Bloomington-Normal

Greenhouse Gas Emissions Inventory Update

A Comparison of Local Government Operations Emissions & Community-Scale Emissions for 2008 & 2015

prepared by the

ECOLOGY ACTION CENTER

Town of Normal

2023

CITY OF Bloomington ILLINOIS

ACKNOWLEDGEMENTS

This inventory would not have been possible without the time, support and cooperation of many individuals and agencies. The Ecology Action Center is grateful for a community that makes stewardship of our natural environment such a high priority.

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EXECUTIVE SUMMARY

The Ecology Action Center (EAC) completed its first, baseline inventory of local greenhouse gas (GHG) emissions for the Bloomington-Normal community using data from 2008. The 2015 inventory examines data from the 2008 baseline year and new 2015 data to assess changes that have occurred since the baseline inventory.

Since 2008, the EAC invested in ClearPath software to conduct the 2015 inventory. Data from 2008 was subsequently entered into ClearPath to ensure clear comparisons between the two years.

Both inventories were completed using the International Local Government GHG Emissions Analysis Protocol (IEAP), developed by Local Governments for Sustainability (ICLEI), a protocol used internationally for measuring and reporting greenhouse gas emissions. Adopting this protocol standardizes our local emission data, allowing Bloomington-Normal to compare its results with other communities and with national data.

This 2015 inventory examined emissions from two different perspectives:

1. The municipal government sector, or the local government operations (LGO) of Bloomington and Normal, which includes all municipal building facilities, public transit and wastewater treatment services.
2. All sectors of the Bloomington-Normal community including residential, commercial and industrial.

Between 2008 and 2015, Town of Normal and City of Bloomington LGO emissions increased by 10% and 12% respectively. Community-scale emissions fell by 4%. The leading source of greenhouse gas emissions in Bloomington-Normal in 2015 was stationary energy usage, which includes electricity and natural gas used for cooling, heating, and other needs in homes, businesses, industry, and local government. On-road vehicular transportation, the next leading source of greenhouse gas emissions, includes all gasoline and diesel usage in local transportation. These results include a number of limitations, which can be found in the methodology section of this report.

Conducting regular greenhouse gas emission inventories allows our community to be better informed about its energy use and resulting impact on air quality. Greenhouse gas emissions inventories allow the Bloomington-Normal community to monitor its contribution to global warming and they serve as a guide to develop cost-effective strategies for reducing climate-changing greenhouse gases, conserve energy, save money and preserve valuable natural resources. These GHG emission inventories will also serve as a foundational component for the Bloomington-Normal Community Energy Strategic Plan, a roadmap for achieving short and long-term goals for community air quality improvements and reductions in energy use.

1 INTRODUCTION

BACKGROUND

Our existence depends on the ability of the earth to constantly regulate its temperature by balancing the energy entering and leaving its atmosphere. Over the past century, the amount of carbon dioxide and other gases released into the atmosphere has steadily increased. These gases are primarily generated by burning fossil fuels for energy and transportation, deforestation, industrial processes, and agriculture. They are called greenhouse gases because they trap energy inside of our atmosphere causing it to retain heat instead of releasing it into space, much like the glass walls of a greenhouse trap heat.

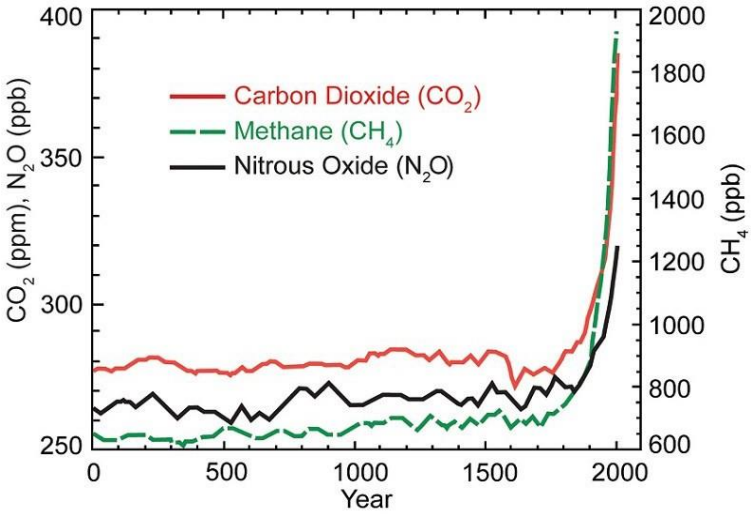


Figure 1.1 Atmospheric concentrations of global GHGs over the last 2,000 years.

This "blanketing" effect, caused by trapped greenhouse gases, caused average global temperatures to rise 1.5 degrees over the past hundred years. Global temperature is projected to increase up to 11.5 degrees over the next century unless measures are taken to curb greenhouse gas emissions into the atmosphere. Global temperature increases directly correlate to increased atmospheric concentrations of greenhouse gases. As Figure 1.1 illustrates, these concentrations rose drastically around the start of the industrial revolution.[1]

While some warming is normal, the rate at which the planet is currently warming, and current levels of GHGs in the atmosphere are unprecedented. There are significant current and future consequences of the unchecked changes in global climate, consequences that will affect everyone.[2]

[1] Environmental Protection Agency. (2016, December 27). Causes of climate change. EPA. https://19january2017snapshot.epa.gov/climate-change-science/causes-climate-change_.html

[2] International Panel on Climate Change, "Climate Change 2007: The Physical Science Basis," 2007. http://www.ipcc.ch/pdf/assessment- report/ar4/wg1/ar4-wg1-faqs.pdf

The United States is the second largest greenhouse gas emitter in the world, and the largest historical emitter. Scientists and many political leaders acknowledge the threat of global climate change and the need to take significant steps to reduce greenhouse gas emissions. In 2015, President Barack Obama signed the Paris Climate Agreement, a globally negotiated plan signed by almost 200 countries, which aims to address greenhouse gas emissions and combat climate change. Although the United States briefly left the agreement, we are once again an official party. Concerns over climate change stretch beyond political and geographic borders because its consequences impact every living thing, world-wide.

Consequences of increasing GHGs and unchecked climate change

- Migrating agricultural and fishing zones will impact growing seasons and food production
- Increasing frequency and severity of droughts, floods, and other natural disasters
- Sea level rise, increasing ocean acidity and habitat destruction
- Stagnating economic growth
- Declining air quality and human health
- Changes in ecosystems, shifting habitats and increased rates of species extinction
- Shrinking water supplies coupled with increased water demand

"Climate change has become a partisan issue, but it hasn't always been. It wasn't that long ago that Republicans led the way on new and innovative policies to tackle these issues. Richard Nixon opened the EPA. George H.W. Bush was the first U.S. President to declare — 'human activities are changing the atmosphere in unexpected and unprecedented ways.' John McCain introduced a market-based cap-and-trade bill to slow carbon pollution. We've got to move beyond partisan politics on this issue."[3]

- President Barack Obama, 2013

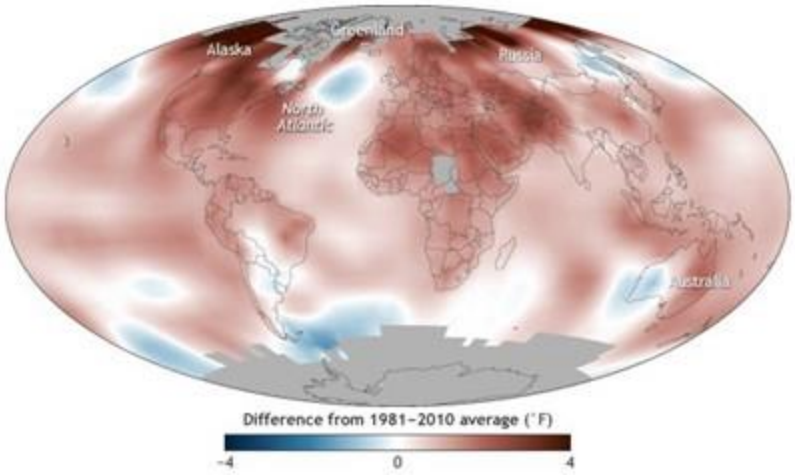


Figure 1.2
Average surface temperature in 2016 compared to the 1981-2010 average.[4]

[3] Office of the Press Secretary. (2013, June 25). Remarks by the President on Climate Change. Obamawhitehouse.archives.gov. Retrieved December 20, 2021, from https://obamawhitehouse.archives.gov/the-press-office/2013/06/25/remarks-president-climate-change.

[4] Blunden, J. and T. Boyer, Eds., 2020: "State of the Climate in 2020". Bull. Amer. Meteor. Soc., 102 (8), Si–S475, doi:10.1175/2021BAMSStateoftheClimate.

RECENT CLIMATE & AIR QUALITY RELATED REGULATIONS & COMMITMENTS

- **Inflation Reduction Act -** The most significant action Congress has taken on clean energy and climate change in the nation's history. The act includes tax provisions that will save families money on their energy bills and accelerate the deployment of clean energy, clean vehicles, clean buildings, and clean manufacturing. The act also provides billions of dollars in grant and loan programs for clean energy and climate action.
- **Illinois Future Energy Jobs Act -** One of the most significant pieces of energy legislation ever to pass in Illinois. The act states that 25% of Illinois's electricity will come from clean, renewable power by 2025. It also increases energy efficiency programs and devotes $750 million to programs that will provide training for new energy jobs and will help consumers cut their utility bills.
- **Ozone National Ambient Air Quality Standards.** Stricter standards issued in 2015, to further regulate ground-level ozone/smog, which causes respiratory problems for humans, and improve quality of life in urban areas.
- **Illinois Climate Equitable Jobs Act –** This act will implement new programs and initiatives to further the state's goals of transition to 100% clean energy by supporting a responsible transition away from the carbon-intensive power generation, increasing public participation in regulatory matters, and encouraging further diversity and inclusion within the renewable energy industry.
- **Ameren Illinois -** Ameren, a regulated electric and gas delivery company that ranks as Illinois' third largest natural gas distributer, has pledged to achieve net zero carbon emissions by 2045 and are targeting a 95% reduction of water withdrawn for thermal generation. Ameren has invested in new infrastructure at their facilities, installed air scrubbers, burn low-sulfur coal, and monitor air quality at several of their facilities.

Since the beginning of the 20th century, average Illinois temperatures rose more than 1 degree Fahrenheit and average Midwest air temperature increased more than 1.5 degrees Fahrenheit (Figure 1.3). In a recent report, researchers from Purdue University concluded that summer surface temperatures in Lake Michigan have warmed about 3 degrees since 1980. They warn that a warmer and wetter climate caused by global warming could displace cold water fish species. [5]

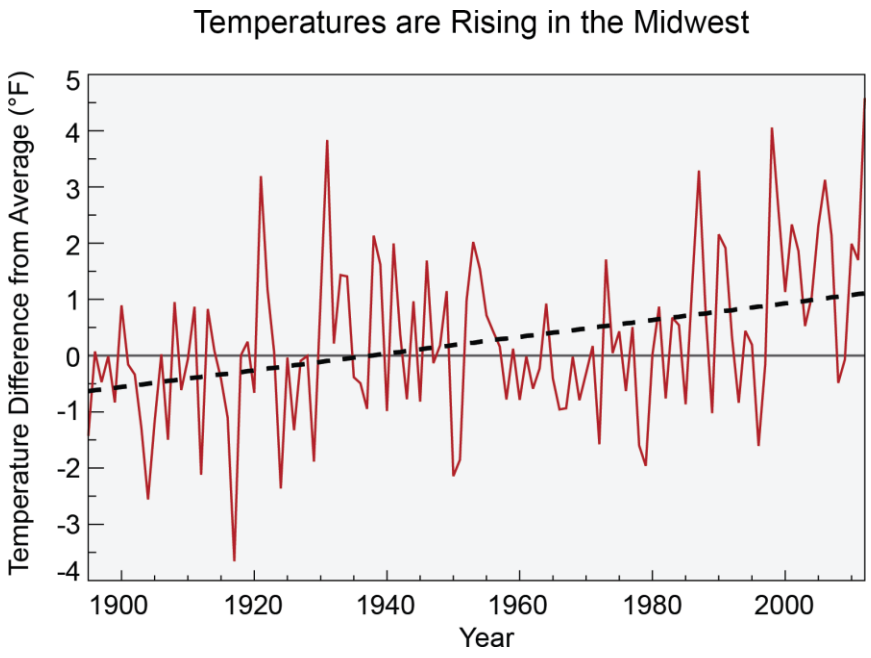


Figure 1.3
Annual average temperatures across the Midwest.[6]

The unpredictability of greenhouse gas-induced climate change is leading to increased extreme and abnormal weather events, that will impact agriculture yields in the Bloomington-Normal region and in Illinois as a whole. The effects of climate change will exacerbate as the Bloomington-Normal area becomes increasingly urbanized. Increased ground-level ozone, warmer temperatures and longer pollen seasons will lead to poor local air quality, and pose a greater health threat to Bloomington-Normal citizens.

Bloomington-Normal ozone levels are monitored and are subject to federal regulations that aim to protect our water, air land and public health. The Clean Air Act requires the National Environmental Protection Agency (EPA) to set National Ambient Air Quality Standards (NAAQS) for six common air pollutants, to help protect communities from poor air quality for extended periods of time.[7]

Of the six common air pollutants, ground-level ozone, or smog formed when pollution from vehicles, power plants and other industrial sources reacts with sunlight, has the most significant impact on our community. Ozone concentrations are associated with serious health effects for humans and can affect

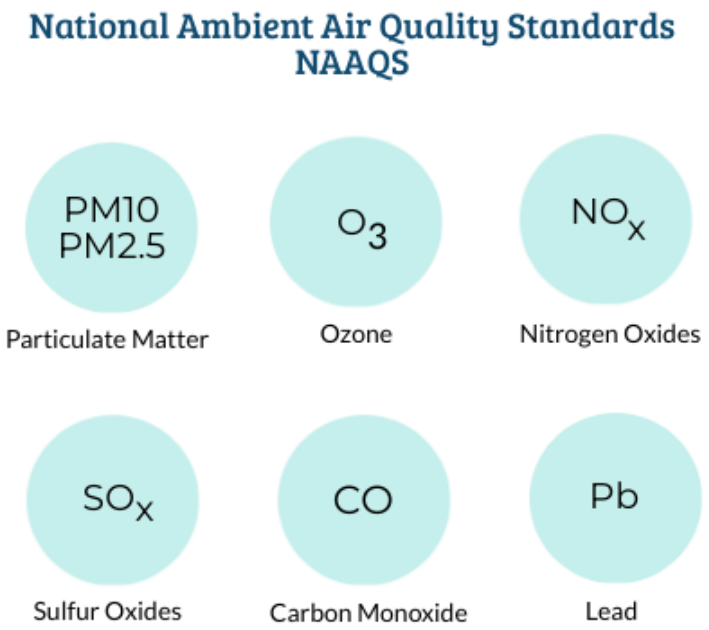
[5] Chicago Tribune, "Lake Michigan is warming. A new report says that could mean trouble for game fish." September 2018. http://www.chicagotribune.com/news/ct-met-lake-michigan-warming-20180913-story.html

[6] Pryor, S. C. (2014). Midwest. National Climate Assessment. Retrieved December 20, 2021, from https://nca2014.globalchange.gov/report/regions/midwest

[7] United States Environmental Protection Agency. (2021, February 10). NAAQS Table. EPA.gov. Retrieved December 20, 2021, from https://www.epa.gov/criteria-air-pollutants/naaqs-table#3

the growth of plants. In 2015, national air quality standards for ozone levels were tightened from 0.075 ppm to 0.07 ppm.

