



Carbon Neutrality at MSU

Greenhouse Gases, energy, and carbon neutrality are difficult concepts to grasp. We've included definitions of important concepts to provide context for our Carbon Neutrality story here at MSU. In all things, our partnerships work to make this institution a better place for this campus community and for future students, faculty, and staff.

Definitions

Greenhouse Gas Effect

So named because certain gases in our atmosphere act like a greenhouse; heat from the sun passes through the atmosphere to reach the earth's surface but is then unable to escape back through the gases. This concentrates heat on the earth's surface. It is a natural occurring phenomenon, essential to the earth's environmental systems, but human activities (burning fossil fuels for energy) are compounding the effect.

CO₂e (CO₂ Equivalency)

Not all gases affect heat the same way, but the most abundant heat-trapping gas in our atmosphere is Carbon Dioxide, or CO₂, so we use that as our baseline. Methane gas, on the other hand, traps about 25 times as much heat as CO₂. Therefore, a methane molecule has the equivalency of 25 CO₂ molecules. One pound of methane has 25 CO₂e. CO₂e is measured as equivalent pounds of CO₂.

Carbon Footprint

The total CO₂e a person, institution, company, country, etc is responsible for emitting into the atmosphere, generally measured per year. You can [measure your carbon footprint here!](#)

Global Warming or Climate Change

Global Warming: An oversimplifying and often misleading name for the issues posed by human activity and the Greenhouse Gas Effect, suggesting that the temperatures of all geographic regions on earth are increasing together and at a constant rate.

Climate Change: The overarching effects of the human-compounded Greenhouse Gas Effect, increasing average global temperatures, but in doing so, drastically altering global weather patterns and ecological zones.



Carbon Neutrality at MSU

Mitigation

Acting to reduce the severity of Climate Change and its immediate effects. Mitigation efforts often strive to reduce carbon footprints by either using less energy or by sourcing more energy from renewable sources and less from fossil fuel sources.

Energy: Fossil Fuels and Renewables

Energy powers things to change and move. Energy from food powers our bodies and energy from fossil fuel and renewable sources powers our vehicles and homes.

Fossil fuels: Buried deposits of organic materials, formed from decayed plants and animals that have been converted to crude oil, coal, natural gas, or heavy oils through exposure to heat and pressure in the earth's crust for over hundreds of millions of years. Though they store high densities of energy, the combustion required to access that energy releases their high percentages of carbon into the atmosphere.

Renewable Energy: Collected from resources that are naturally replenished on a human timescale, such as sunlight, wind, rain, tides, waves, and geothermal heat. Though named for their ability to renew, these sources of energy are favored in climate change mitigation because of their limited carbon footprints.

Carbon Offsets and Carbon Sequestration

Carbon Offsets: Reduction in CO₂e emissions in one location in order to compensate for emissions made in another. Entities can “purchase” offsets by funding projects that reduce global greenhouse gas emissions, *offsetting* their own emissions. These projects reduce greenhouse gas emissions and increase carbon sequestration.

Carbon Sequestration: The long-term removal, capture, or sequestration of carbon dioxide from the atmosphere. Carbon dioxide is naturally captured from the atmosphere through biological, chemical, and physical processes that can be accelerated or mimicked by human efforts.

Net Greenhouse Gas Emissions

The net greenhouse gas emissions of a person, institution, company, country, etc. is equal to the entity's total CO₂e emissions minus the entity's carbon offsets.



Carbon Neutrality at MSU

What is Carbon Neutrality?

Carbon Neutrality refers to achieving net zero Greenhouse Gases emissions at a particular institution or organization. Per Fiscal Year, Montana State University uses energy to power and heat our buildings, grow and transport our food, handle our garbage, etc. We use a third-party calculator to determine the net amount of CO₂e emissions Montana State University is responsible for, per Fiscal Year.

