HFC-23 | 12,400 | 10,800 |

## Assumptions in Inventory Calculations

Assumptions were made when compiling the inventory data, particularly regarding emissions from student and employee commuting. University GHG inventories typically estimate commuting data in one of two ways; 1) Conducting a transportation study that surveys students, faculty and staff about their commuting behaviors, and 2) Using ZIP code data from student, faculty and staff places of residence to estimate total miles traveled. We used self-reported commuting data from Behaviors, Attitudes, Resources, and Knowledge of Sustainability (BARKS) survey which was conducted from August to October 2023. A copy of the BARKS report is available on the Campus Sustainability website.

## SIMAP Inventory Tool

Data about inventory processes (e.g. electricity consumption) are fed into inventory tools to calculate total CO2e emissions. This inventory was completed using the Sustainability Indicator Management and Analysis Platform (SIMAP) tool. Signatories to Second Nature, the organization that manages university climate commitments, are encouraged to use SIMAP for their greenhouse gas reports. This allows for easier benchmarking between institutions.

# Results

NIU emitted a total of 108,160 metric tons of CO2e in 2023. Energy consumption was the largest source of emissions, followed by transportation.

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| --- |
| **Emissions by Sector** |
| Sector | CO2e Emissions in Metric Tons | Percent Contribution to Inventory Total  |
| Energy | 77,268 | 68.7% |
| Transportation | 21,536 | 21.8% |
| Solid Waste | 4,454 | 4.5% |
| Water and Wastewater  | 1,178 | 1.2% |
| Other | 3,722 | 3.8% |
| **Total**  | **108,160** | **100** |

A detailed list of emissions by scope and process is provided for 2023.

|  |
| --- |
| **Emissions Processes with Calculated CO2e and % Contribution to Total****2023** |
|  | **Emission process** | **Calculated CO2e Emissions (MT)** | **Percentage Contribution to Total Emissions** |
| **Scope 1** | Other On-campus stationary. | 32,442.35 | 30.0 |
| Direct transportation. | 2,613.02 | 2.4 |
| Refrigerants and chemicals. | 3,716.16 | 3.4 |
| Fertilizer and animals. | 0.07 | 0.0 |
| **Scope 2** | Purchased electricity. | 30,011.24 | 27.7 |
| **Scope 3** | Faculty commuting. | 2,707.21 | 2.5 |
| Staff commuting. | 1,955.65 | 1.8 |
| Student commuting. | 13,285.91 | 12.3 |
| Directly financed air travel. | 735.27 | 0.7 |
| Directly financed travel (personal mileage reimbursement). | 239.42 | 0.2 |
| Solid waste. | 4,454.37 | 4.1 |
| Wastewater. | 1,178.38 | 1.1 |
| Paper purchasing. | 6.18 | 0.0 |
| Fuel and energy related activities (upstream natural gas losses). | 13,134.86 | 12.1 |
| Transmission and distribution losses (electricity). | 1,679.62 | 1.6 |
|  | **TOTAL** | **108,159.71** | **100.0** |

## Comparing 2019 to 2023

Total greenhouse emissions at NIU decreased approximately 8.5% from 2019 to 2023. NIU had moderate declines in the use of natural gas (3.8%) and electricity (9.1%) of this time period likely due to efforts to reduce the campus footprint via the closure of certain buildings (i.e., Adams Hall) and energy conservation measures that were implemented. The decrease in emissions associated with transportation, including commuting to campus, likely reflects both a change in methodology to measure commuting patterns and the decrease in commuting behavior amongst campus faculty, staff and students during this time period as it is significantly more common now for classes and/or work to be conducted in a hybrid or virtual manner. The 2023 inventory accounted for a few things in the “other” category that were not captured in the 2019 inventory.

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| --- | --- | --- | --- |
| **Sector** | **2019****Calculated CO2e Emissions (MT)** | **2023****Calculated CO2e Emissions (MT)** | **% Change** |
| Natural Gas | 49,130 | 45,577 | -3.8 |
| Electricity | 38,074 | 31,691 | -9.1 |
| Transportation | 37,486 | 25,751 | -18.6 |
| Solid Waste and Wastewater | 3,526 | 5,633 | 23.0 |
| Other | 0 | 3716 | 100.0 |
| **Total** | **128,216** | **108,160** | **-8.5** |

## Comparing Emissions From NIU and Other Institutions

To provide some perspective, we benchmarked NIU’s emissions relative to other Midwestern universities in Illinois, Michigan, Minnesota and Wisconsin (all of which have similar climates). This data is based on publicly available data, so comparisons by year were not always possible. Emissions were standardized per capita based on the full-time student population at the time of the inventory. As evident in the table below, NIU’s per capita emissions are average compared to the benchmarked universities. However, many of these institutions include Scope 3 emissions that were not included in the NIU inventories such as faculty and staff travel to conferences and research, purchased goods and services, and indirect emissions tied to financial investments. Internal comparisons of how NIU’s emissions change over time are most valuable to understanding our efforts toward climate mitigation rather than comparisons to peer institutions. This can be accomplished by conducting annual greenhouse gas inventories at NIU.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Institution** | **Total CO2e Emissions** **(MT)** | **Year** | **Student Population****(FTE)** | **Per capita emissions (MT)** |
| University of Wisconsin-Milwaukee | 73,039 | 2021 | 19,607 | 3.7 |
| Western Michigan University | 126,044 | 2018 | 22,562 | 5.6 |
| University of Illinois Chicago | 220,799 | 2021 | 34,586 | 6.4 |
| University of Minnesota Twin Cities | 320,361 | 2023 | 46,460 | 6.9 |
| **Northern Illinois University (2023)** | **108,160** | **2023** | **13,602** | **7.9** |
| University of Illinois Urbana Champaign | 433,797 | 2019 | 51,605 | 8 |
| University of Wisconsin-Madison | 640,022 | 2022 | 43,235 | 14.8 |

## Future Greenhouse Gas Inventories

Several important sources of emissions were omitted from this GHG inventory given the difficulty of obtaining accurate records at this point in time. However, they do contribute to NIU’s carbon footprint and efforts should be made to include these in future inventories. The following sources should be included in future inventories:

* Athletics travel — This includes travel that is contracted with outside companies (e.g., chartered buses, flights).
* University-financed travel — Any travel conducted without the use of university vehicles (e.g., travel to conferences or field sites).
* Purchased goods and services.
* University investments.

Accounting for purchases and investments is particularly tricky and is something that better-resourced institutions of higher education still struggle to accurately account for in their greenhouse gas inventories. However, Second Nature can provide helpful guidance for how to include this in our inventory calculations.

# Progress Toward NIU’s Climate Commitment Goals

Since the completion of our last greenhouse gas inventory, NIU became a signatory to Second Nature’s carbon commitment. In doing so, we committed to a goal of becoming carbon neutral by 2050, with a short-term goal of reducing our carbon emissions by 40% by 2030. In spring 2022, an ad hoc taskforce wrote NIU’s first Sustainability and Climate Action Plan (SCAP) which details our sustainability goals and actions we plan to take to achieve our commitment to reducing our greenhouse gas emissions.

NIU has reduced its total greenhouse gas emissions by approximately 8% since 2019. While some of this may be due to a change in methodology for measuring transportation emissions, emissions from natural gas fell by 3.8% and electricity fell by 9.1%. These are real reductions indicating incremental progress toward our long-term goal. NIU is now entering a phase of more intentional planning related to energy conservation measures and transition to renewable energy, with the goal of starting to implement these measures by early 2025. We expect that these actions will continue to result in measurable downward progress in subsequent inventories.

# Acknowledgements

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