Figure 1.4
National Ambient Air Quality Standards (NAAQS)



McLean County is currently classified as an attainment area for the standards set for all six common air pollutants. This means local concentrations of pollutants are currently below the levels established by the National Ambient Air Quality Standards. Figure 1.5 shows that Bloomington-Normal's attainment levels met the previous 0.075 ppm levels, but exceeded the new 2015 0.07 ppm standard five times since 2006. Figure 1.6 is a snapshot of an interactive map sourced from the Environmental Protection Agency, and using data from 2012-2014, highlights that McLean County's past levels do not meet new 2015 standard for ozone levels. The financial cost of nonattainment is significant and can include loss of federal transportation funding and adoption of mandatory vehicle emissions testing. Tracking community emissions, forming an energy strategic plan, and working to reduce our emissions will help Bloomington-Normal maintain attainment levels in the future.

Figure 1.5

Design value ozone concentrations for Bloomington-Normal. The design value is the three-year average of the fourth high concentration. Design values greater than 0.075 ppm (through 2015) and greater than 0.07 ppm (2016 and after) is a violation of the National Ambient Air Quality Standard.[8]

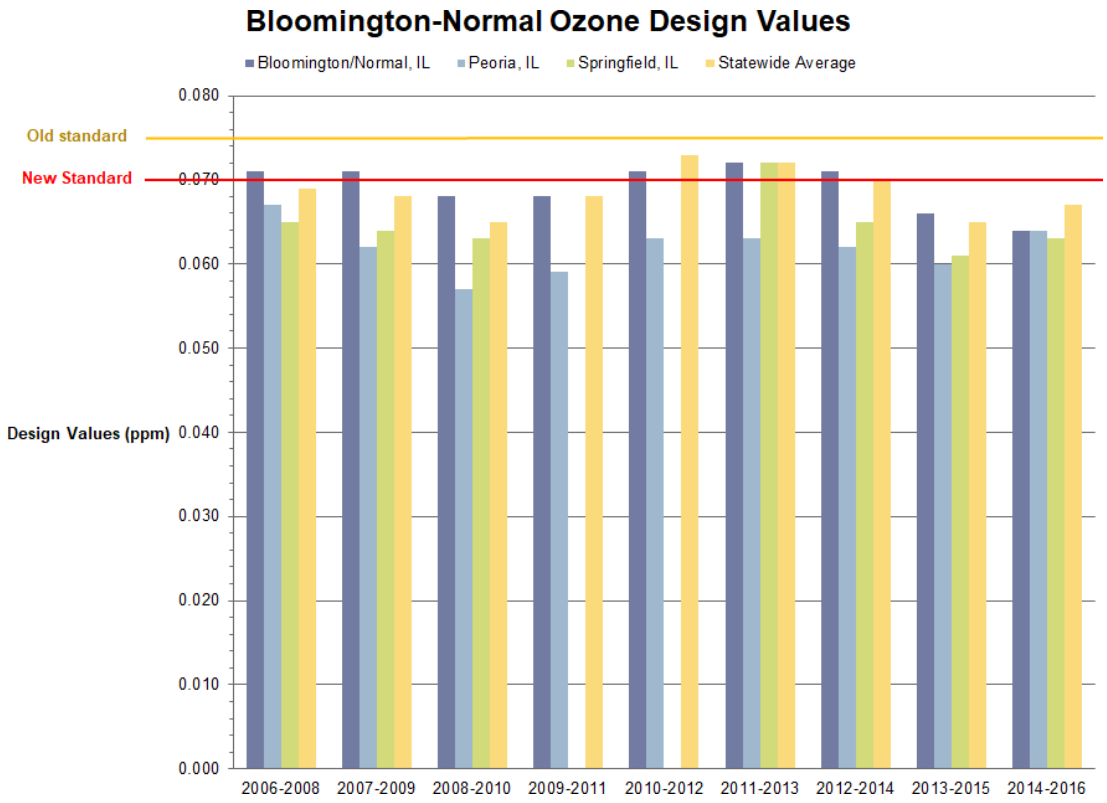
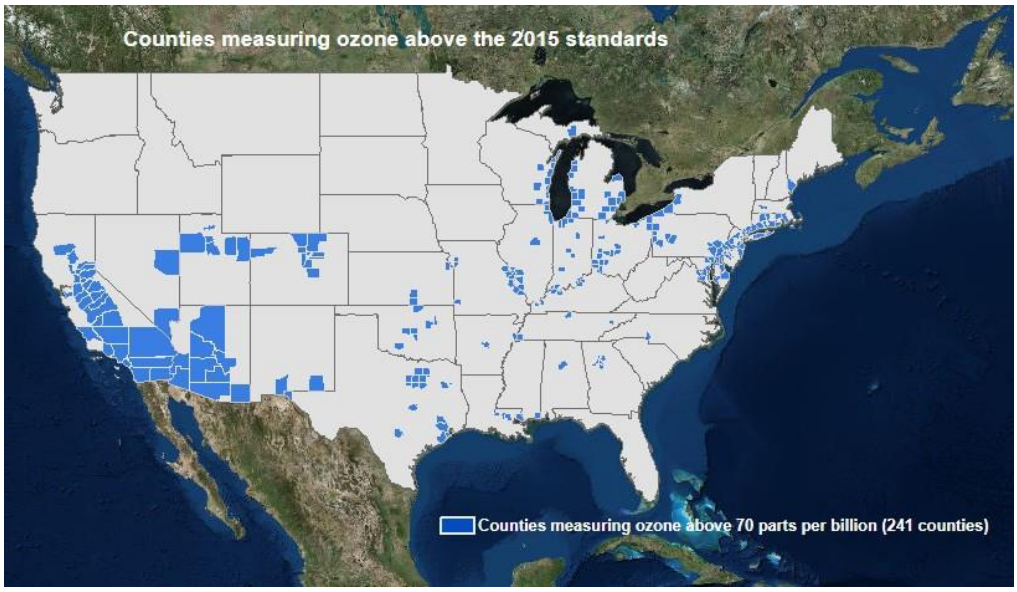


Figure 1.6

Counties measuring ozone above the 2015 Ozone Standards, based on 2012-2014 data.[9]



[8] Illinois Environmental Protection Agency Air Quality Reports, 2010-2016. https://epa.illinois.gov/topics/air-quality/air-quality-reports.html

[9] United States Environmental Protection Agency. (2017). 2015 Ozone Standards. EPA.gov. Retrieved December 20, 2021, from https://ozoneairqualitystandards.epa.gov/OAR_OAQPS/OzoneSliderApp/index.html#

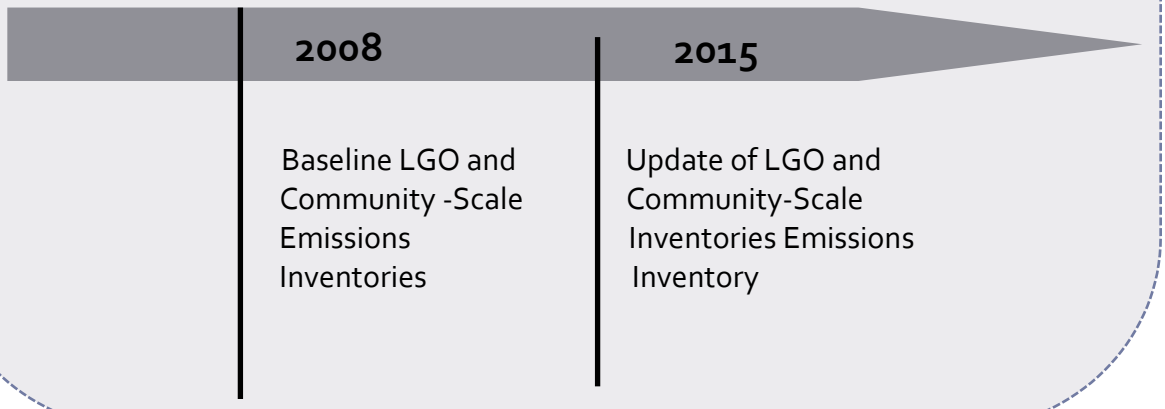
PURPOSE OF THIS REPORT

Since cities contribute about 70% of global greenhouse gas emissions and use two-thirds of the world's energy[10], measuring emissions at the city level is an important and necessary first step toward regulating our contribution to global emissions and combating global warming and climate change.

A greenhouse gas emissions inventory is a tool that many communities use to quantify their emissions and regularly assess their progress towards meeting federal, state and local emissions goals.

This GHG emissions inventory quantifies 2015 carbon dioxide emissions for the Bloomington-Normal community, comparing them to the 2008 baseline inventory. Both inventories gathered and analyzed Bloomington-Normal emissions data on two different scales: emissions produced by local government operations (LGO Emissions Inventory); and emissions produced by all sectors of Bloomington-Normal (Community -Scale Inventory).

The Ecology Action Center recommends this community reassess its greenhouse gas emissions at regularly planned intervals, ideally no less than every five years. These inventories, as well as other data, community plans, and reports will all help guide the Community Energy Strategic Plan. Using the data from regular GHG inventories, the goal is to take informed steps to lower Bloomington-Normal's risk of becoming a non-attainment community, reducing emissions of climate-changing greenhouse gases, conserving energy, saving money, preserving valuable natural resources, improving local air quality, and decreasing negative impacts on human health. Making choices that improve local air quality and slow climate change positively impacts the Bloomington-Normal community and the world.



[10] Iea. (2021, July). *Empowering cities for a net zero future – analysis*. IEA. https://www.iea.org/reports/empowering-cities-for-a-net-zero-future

WHAT IS A GREENHOUSE GAS INVENTORY?

A greenhouse gas inventory identifies and quantifies greenhouse gas pollution from human activities emitted into the atmosphere over a period of one year, and correlates this pollution with the activities that caused the emissions. A greenhouse gas emissions inventory also provides background on the methods used to make these calculations. Policy makers use GHG inventories to track emission trends, develop strategies to reduce GHG pollution, and assess progress toward meeting reduction goals.[11] The combustion of fossil fuels such as coal, petroleum, and natural gas for electricity generation and transportation are the primary sources of these emissions.

The International Panel on Climate Change (IPCC), an internationally acknowledged authority on climate change, identifies six greenhouse gases, but three of the six are most relevant and practical for most local inventories.

Figure 1.7
Greenhouse Gases Overview

INCLUDED	EXCLUDED
carbon dioxide (CO_2)	perfluorocarbons (PFCs)
methane (CH_4)	hydrofluorocarbons (HFCs)
nitrous oxide (N_2O)	sulfur hexafluoride (SF_6)

Accurate local data are not available to measure perfluorocarbons, hydrofluorocarbons, and sulfur hexafluoride, which typically result from industrial processes. Furthermore, while significantly more potent than carbon dioxide, these fluorinated gases represent only 3% of our nation's total emissions.[12] Accordingly, these gases were not included in this inventory.

Instead, this report focuses on accurately calculating quantities of carbon dioxide (CO_2), nitrous oxide (N_2O), and methane (CH_4) emissions. Following standards set by the International Association of Local Governments for Sustainability (ICLEI), these gases were aggregated and reported as carbon dioxide equivalents (CO_2e), a commonly used unit that combines greenhouse gases with diverse impacts on the earth's climate into one weighted unit. CO_2e volumes are expressed as the unit "metric tons (MT) of carbon dioxide equivalents," which equal 1,000 kilograms, or 2,204.6 pounds. Metric tonnage of carbon dioxide equivalents (MT CO_2e) is the internationally accepted unit for measuring greenhouse gas emissions. Emission quantities were converted to MT CO_2e using standardized conversions related to the potency (global warming potential) of those gases relative to carbon dioxide (Figure 1.8).

While all three of the gases that make up MT CO_2e are of concern, carbon dioxide is the most significant.

[11] Environmental Protection Agency. (n.d.). GHG Inventory Development Process and Guidance . EPA. https://www.epa.gov/climateleadership/ghg-inventory-development-process-and-guidance

[12] Environmental Protection Agency. (n.d.-b). Global Greenhouse Gas Emissions Data . EPA. https://www.epa.gov/ghgemissions/global-greenhouse-gas-emissions-data

Figure 1.8
Global Warming Potential [13] & U.S. percentages of greenhouse gases.

Gas	Abbreviation	Global Warming Potential[13]	Percentage of U.S. Emissions
Carbon Dioxide	CO_2	1	82%
Methane	CH_4	21	9%
Nitrous Oxide	N_2O	310	6%
Hydrofluorocarbons	PFCs	43-11,700	3%
Perfluorocarbons	HFCs	6,500-9,000	
Sulfur Hexafluoride	SF_6	23,900	

Expressing total volumes of greenhouse gases in one universal unit allows for comparisons of emissions in terms of one common "currency;" however, it is important to note when an activity's emissions consist of higher levels of a more potent gas, such as methane or nitrous oxide. Although CO_2 represents 82% of all emissions released by human activity, the impact of other gases on climate change could be more significant.

BENEFITS OF GHG EMISSION INVENTORIES

The value of a GHG inventory goes beyond the obvious goal of quantifying and identifying greenhouse gas emissions. A GHG inventory allows you to identify and target the largest sources of greenhouse gas emissions and to track those emission trends over time. Inventories can be used to develop mitigation strategies and to measure progress made towards reaching emissions goals. The information can be shared with stakeholders and policy makers to help further regulate emissions and protect the health of community members.

Risk Management and Voluntary Action

By measuring emissions, Bloomington-Normal will have a tool to prepare for a carbon-constrained future that will document actions undertaken to reduce GHG emissions. Understanding and tracking emissions will allow for climate change risk management approaches such as mitigation and adaptation efforts. Voluntary reporting of GHG emissions by communities may ultimately reduce the need for more severe reduction mandates by higher levels of government.

[13] Global Warming Potential is a relative measure of how much heat a greenhouse gas traps in the atmosphere. See Appendix A for a definition.