The overarching purpose of Carbon Neutrality is to reduce the “Net CO₂e” to effectively zero pounds per Fiscal Year. As we reduce our Net CO₂e, we are effectively reducing our contributions to climate change.

How do we do this? At Montana State University, the primary tools we use to power and heat our buildings are:

- 🍊 Our on-campus steam plant that burns natural gas to generate steam. Steam is delivered to our core buildings and generates approximately 4% of our electricity use
- 🍊 Purchased natural gas from our local utilities that can be burned on-campus to heat our buildings
- 🍏 Purchased electricity from our local utilities that can power electric heating or power our electrical appliances
- 🍏 On-site generated electricity from renewable sources that power electric heating or power our electrical appliances

As engineers on campus identify and implement strategies to reduce CO₂e, the primary goal is to switch our sources of energy from 🍊 natural gas and electricity that was generated from fossil fuels to 🍏 electricity that was generated from renewable sources (solar, hydropower, geothermal and wind).



Carbon Neutrality at MSU

Scope 1, Scope 2, and Scope 3 Greenhouse Gas Emissions

When conducting a greenhouse gas inventory at a particular institution or organization, the total footprint is divided amongst three emissions categories. Those categories are Scope 1, Scope 2, and Scope 3. Emissions are assigned a category based on how the institution takes responsibility for their occurrence. When looking at mitigating our greenhouse gas footprint, we address each scope individually, as they all call for unique action.

Scope 1:

Scope 1 emissions are those produced directly on campus. This includes emissions associated with burning natural gas in our central heating plant, emissions from campus fleet vehicles operating on campus, and methane emissions from campus owned cattle.



Scope 2:

Scope 2 emissions are associated with our purchased electricity on campus. Here at MSU, we purchase our electricity from Northwestern Energy. Therefore, emissions from Northwestern Energy burning coal or natural gas to produce the electricity we consume on campus fall into our scope 2 emissions.



Scope 3:

Scope 3 emissions are those caused directly by our operations as a university, but occur off our campus. Due to their unique nature, these emissions are often the most difficult to track and mitigate. They include emissions from financed air travel (i.e. sports, conferences, research); study abroad air travel; and student, faculty, and staff commuting.





Carbon Neutrality at MSU

So What Do We Do About It?

Past: In years past, our primary goal has been to reduce the total amount of energy consumed on campus. Instead of switching out energy sources, we have been concentrating on “mitigating” or reducing the total amount of energy needed to actually power this campus. Examples include:

- LED bulbs we have switched out in campus buildings
 - Reduces electricity consumption for scope 2
- Increasing our waste diversion rate from 2% in 2010 to 36% in 2020
 - Reduces landfill emissions for scope 3
- Installing 10 LEED Buildings in the past 10 years
 - These buildings require less energy for heating and electricity, reducing scopes 1 and 2
- Installing software to instantaneously monitor energy consumption on our campus
 - Helps us track and reduce scopes 1 and 2

Current: University Services has begun to install on-site renewable electricity sources and switch natural gas heating with alternative sourcing.

- Photovoltaic cells installed on the roof of Norm Asbjornson Hall
 - Increase our renewable electricity for scope 2
- Passive solar walls heat air coming into Jabs Hall and Norm to reduce natural gas
 - Reduce need for the heating plant for scope 1
- Drilling geothermal wells around Romney Oval and annually mitigating one million pounds of CO₂e
 - These heat and cool buildings, reducing demand for heating plant for scope 1

Future: MSU’s new Sustainability Plan, called for in the Choosing Promise Strategic Plan, will contain goals for carbon neutrality on our campus. This will involve bringing our approximately 50,000 ton CO₂e annual footprint to zero by our goal date. A number of changes on campus must happen to achieve this, including energy reduction, campus electrification, greening the grid, behavioral transformations, and potential sequestration projects. Specific task forces will be created for addressing scopes 1, 2, and 3 emissions on campus. It is an exciting time to talk about carbon neutrality here on campus, so stay tuned!