Identification of Inefficiencies and Cost-Savings Opportunities

Accounting for emissions creates opportunities to identify ways to improve efficiency by reducing materials and energy inputs, waste, and emissions. The benefits of doing so include cost savings, emissions reductions, and future cost control for activities that have high carbon intensity. Using this information, appropriate and actionable goals for reducing emissions can be made, making operations more cost-effective.

Leadership

While many central Illinois communities are working to reduce their carbon footprint, relatively few have completed a baseline GHG emissions inventory. Like many past initiatives, Bloomington-Normal will set an example for other central Illinois communities by taking responsibility for our impact on the climate. Sharing the lessons learned throughthis experience will empower others to follow suit for even greater impact.

Mitigation and Adaptation

After completing a baseline inventory quantifying local GHG emissions, Bloomington-Normal can next identify and implement strategies to reduce those emissions. At the same time, the community can begin planning adaptive strategies for a changing environment. Examples might include using water resources more efficiently, adapting building codes to new climate conditions and extreme weather events, and choosing tree species less vulnerable to storms and drought. Greenhouse gas inventories are essential to informing any climate action plan.

2 METHODOLOGY

EXISTING STUDIES

Bloomington-Normal's first GHG emissions inventory was conducted in 2008. This was the earliest year consistent and complete data were available from local government operations. The 2008 inventory is the baseline, and a comparison point for all future inventories and analysis. The 2008 Bloomington-Normal Greenhouse Gas Emissions Inventory is available on the Ecology Action Center's website.

SELECTED PROTOCOL

The 2008 and 2015 inventories were conducted according to the International Local Government Greenhouse Gas Emissions Analysis Protocol (IEAP) produced by ICLEI. IEAP protocol for each inventory provides standardized principles, approach, methodology, and procedures for reporting GHG emissions inventory as completely, transparently, and accurately as possible. By using IEAP protocols, the results of this inventory can be compared with other municipalities both nationally and internationally.

This inventory was completed according ICLEI Protocol's five principles. A summary of these principles may be found in the Appendix of this document.

Local Government Operations (LGO) Emissions Inventory

Measures GHG emissions produced by local government operations of the City of Bloomington and the Town of Normal. Includes emissions produced by stationary energy, LGO vehicles, public transit, and wastewater treatment. This inventory is useful because it's the area where local governments have direct control over emissions and therefore the greatest potential to implement changes.

Community-Scale Emissions Inventory

Measures GHG emissions produced by all non-governmental sectors within the political boundaries of the Bloomington-Normal community. Includes stationary energy, solid waste, on-road transportation, rail travel, and air travel.

ICLEI Protocol Purpose and Objectives[14]	
Local Government Inventory Protocol	**Community Inventory Protocol**
⇒ Enable local governments to develop emissions inventories following internationally recognized GHG accounting and reporting principles with attention to the unique context of local government operations ⇒ Advance the consistent, comparable and relevant quantification of emissions and appropriate, transparent, and policy-relevant reporting of emissions ⇒ Enable measurement towards climate goals ⇒ Promote understanding of the role of local government operations in combating climate change ⇒ Help create harmonization between GHG inventories developed and reported to multiple programs.	⇒ Enable local governments to estimate and report on GHG emissions associated with their communities in order to measure progress towards GHG emission reduction goals. ⇒ Use best practice methods that align, where possible, with nationally and internationally recognized GHG accounting and reporting principles, as well as with emerging reporting processes or registries. ⇒ Provide local governments with an assessment of GHG emissions associated with their communities so that they – and others – can make more informed decisions about where and how to pursue GHG emissions reduction opportunities. ⇒ Help local governments engage with residents, businesses, and other stakeholders about opportunities in their communities for reducing GHG emissions. ⇒ Advance consistent, comparable, and relevant quantification of GHG emissions and appropriate, transparent, and policy-relevant reporting of GHG emissions to allow communities to compare their baseline emissions.

[14] ICLEI – Local Governments for Sustainability USA. (2021, February 14). GHG protocols. Greenhouse Gas Protocols. Retrieved December 20, 2021, from https://icleiusa.org/ghg-protocols/

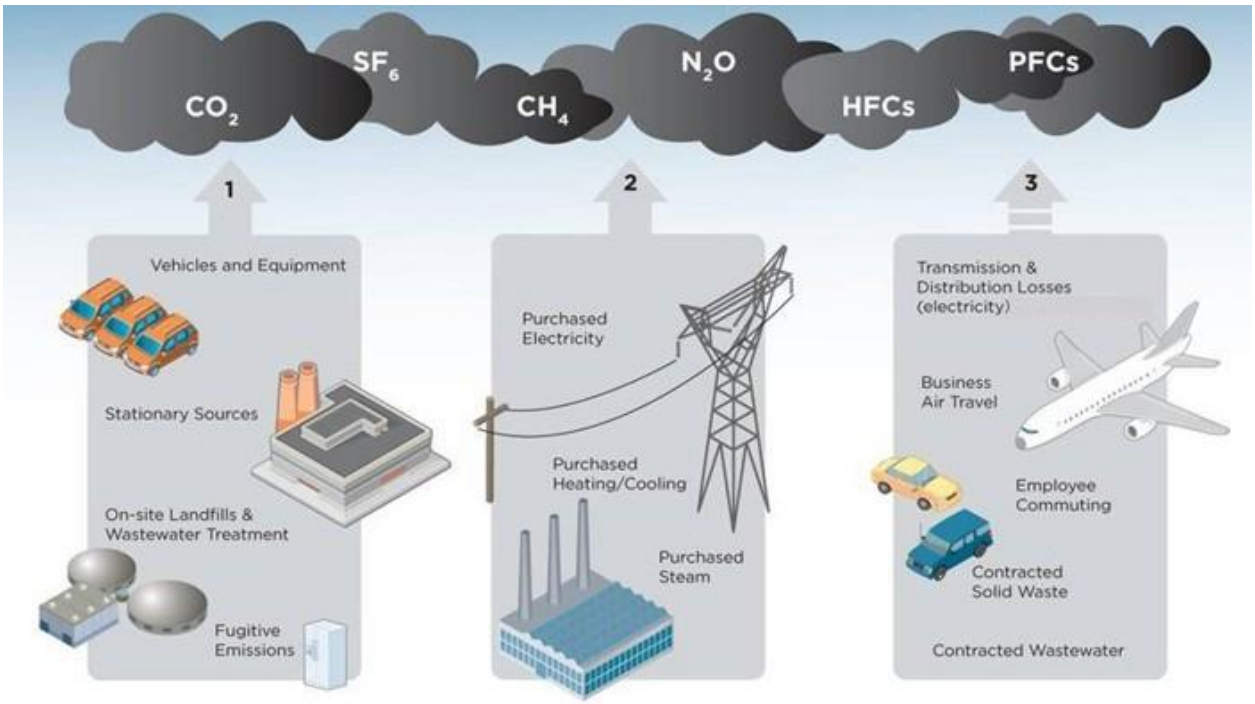
EVALUATING BY SCOPE AND SECTOR

This inventory includes the most important sources of greenhouse gas emissions within Bloomington-Normal's political and organizational boundaries. ICELI's IEAP Protocol calls for reporting of emissions by scope. Scope entails categorizing emissions based on whether they are direct or indirect sources. They are then assigned to an entity relative to the degree that it controls or owns the sources that are attributed to it. This allows local governments to appropriately distinguish direct and indirect emissions and create relevant emission reduction policies. It is important to note that many of the sources of emissions attributable to Bloomington-Normal may not be produced here. For example, out-of-state coal-fueled power plant supplying electricity to the grid will generate greenhouse gases even though it is not located here. Although the emissions from this plant will not directly impact the local community, Bloomington-Normal is still responsible for a portion of its emissions when we purchase energy from the grid.

Identifying emissions scopes avoids double counting emissions and ensures inclusion of all relevant information. Although scopes are a useful way of illustrating emissions from individual organizational entities, such as business or LGOs operations, the Community-Scale Protocol does not use scopes as a framework for categorizing emissions. This is because the organization-related definitions of scopes do not translate to the community scale in a manner that is clear and consistently applicable as an accounting framework.[15]

Figure 1.9

Scopes by which to assess the GHG emissions of Local Government Organizations[16]

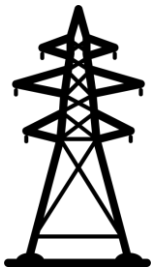


[15] World Resources Institute. (n.d.). Global protocol for community-scale greenhouse gas emission inventories. https://ghgprotocol.org/sites/default/files/ghgp/standards/GHGP_GPC_0.pdf

[16] Environmental Protection Agency. (n.d.-c). Greenhouse Gases at EPA . EPA. https://www.epa.gov/greeningepa/greenhouse-gases-epa

Scope 1

Direct GHG emissions from sources owned or controlled by the local government, residents, and commercial property owners in Bloomington-Normal. This includes the mobile combustion of fossil fuels by fleet vehicles, personal and public transportation, and the stationary combustion of fossil fuels used in boilers, furnaces, and processing equipment.



Scope 2

Indirect GHG emission sources from purchased electricity that is generated at facilities not owned by Bloomington-Normal or private properties. Scope 2 includes all emissions generated in the production of electricity consumed by local government facilities.

Scope 3

Includes all other indirect emissions not covered in Scope 2, such as emissions resulting from the extraction and production of purchased materials and fuels, transportation related activities in vehicles not owned or controlled by the local government (e.g., employee commuting, outsourced activities, waste disposal).

Sectors refer to the entity that creates emissions. Typical sectors include residential, commercial, industrial, and municipal. Within an LGO inventory, sectors may be further subdivided.

This LGO Emissions Inventory examines municipal sector emissions for both the Town of Normal and City of Bloomington. Data were analyzed for three main sub-sectors:

- Energy used by each municipality's buildings and facilities
- Fuel used by each municipality's vehicle fleet
- Fuel used by the public transit servicing both municipalities
- Energy and fuel used by the Bloomington-Normal Water Reclamation District (BNWRD), which services both cities

For LGO Inventory, each sector is assigned a scope, to help identify whether emissions produced by the LGOs come from direct or indirect sources.

The waste landfilled category is normally split into residential, commercial, industrial, and municipal sectors. However, because the data received were not segregated, these emissions were classified as a mixed-source sector under the community-scale inventory.

Figure 2.0
Data collection levels for the LGO and Community-Scale Inventories

LGO Inventory: Municipal Emissions				
Source	**Type**	**Category**	**Sector**	**Scope**
Energy	Stationary Combustion	Electricity	LGO buildings/facilities	2
			BNWRD building/facilities	2
		Natural Gas	LGO building/facilities	1
			BNWRD building/facilities	1
	Transportation	Gasoline	LGO Vehicle Fleets	1
			LGO Employee	3
			BNWRD fuel use	1
		Diesel	LGO Vehicle Fleets	1
			LGO Public Transit Fleet	1
			BNWRD fuel use	1
Waste	Wastewater treatment	Wastewater treatment	BNWRD wastewater treatment process	1

Community-Scale Inventory: Residential, Commercial & Industrial Emissions			
Source	**Type**	**Category**	**Sector**
Energy	Stationary Energy	Electricity	Residential
			Commercial
			Industrial
		Natural Gas	Residential
			Commercial
			Industrial
	Transportation	Vehicular Transportation	Mixed Residential,
		Air Travel	Passenger & Commercial
		Railroad	Passenger & Commercial
Waste	Waste	Waste Landfilled	Mixed Residential, Commercial, Industrial

DATA & CALCULATIONS

Municipal staff members, utility providers, and local organizations provided the data used for both the LGO and Community-Scale GHG inventories in the form of utility bills, fuel records, energy usage reports, and correspondence.

Since the completion of the 2008 baseline inventory, the Ecology Action Center invested in new web-based software for energy and emissions management called ClearPath. ClearPath is a tool developed by ICLEI that helps local communities store data, perform calculations, and develop protocol-compliant inventories. The 2008 baseline inventory was completed using a different software. To ensure cohesive results between both inventories, the 2008 data collected were also entered into the ClearPath software and reprocessed. As a result, emission quantities for 2008 reported here will likely vary from the quantities reported in the initial 2008 GHG report.

Since direct measurement of all carbon emissions is not possible, a GHG inventory must rely upon indirect measurements which are extrapolations of emissions from annual consumption data like the number of kilowatt hours of electricity used, vehicular miles traveled, tons of waste landfilled, gallons of wastewater processed, etc. The EAC used the ClearPath software to calculate carbon emission equivalents from most of the annual consumption data. In a few cases, however, manual calculations were necessary to estimate carbon equivalents.

ClearPath software allows each community to manage and utilize unique emissions factors according to the inventory year and community's location. These emissions factors play a key role in the conversion of energy usage and waste disposal data into carbon dioxide equivalents. For the purposes of this inventory, the EAC chose to use standard emissions factors based on national averages. The EAC did not customize these values according to local or regional energy sources, weather conditions, or other factors.

Overall, this inventory used a simplified data collection strategy to encompass a fairly broad scope of emissions. While some omissions are inevitable, this approach allows for reliable and reproducible process that generates a dependable record of LGO and Community-Scale greenhouse gas emissions.

Stationary Energy

Ameren, Nicor Gas, and Corn Belt provided access to LGO and community stationary energy (LGO buildings/facilities and community residential/commercial and industrial energy) data in the form of utility bills, fuel records, energy usage reports, and correspondence.

Public Transit Fleet

Connect Transit (formerly the Bloomington-Normal Public Transit System) supplied public transit fuel data. Transit route mileages were calculated by the McLean County Regional Planning Commission. Connect Transit is an inter-city system serving both Bloomington and Normal, so it is not possible to determine the exact proportion of gallons of diesel (and therefore GHG emissions) attributable to each

municipality. As the next most accurate means of segregating these emissions, the EAC divided the total volume proportionally by the total mileage of the routes in each municipality in 2008. Route lengths were measured using GIS. The same proportion of total route miles for both the 2008 and 2015 inventories were used. These segregated emissions are reflected in the transportation and fuel emissions totals in the LGO inventory where the results are shown by municipality. Segregated diesel and gasoline amounts were not available. However, since the majority of Connect Transit's fleet is diesel, carbon dioxide emissions are based on units of diesel fuel used.

The table below shows the proportion of Bloomington-Normal public transit route miles attributed to each LGO.

Municipality	Proportion of Total Route Miles
Bloomington	65.70%
Normal	34.30%

Employee Commute

Municipal employee commute emissions data were not included in the 2008 baseline inventory, because there was not an accurate means of segregating the data. For the 2015 inventory, the Town of Normal staff used ArcMap software to estimate average annual vehicular miles traveled (VMT) by employees according to distance of their residence from City Hall. The VMT data were then used to estimate employee commute emissions for the Town of Normal. Because of the demographic similarities between Town of Normal and City of Bloomington, this report applied the Town of Normal VMT ratios to total City of Bloomington in order to estimate employee commute emissions for the employees of the City of Bloomington.

Wastewater Treatment

The Bloomington-Normal Water Reclamation District provided wastewater treatment data. The table below shows the population proportion used to apportion fuel and energy emissions to each LGO.

Municipality	2008 % Population	2015 % Population
Bloomington	58.40%	59.05%
Normal	41.60%	40.95%

Vehicle Fleet

Bloomington and Normal municipal staff provided segregated fuel usage (diesel and gasoline) data for their on-road and off-road municipal vehicle fleets in the form of bills, fuel records and correspondence. Emissions from diesel and gasoline fuel usage were calculated separately.

Vehicular Miles Traveled

Average annual vehicular miles traveled for 2008 and 2015 was obtained from the *Travel Statistics* report that the Illinois Department of Transportation publishes annually.[17] This data includes all VMT for the "Greater Bloomington Urbanized Area" (GBUA). Because the GBUA also includes Downs and Towanda, the total number of VMT for each municipality based on its proportion of linear miles was prorated. Not only is this the most reliable way of finding Bloomington's and Normal's shares of the VMT, but it also allows for easy comparison of future VMT from GHG inventories against the baseline, since the boundaries of the GBUA are subject to change. For the 2015 update, the same linear mile proportions were used for both the 2008 report and the 2015 update. Since local information on fuel type and vehicle class were not
available, the following default standard values provided by ClearPath were used: gasoline passenger vehicles; 60.6% diesel passenger vehicles; 0.3% gasoline light trucks; 32.4% diesel light trucks, 1.3% gasoline heavy trucks, 0% diesel heavy trucks: 5.4%.

The table below shows the proportion of total urbanized area mileage applied to VMT of the Bloomington-Normal community.

Municipality	% of miles
Bloomington	61.30%
Normal	35.36%

Solid Waste

The Ecology Action Center calculates annual community-wide waste and recycling rates by surveying local waste haulers, recyclers, municipalities, corporations, and other entities in McLean County.[18] Population proportions from 2008 and 2015 were used to allocate solid waste volumes for the Bloomington-Normal community. While breakdown of this information into separate sectors (municipal, residential, commercial, and industrial) would be beneficial to GHG emission analysis, it is not currently possible due to local waste collection and reporting practices.

Within the landfill, biologic components are broken down into simpler carbon compounds that generate a mix of CH_4 and CO_2 gas. The methane emissions reported in this report include a 10% oxidation factor and a default 75% collection efficiency rate provided by the ClearPath software, which are applied to calculations for landfills with gas collection systems. Total GHG emissions are calculated by applying their associated global warming potential values to express emissions in terms of CO_2 equivalents.

[17] Annual Travel Statistics Report. Illinois Department of Transportation. 2008: https://rosap.ntl.bts.gov/view/dot/6432. 2015: https://idot.illinois.gov/content/dam/soi/en/web/idot/documents/transportation-system/reports/opp/travel-stats/2015_its.pdf

[18] Recycling and waste generation rates are determined by protocols set by Illinois Environmental Protection Agency and Illinois Counties Solid Waste Management Agency in Recycling Measurements Working Group Final Report 1997. Contact the Ecology Action Center in Normal, Illinois for recycling and landfill waste rates for McLean County.

In addition to the emissions produced by decaying landfilled waste, emissions in this section also include CO_2 emissions associated with powering the equipment necessary to manage the landfill.

GHG emissions associated with the landfill facility's stationary energy and the collection and transport of solid waste were not included in this section as it assumed these emissions are captured in other sections of the community scale inventory. The table below shows the proportion of county solid waste attributed to each LGO, according to population.

Municipality	2008 % County Population	2015 % County Population
Bloomington	44.20%	45.1%
Normal	31.40%	31.3%

Rail Travel

The EAC submitted a Freedom of Information request to Amtrak in order to obtain route frequency and fuel usage rate data on local passenger-rail services. In a new freight study, the McLean County Regional Planning Commission (MCRPC) calculated in-boundary track mileages for both passenger and commercial rail lines. Calculating emissions for commercial rail lines involves gathering data for both line-haul locomotives and switching locomotives in rail yards. Although Bloomington-Normal area includes at least one rail switching yard, the EAC was unable to estimate emissions produced by the yard due to lack of local information available.

The MCRPC study provided information on the total annual tonnage of goods moved through McLean County in the year 2014, as well as daily frequency of Union Pacific and Norfolk Southern trains passing through Bloomington Normal. The crude estimate of local GHG emissions from the commercial rail was generated by prorating annual tonnage amounts according to the proportion of commercial rail trips through the Bloomington-Normal community. The table below shows key figures used to calculate rail travel-related GHG Emissions.

	Miles of track within B-N boundaries	Proportion annual commercial rail trips through county (2014)	Annual tons carried through B-N community (2014)
Norfolk Southern	5.77	0.18	571,428.57
Union Pacific	5.68	0.61	1,942,857.14
	Miles of track	**Trains per day**	**Fuel Usage Rate**
Amtrak	5.68	10	2.3 (gallons/mile)

Air Travel

The Central Illinois Regional Airport (CIRA) supplied fuel data to estimate emissions related to air travel. Air travel data were not included in the 2008 baseline inventory because of uncertainty and difficulty accurately portraying the relative share of emissions from local residents' travel and/or air travel that occurs only within our geographic boundaries. Although CIRA, located in Bloomington, also serves residents from outside the Bloomington-Normal city limits, emissions are typically allocated to the primary community generating demand for the use of the airport, which would be the cities of Bloomington and Normal.

IEAP Protocol provides a means of apportioning air travel emissions to a specific community based on the amount of travel associated with its residents, the EAC added air travel emissions data to the 2015 community-scale inventory. It's important to note that direct and indirect emissions are rarely more than 5% of total airport emissions and are already captured by the stationary energy community totals. CIRA was able to provide us with 2015 aircraft fuel usage and 2015 ground fleet/support equipment fuel usage, which are not accounted for elsewhere in the inventory.

INVENTORY LIMITATIONS

- ICLEI Protocol recommends identifying individual energy usage amounts for a variety of LGO operations: buildings and facilities, backup generator fuel, water transport, and streetlight and traffic signals.
  Due to limitations in data reporting and collection at the municipal level, numbers for these operations could not be segregated and are instead generalized by the building/facility totals. Unmetered street lights, which operate at a per fixture cost, are not included in the building/facility emission totals for the City of Bloomington.
- ICLEI Protocol recommends segregating community stationary energy data into residential, commercial and industrial sectors. Due to the size of the community and sensitivity of information, segregated amounts were not available.
- Aircraft emissions data, airport ground fleet emissions data, and employee commute data are all new additions to the 2015 inventory, which should be taken into consideration when comparing the change in total emissions between 2008 and 2015.
- Consumption, fugitive, refrigerant, and industrial process emissions were not included in this inventory because the data were unavailable. Emissions from leaks, such as natural gas, are not included.
- This inventory only captures emissions from activities occurring within city boundaries. This includes carbon emissions associated with importing, exchange and production of food, goods and services in this community. Commercial agriculture, forestry, and land use changes were not considered significant activities within the Bloomington-Normal city limits and were therefore not included.
- This inventory only reports on three of the six total greenhouse gases.

3 LOCAL GOVERNMENT OPERATION EMISSIONS

SUMMARY OF RESULTS

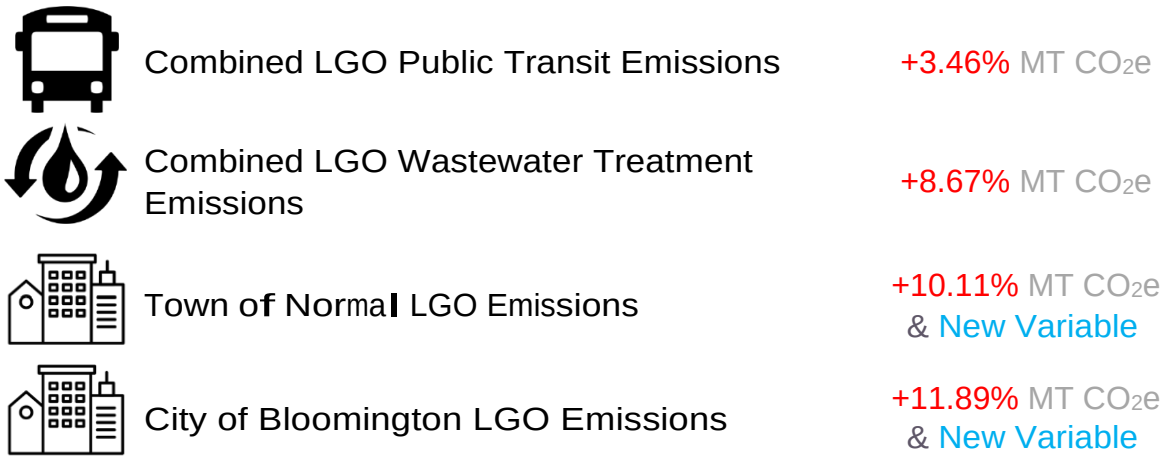
The LGO inventory examines GHG emissions associated with both the City of Bloomington and Town of Normal. Total GHG emissions for each LGO in this inventory include emissions produced from energy and fuel used by municipal buildings and facilities, fleet vehicles, employee commute, public transportation, and wastewater treatment. Data on electricity, natural gas, gasoline, diesel energy, and fuel consumption were obtained directly from staff or utility bills from each LGO. Emissions inventory protocols provide a way to convert these energy and fuel quantities into carbon dioxide equivalents.

Public transportation and wastewater treatment services are both provided to the LGOs by third parties (Connect Transit and the Bloomington Normal Water Reclamation District), therefore public transit and wastewater emissions are examined separately from the rest of LGO emissions. Results are then prorated according to route mileage and population data for each community so those numbers can be included in each LGO analysis. At this time, segregated information for streetlights, traffic signals, and water distribution is not available; energy usage for these categories is assumed to be included in the buildings and facilities energy usage totals provided by the LGOs.

GHG emission totals have increased overall since the 2008 baseline year, with the largest increase coming from direct GHG emissions (scope 1). Understanding LGO-related GHG emissions provides local municipalities with the information they need to reduce their impact on global climate change.

Figure 2.1

Percent change in LGO emissions between 2008 and 2015. These changes do not include new 2015 variables.



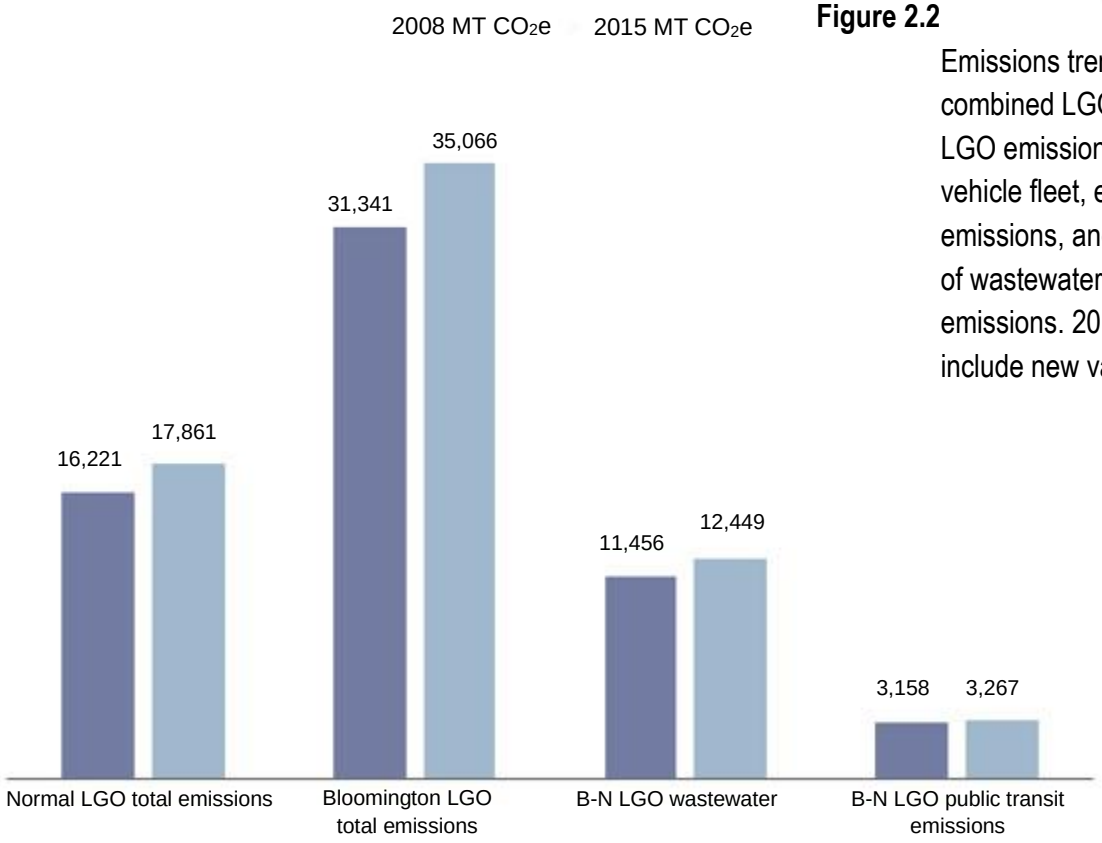
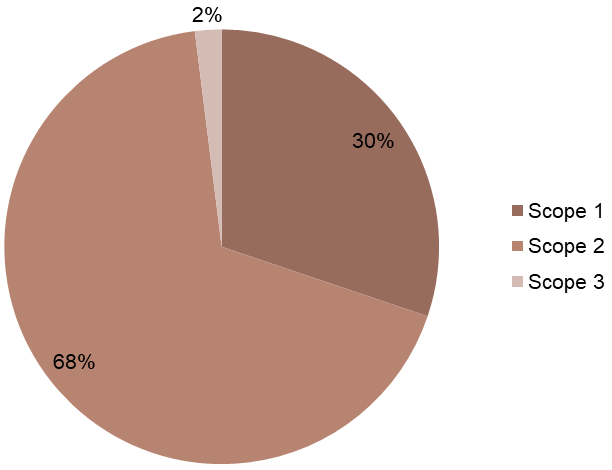


Figure 2.2

Emissions trends for area LGO and combined LGO sources. Municipal LGO emissions include stationary, vehicle fleet, employee commute emissions, and associated portions of wastewater & public transit emissions. 2015 totals do not include new variables.

Figure 2.3

2015 Town of Normal LGO GHG Emissions by scope and change since baseline year



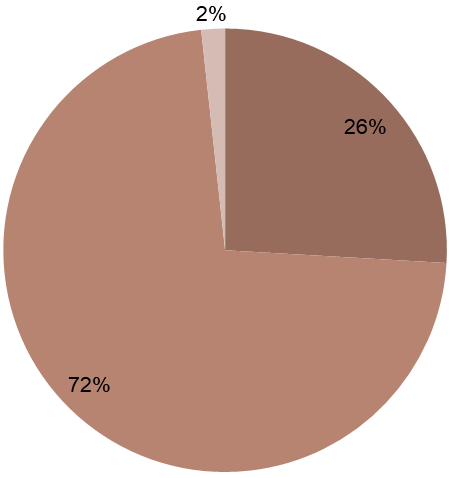
Scope 1 +14.68% MT CO_2e

Scope 2 +8.19% MT CO_2e

Scope 3 New Variable—

Figure 2.4

2015 City of Bloomington LGO GHG Emissions by scope and change since baseline year.



Scope 1 +13.79% MT CO_2e

Scope 2 +11.22% MT CO_2e

Scope 3 New Variable—

PUBLIC TRANSIT EMISSIONS (COMBINED LGO)

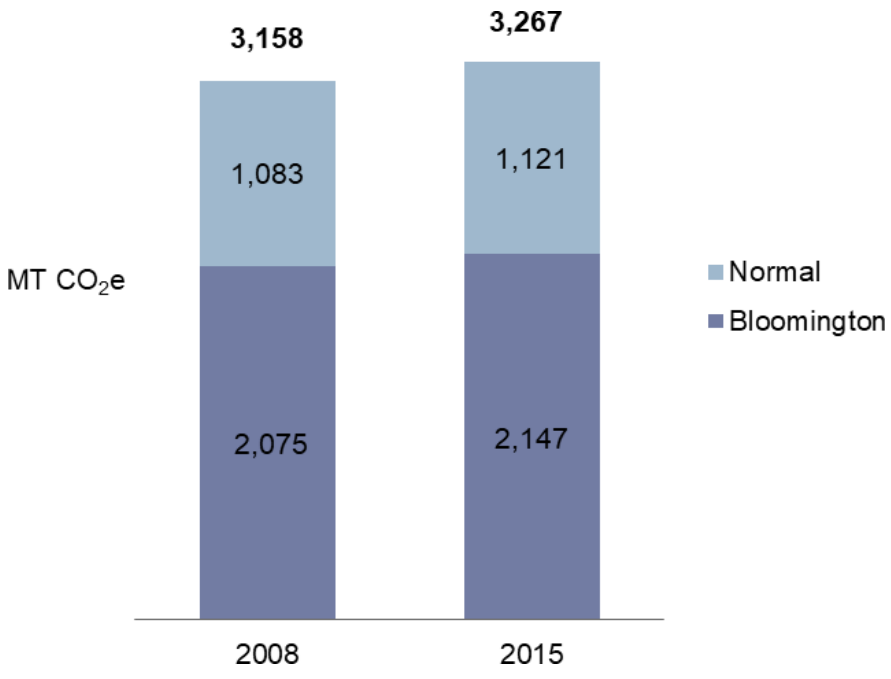
Connect Transit provides public transportation services to both Bloomington and Normal. As a public service entity, its emissions fall within the LGO inventory. In 2008, Connect Transit provided public transportation to the Bloomington-Normal community through 11 fixed routes with approximately 27 buses and vans running at a time (maximum service). The number of fixed routes remained the same in 2015, but the number of buses and vans in max service increased to 31.

B-N LGO Public Transit Emissions +3.46% MT CO_2e

Determining the exact proportion of gallons of diesel (and therefore GHG emissions) attributable to Bloomington and Normal respectively is not realistic. To segregate the emissions as accurately as possible, the EAC divided the total volume proportionally by the total mileage of the routes in each municipality. Route lengths were measured using GIS. The same route lengths were used for both 2008 and 2015 inventories. These segregated emissions are reflected in the transportation and fuel emission totals in the LGO inventory where the results are shown by municipality. The proportion of miles used to segregate totals by municipality can be found in the methodology section.

Unfortunately, segregated fuel amounts for diesel and gasoline were not available. However, since the majority of fuel used is diesel, GHG emission quantities (expressed in metric tons of CO_2 equivalents) were calculated based on total diesel fuel amounts.

Figure 2.5
Total and Segregated Emissions from LGO Public Transit Fleet (based on diesel fuel amounts).



WASTEWATER TREATMENT EMISSIONS (COMBINED LGO)

Wastewater treatment processes are used to remove soluble organic matter, suspended solids, pathogenic organisms, and chemical contaminants from the water we drink and use on a daily basis. Wastewater treatment can result in many different sources of GHG emissions. In addition to the stationary and mobile emissions produced by the wastewater treatment plant's facilities and equipment, the processes of water treatment generate greenhouse gases, including carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). Recall that the Global Warming Potential (GWP) of methane is 21 times more potent than carbon dioxide (Figure 1.8). Likewise, nitrous oxide has a GWP 310 times that of carbon dioxide.

Bloomington-Normal Water Reclamation District provides centralized, conventional wastewater treatment for both Bloomington and Normal. BNWRD practices anaerobic digestion and nitrification, they do not have a lagoon system and they do not incinerate solids. Representatives from BNWRD supplied the data on 2008 and 2015 utility and fuel usage, as well as figures that were necessary for estimating methane and nitrous oxide emissions.

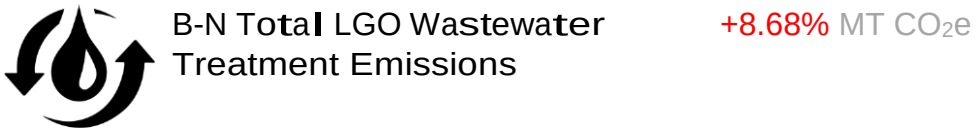
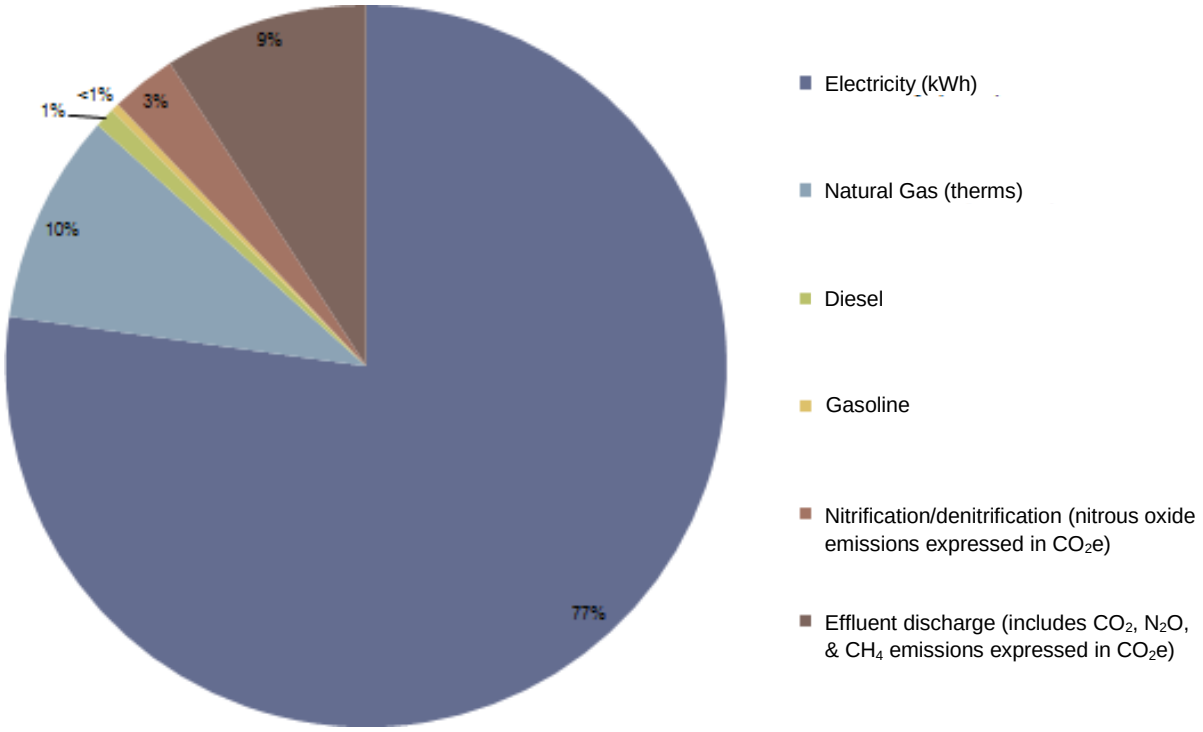


Figure 2.6
MT CO_2e Emissions from Wastewater Treatment by Source

Source	2008 MT CO_2e	2015 MT CO_2e
Electricity (kWh)	9,203	9,609
Natural Gas (therms)*	665	1,176
Diesel	121	112
Gasoline	27	46
Process emissions of nitrification/denitrification, based on population (N_2O emissions expressed in CO_2e)	348	364
Effluent discharge, based on population (includes CO_2, N_2O & CH_4 emissions expressed in CO_2e)	1,092	1,142
TOTAL (does not include digester gas combustion)	**11,456**	**12,449**

*26% of natural gas used in 2015 was biogas; the remainder was service source

Figure 2.7
2015 Proportions of Wastewater Treatment Emissions by Source



Wastewater treatment emissions cannot be accurately segregated by volume of wastewater treated for each municipality. Instead, assuming a similar average per capita usage rate between Bloomington and Normal, the total wastewater treatment emissions were proportionally split by the 2008 and 2015 populations where results are shown by municipality. Population proportions used to segregate total wastewater treatment emissions by municipality can be found in the Methodology chapter.

The total emissions from wastewater treatment increased from 2008 to 2015. However, except for a slight decrease in electricity usage and a slight increase in natural gas usage, proportions of GHG emissions produced by each fuel and energy source remain fairly consistent from 2008 to 2015.

Figure 2.8
Segregated LGO Wastewater Treatment Emissions by municipality

Municipality	2008 MT CO_2e	2015 MT eCO_2e
Bloomington	6,689	7,351
Normal	4,765	5,097
TOTAL	**11,460**	**12,454**

TOWN OF NORMAL LGO EMISSIONS

The Town of Normal provided energy consumption data in the form of monthly electric and natural gas bills and fuel records. The annual volumes of each energy source were converted to carbon dioxide equivalents (CO_2e) to allow for easier comparisons.

Data to calculate employee commute emissions was not available in 2008, but the Town of Normal provided information that allowed us to estimate these emissions for 2015 based on average annual VMT.

Normal LGO's building/facility emissions can be segregated into emissions produced by electricity use and emissions produced by natural gas use. The building and facility emissions sector includes emissions resulting from all city-owned buildings, processes and facilities such as streetlight, traffic signals and water transport and distribution. Similarly, LGO vehicle fleet emissions include emissions from both diesel and gasoline usage.

To arrive at the total emissions generated by the Normal LGO alone, these energy emissions were combined with Normal's share of public transportation and wastewater treatment emissions.

Town of Normal LGO emissions have increased over 10% since the 2008 baseline inventory.

Figure 2.9
Normal LGO total Greenhouse Gas Emissions by sector. Total change does not include new variables.

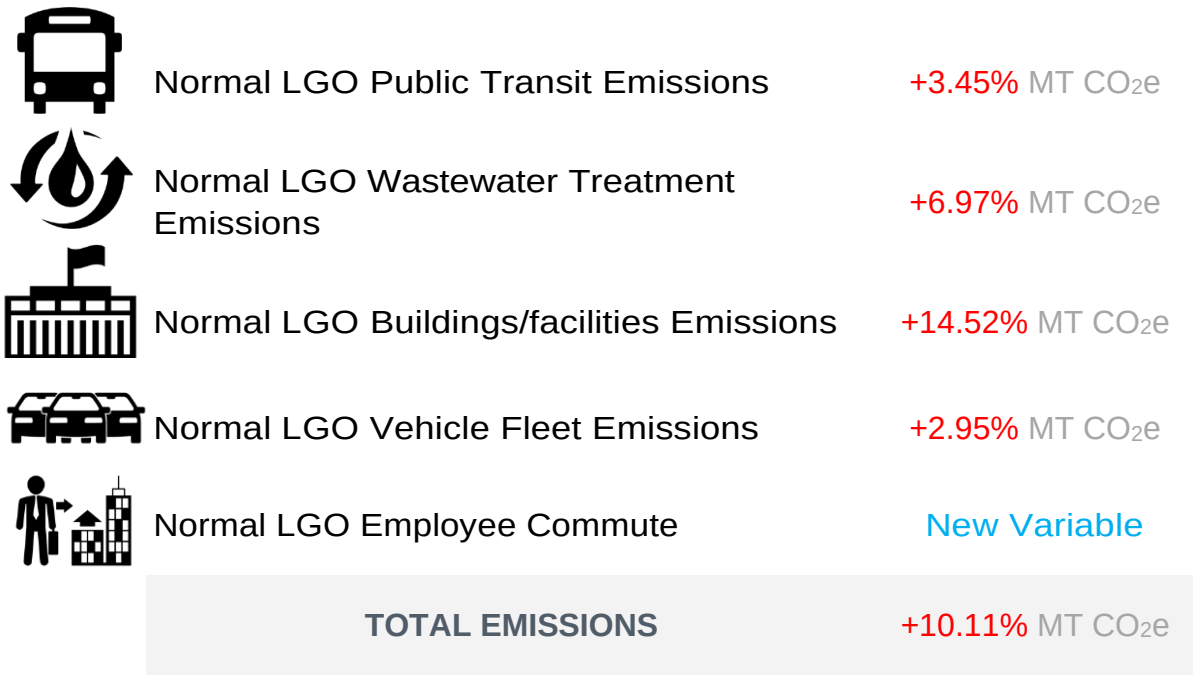


Figure 3.0
Normal LGO Total Greenhouse Gas Emissions by Sector. 2015 totals in this visualization include new variables.

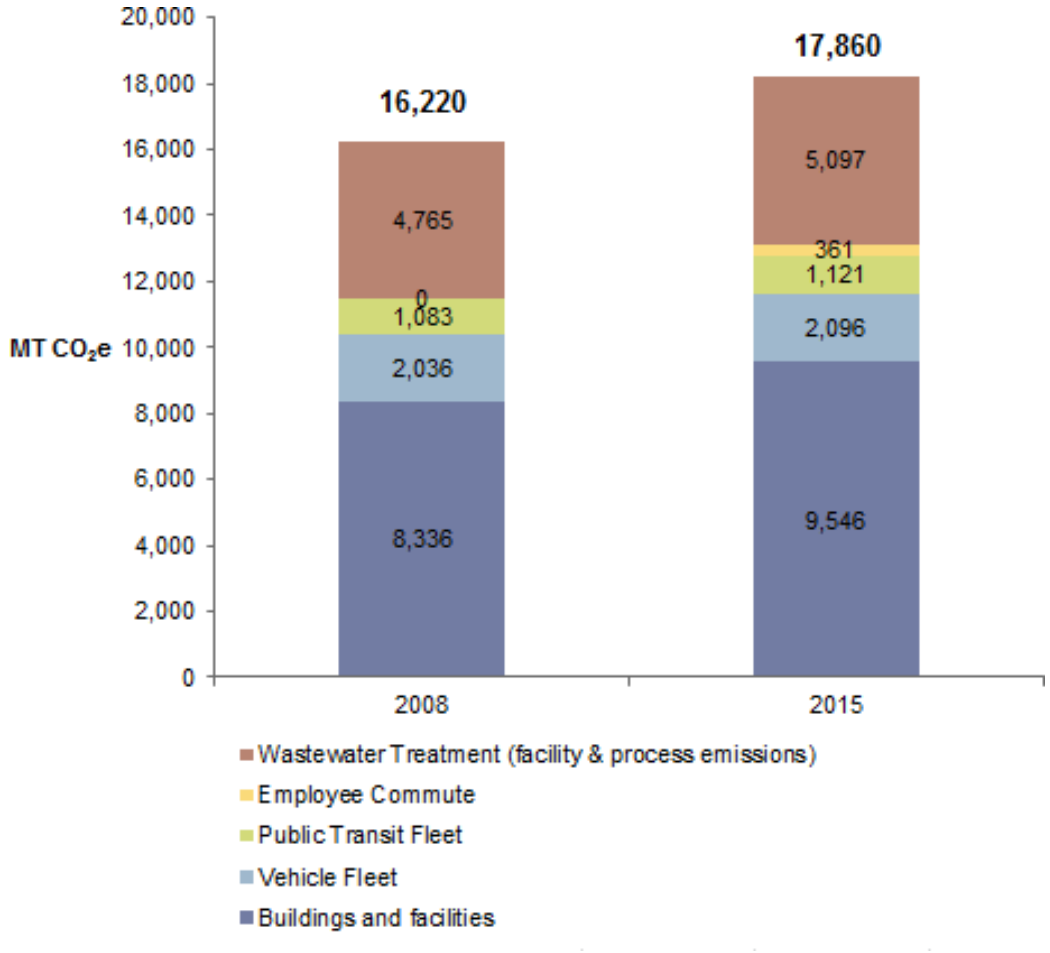


Figure 3.1
Normal LGO Total Greenhouse Gas Emissions by Category. 2015 totals include new variables.

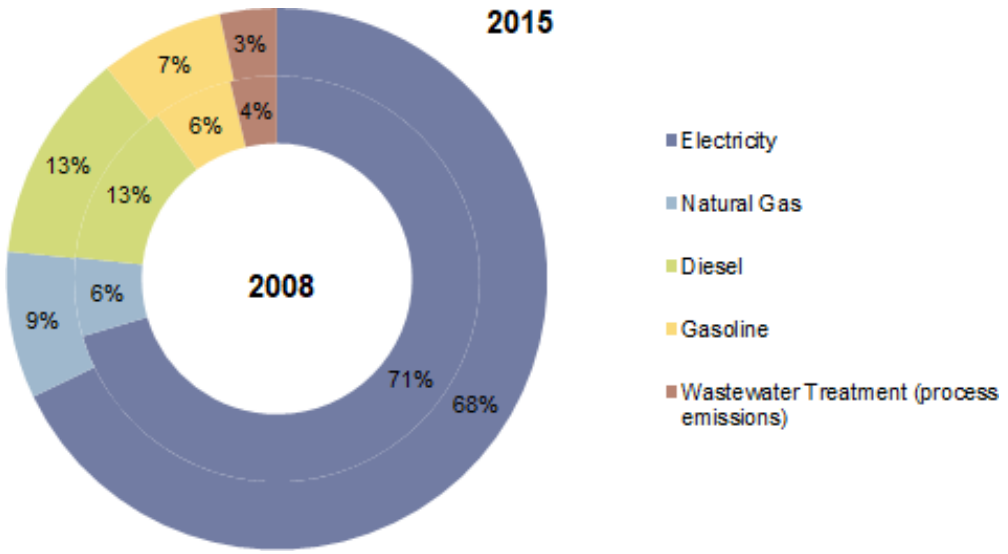


Figure 3.2
Normal LGO building/facility emissions by category

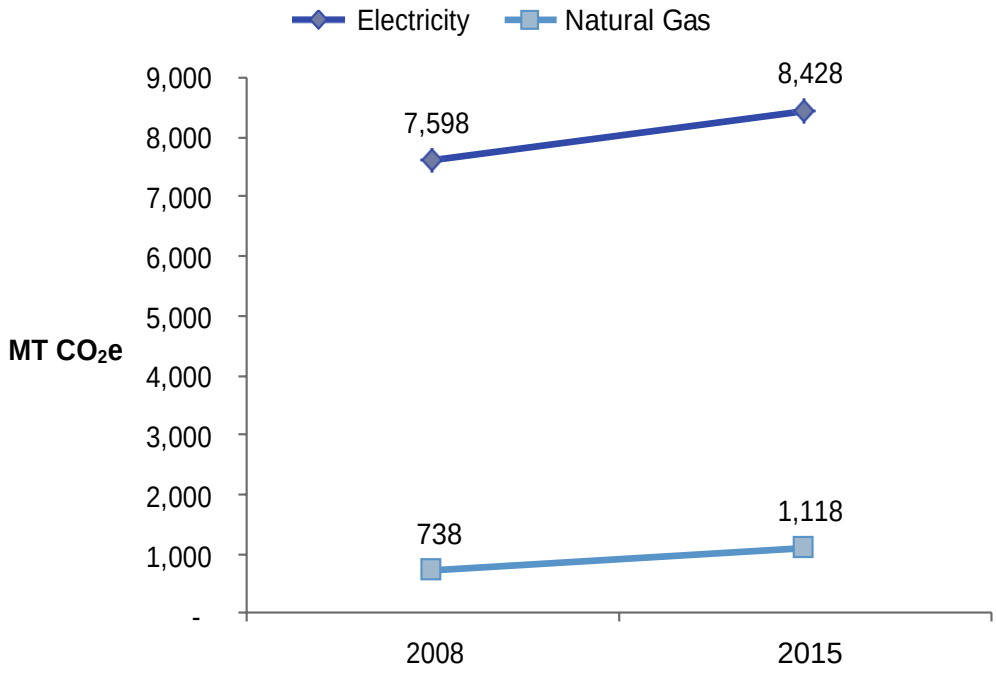


Figure 3.3
Normal LGO vehicle fleet emissions by category

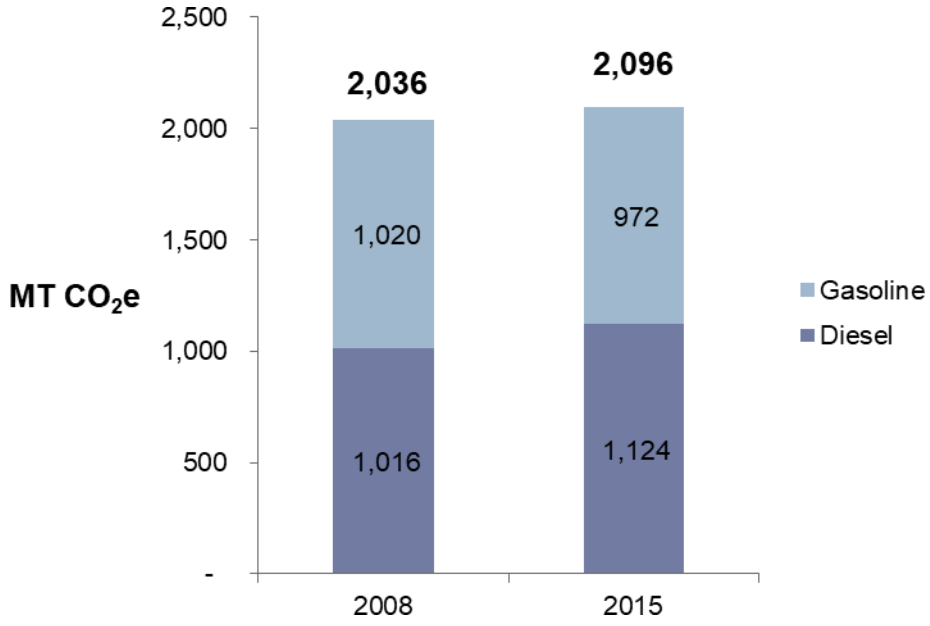
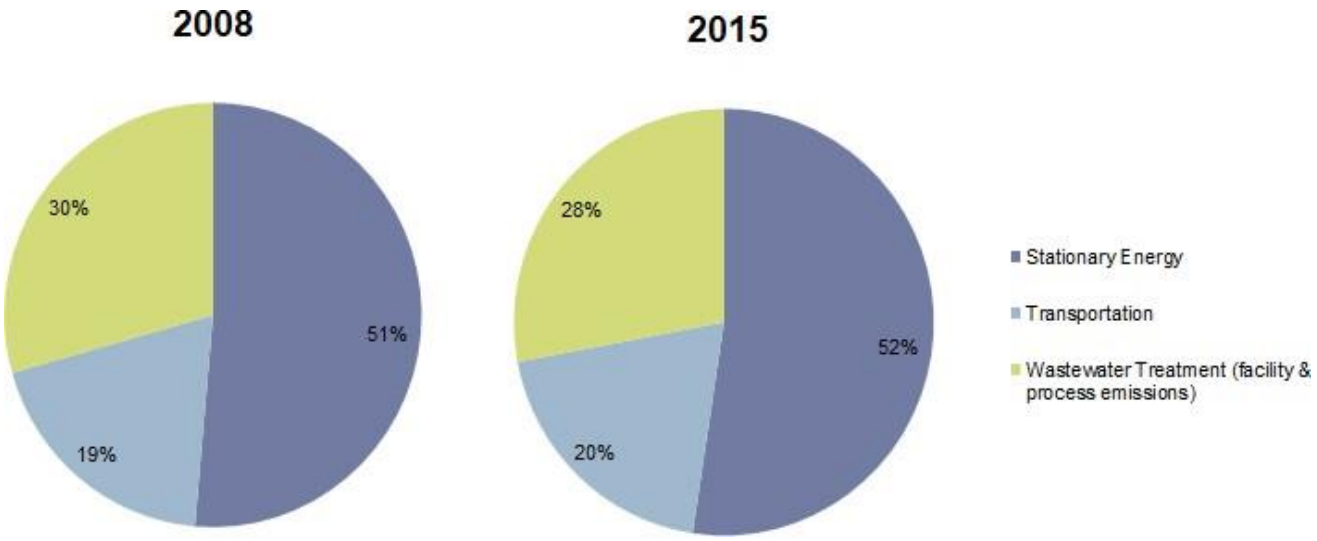


Figure 3.4
Normal LGO Total Greenhouse Gas Emissions by Type. 2015 totals include new variables.



CITY OF BLOOMINGTON LGO EMISSIONS

The City of Bloomington provided energy consumption data from monthly electric and natural gas bills and fuel records. In contrast to the data for 2008, internal segregation of data by department was not available for the 2015 inventory. The annual volumes of each energy source were calculated and converted to carbon dioxide equivalents (CO_2e) for easier comparison.

Data to calculate employee commute emissions was not available in 2008, but the City of Bloomington provided information that allowed us to estimate these emissions for 2015 based on average annual VMT.

Bloomington LGO's building/facility emissions can be segregated into emissions produced by electricity use and emissions produced by natural gas use. The building and facility emissions sector includes emissions resulting from all city-owned buildings, processes and facilities such as streetlight, traffic signals and water transport and distribution. Similarly, LGO vehicle fleet emissions are comprised of emissions from both diesel and gasoline usage. Not included in this total are unmetered street lights, which operate at a per fixture cost.

In order to arrive at the total emissions generated by the Bloomington LGO alone, the energy emissions were combined with Bloomington's share of public transportation and wastewater treatment emissions.

City of Bloomington LGO emissions have increased over 11% since 2008 baseline inventory.

Figure 3.5
Percent change in City of Bloomington LGO emissions between 2008 and 2015. Total percent change does not include new variables.

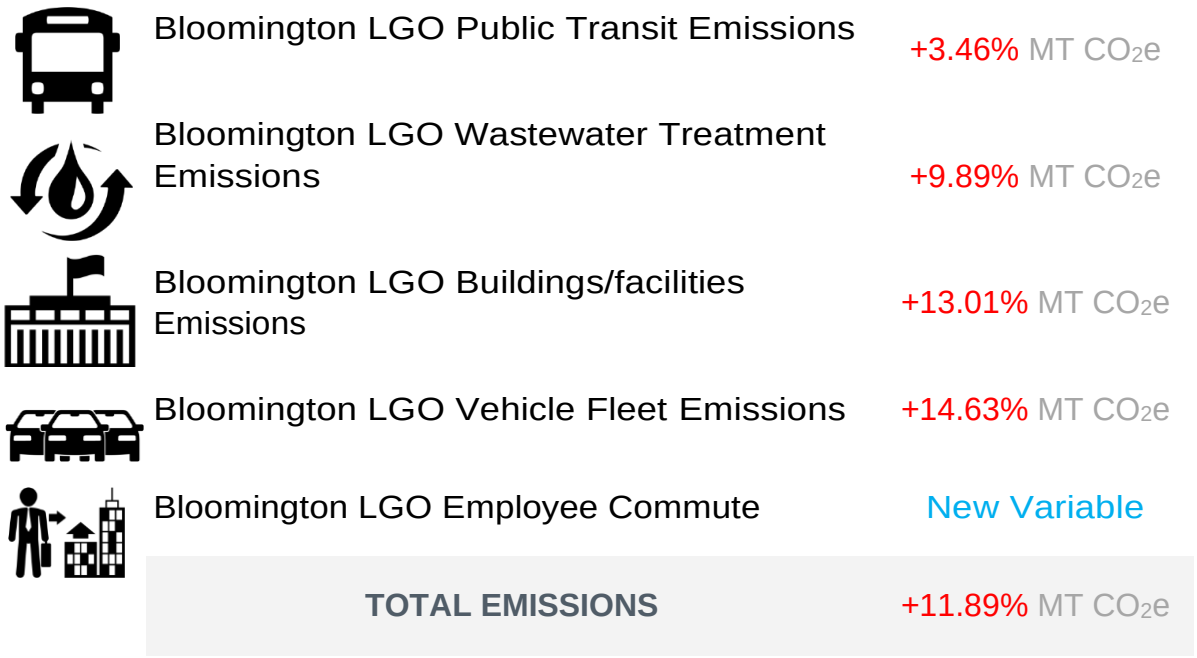


Figure 3.6
Bloomington LGO total Greenhouse Gas Emissions by category and sector. 2015 totals in this visualization include new variables.

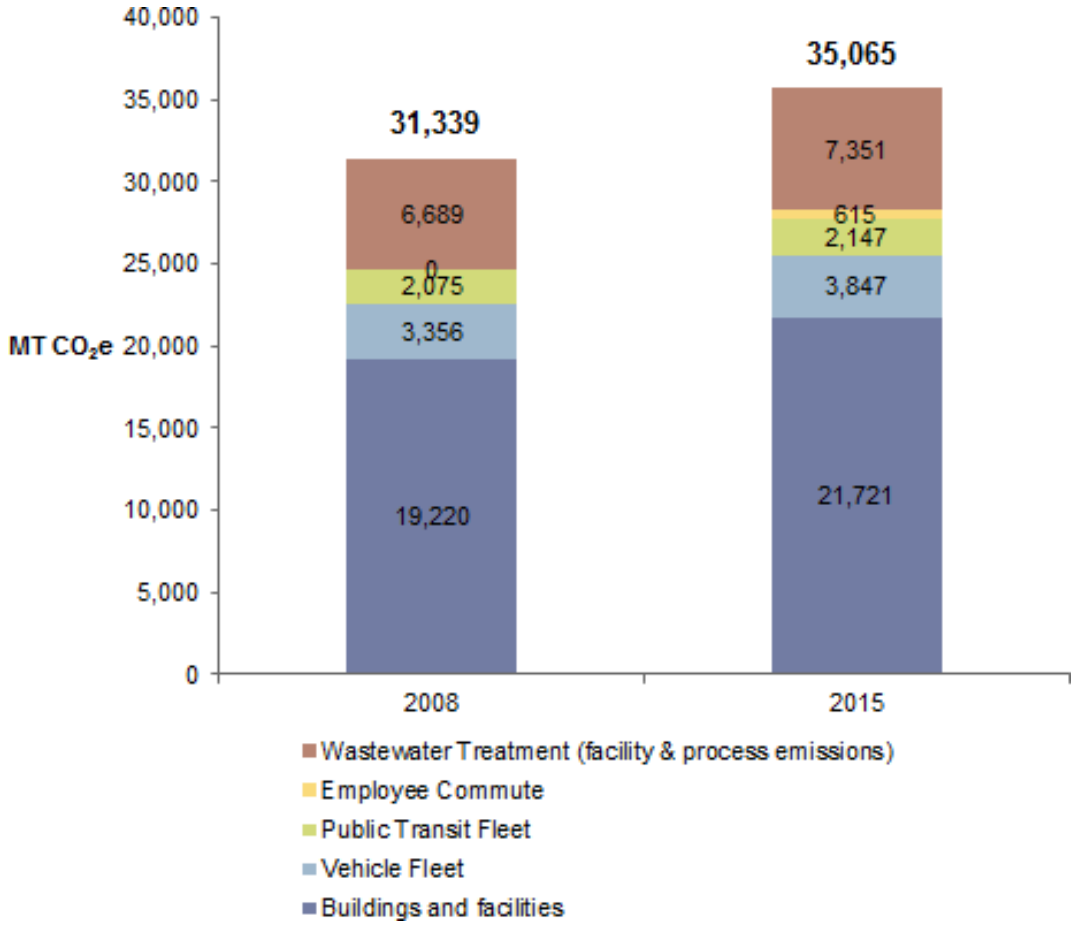


Figure 3.7
Bloomington LGO total Greenhouse Gas Emissions by year and category. 2015 totals include new variables.

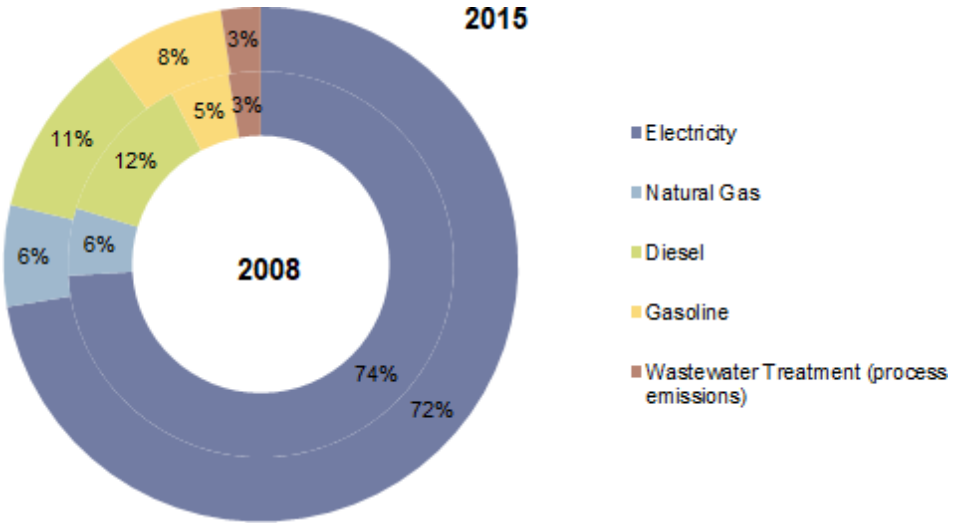


Figure 3.8
Bloomington LGO building/facility emissions by category

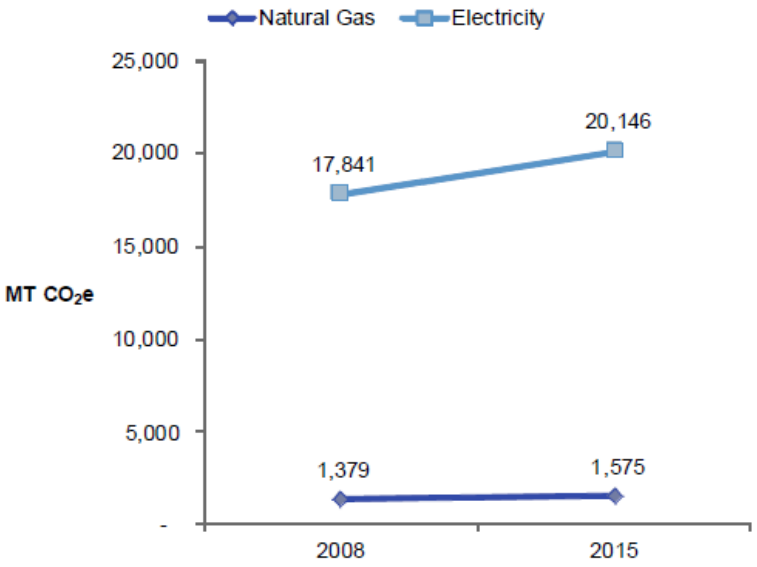


Figure 3.9
Bloomington LGO vehicle fleet emissions by category

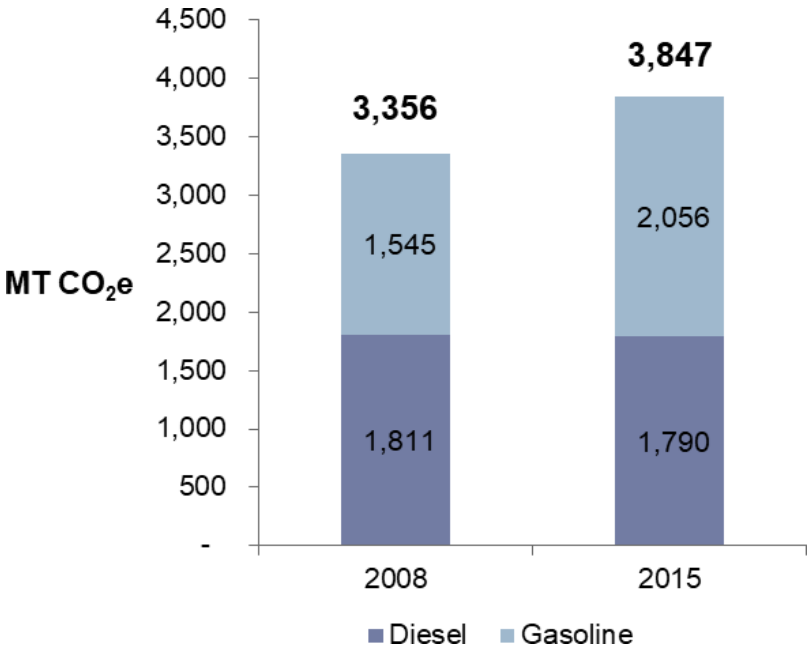
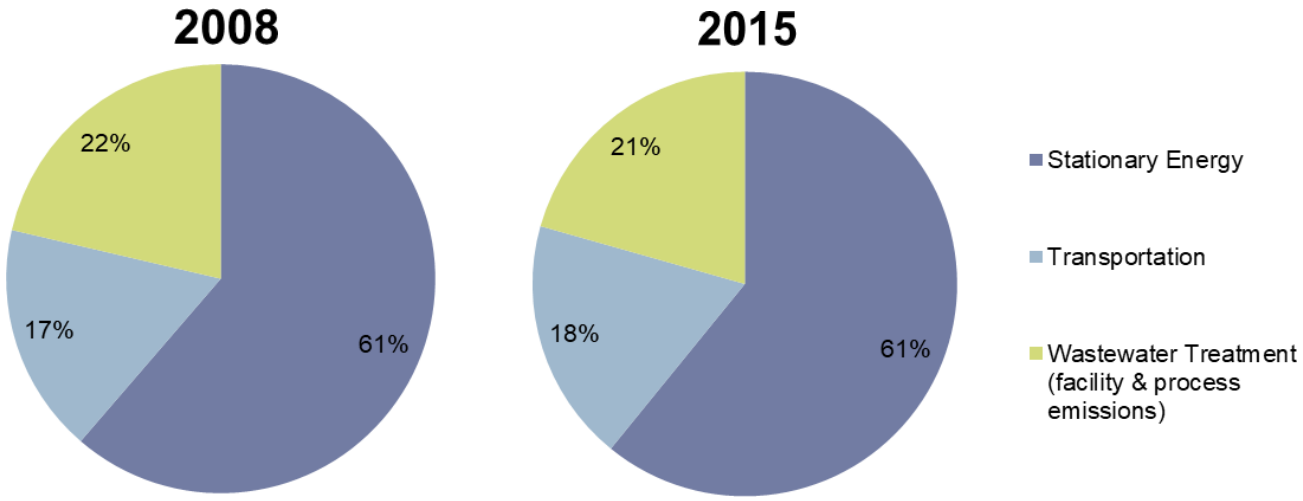


Figure 4.0
Bloomington LGO total Greenhouse Gas Emissions by type. 2015 totals include new variables.



4 COMMUNITY SCALE EMISSIONS

SUMMARY OF RESULTS

The overall community-scale inventory results reflect GHG emissions produced by all activities from governmental, residential, commercial, and industrial sectors within Bloomington and Normal. Because of privacy limitations and a lack of segregated data, results are shown by sector only when possible. Careful scrutiny was utilized to avoid double counting of emissions used in multiple categories or sectors.

Figure 4.1
Summary of change in Bloomington-Normal Community-Scale GHG Emissions from 2008 to 2015. Percent change does not include new 2015 variables.

B-N Community Stationary Emissions	-6.70% MT CO_2e
B-N Community Solid Waste Emissions	-0.95% MT CO_2e
B-N Community On-Road Transportation Emissions	+5.30% MT CO_2e
B-N Community Rail Travel-Related Emissions	+/-0.00% MT CO_2e New Variable
B-N Community Air Travel-Related Emissions	New Variable
Total B-N Community Emissions	-2.35% MT CO_2e

Despite an increase in the total population between the 2008 and 2015 inventories, GHG emissions for the Bloomington-Normal community decreased by 2.35%. This change in total emissions does not include statistics on air travel and commercial rail travel emissions, which were new variables in the 2015 inventory. The 66% increase in rail travel-related emissions is due to the addition of commercial rail emissions for the year 2015. The decrease in emissions produced by solid waste is likely due to a decrease in total tonnage landfilled between 2008 and 2015.

As was the case in 2008, electricity usage continues to be the greatest contributor of CO_2e in the Bloomington-Normal community, followed by natural gas, and on-road vehicular transportation. These three categories contribute to GHG emissions through the combustion of fossil fuel resources.

Figure 4.2
Breakdown of community-wide transportation emission in B-N community.

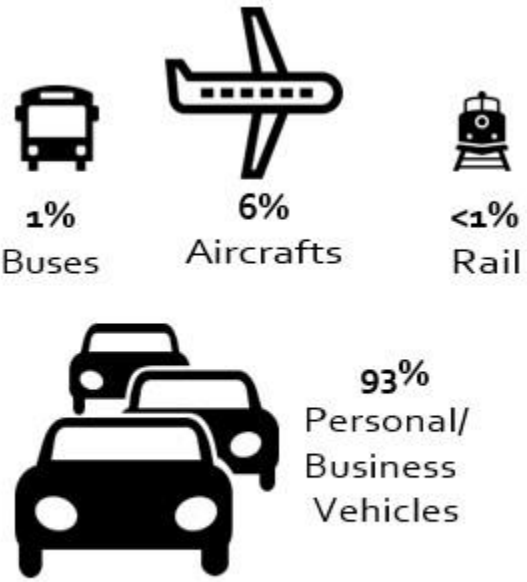


Figure 4.3
2015 B-N Community Scale GHG Emissions by Category. Includes new 2015 variables.

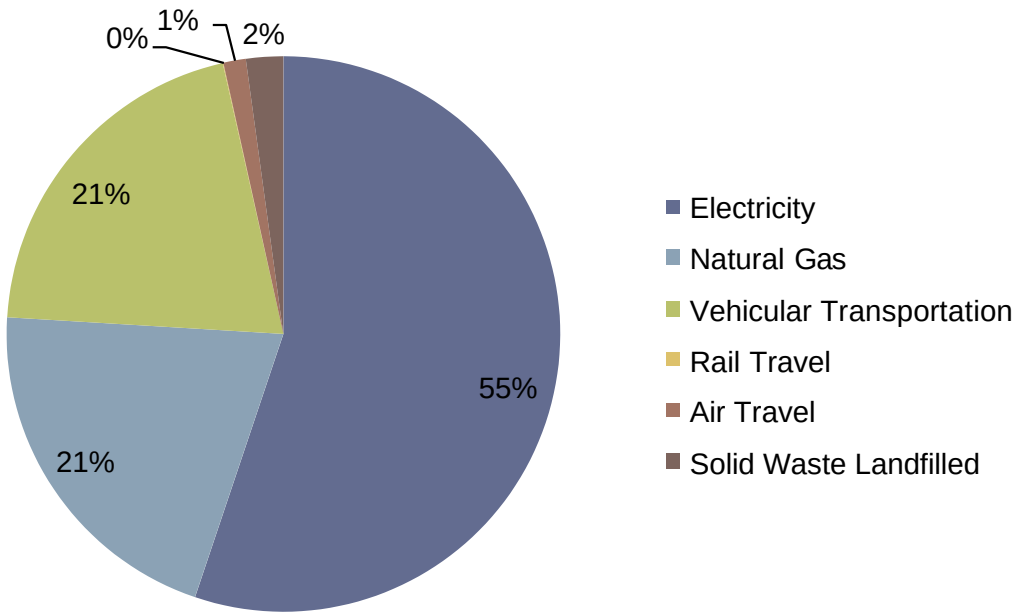
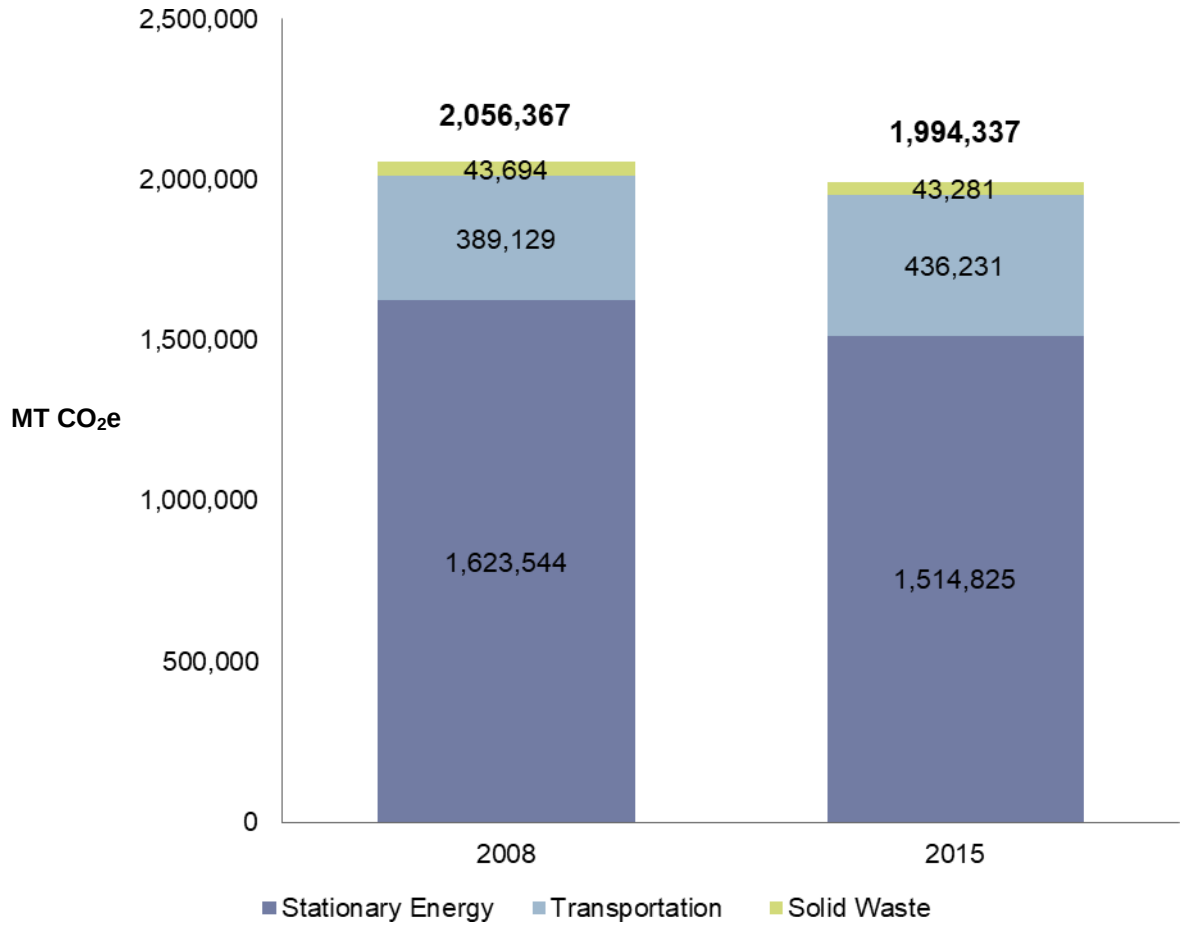


Figure 4.4

B-N Community-Scale GHG Emissions by Type. Includes new 2015 variables.



STATIONARY ENERGY

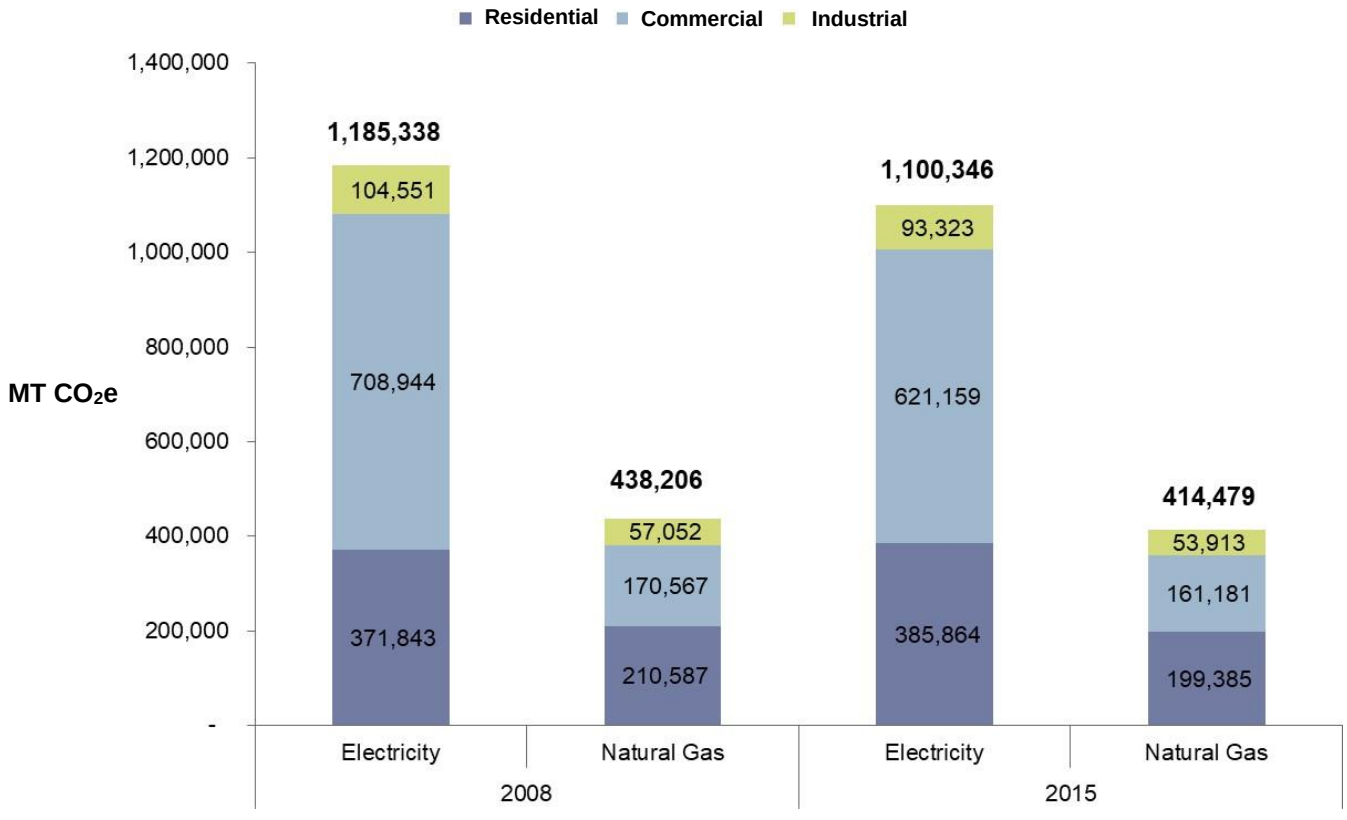
Stationary energy includes all electricity and natural gas usage in the community from home and business heating and cooling, and water treatment pump operation.

B-N Community Stationary Emissions -6.70% MT CO_2e

Ameren and Corn Belt supplied data for electricity usage for the Bloomington-Normal Community which includes amounts from alternate energy retail suppliers. Nicor Gas provided natural gas data. In 2008, natural gas emissions were reported as mixed, multi-sector aggregated volumes. For this inventory update, the EAC was able to obtain specific quantities for each sector.

Although residential electricity emissions increased, all other stationary energy emissions decreased between 2008 and 2015, leading to an overall decline in all Bloomington-Normal community emissions from stationary sources of fuel use. While there was an increase in residential stationary energy emissions, industrial and commercial emissions decreased. One possible explanation is the closure of the local Mitsubishi plant in 2015. However, since it stopped production in November 2015, the impact may be minimal.

Figure 4.5
B-N Community GHG emissions by category and sector



In Figure 4.5 and Figure 4.7, emissions are reported in CO_2 equivalents for ease of comparison, but they include a mixture CO_2, CH_4 and N_2O emissions. Carbon dioxide is still the primary emission gas for stationary energy use; however, methane and nitrous oxide emissions are more prominent in stationary energy usage than they are in other activities. For example, transportation activities produce <0.5 MT of methane and nitrous oxide, while stationary energy produces >1 MT of these gases. Therefore, a breakdown of emissions by gas type has been included in Figure 4.6. Recall that methane and nitrous oxide have GWPs 21 and 310 times more potent than CO_2.

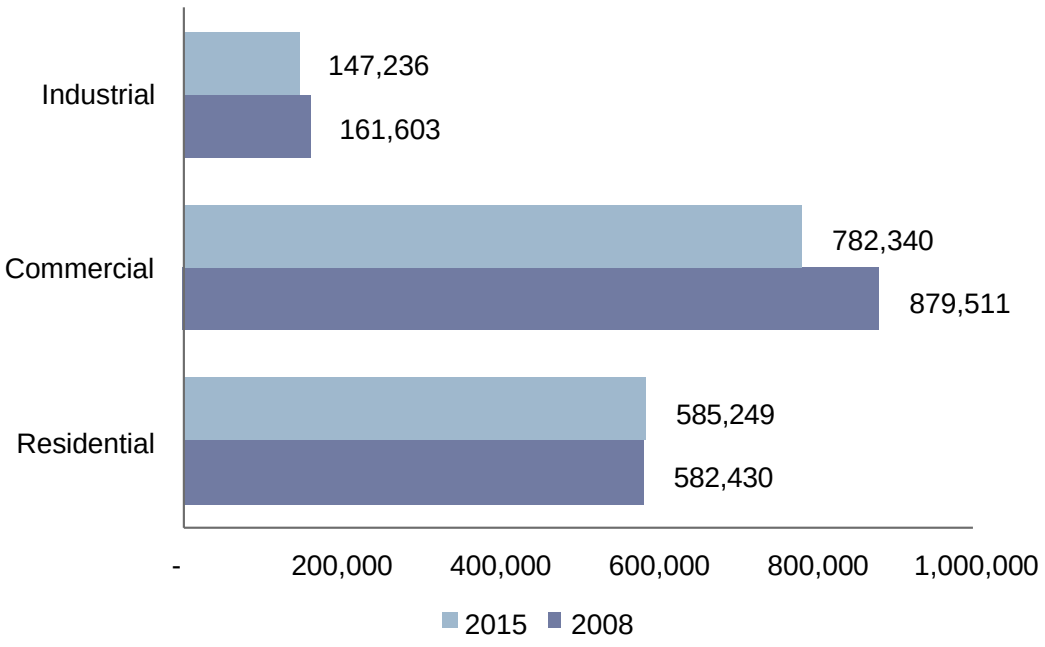
Figure 4.6

2015 B-N Community stationary energy emissions by gas, before transposed into CO_2 equivalents

2015 Electricity Emissions (metric tons)	CO_2	CH_4	N_2O	2015 Natural Gas Emissions (metric tons)	CO_2	CH_4	N_2O
Residential	383,915.0	4.4	6.2	**Residential**	198,804.0	18.7	0.4
Commercial	618,022.0	7.1	9.9	**Commercial**	160,712.0	15.2	0.3
Industrial	92,851.0	1.1	1.5	**Industrial**	53,857.0	1.0	0.1

Figure 4.7

B-N Community Scale Stationary Energy GHG emissions by year and sector



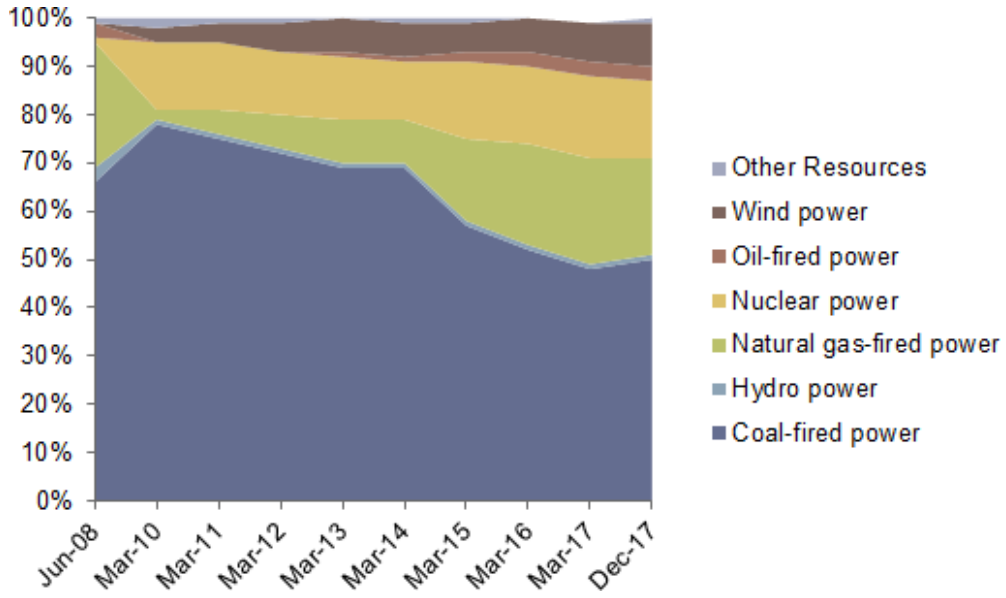
Municipal Electricity Aggregation and Renewable Energy Credits (RECs)

The City of Bloomington and the Town of Normal participate in electric aggregation, where the municipalities secure an energy supply for all Ameren customers from an alternate retail energy supplier. Both municipalities incorporated "green" energy options into their aggregation contracts wherein the energy supplier purchases renewable energy credits (RECs) on participants' behalf in correlation to the amount of energy the resident consumes. One REC is the equivalent of one megawatt-hour (MWh) of electricity generated and delivered to the grid from an eligible renewable energy source anywhere in the country; in the case of municipal aggregation, RECs are often from wind farms. Since the renewable energy from RECs is not generated in Illinois or directly used by Bloomington-Normal customers, there is not a direct effect on community GHG levels. As a result, Community Protocol does not take RECs into consideration for emission reduction calculations. Municipal aggregation is a tool for municipalities to secure lower energy supply rates for residents. Including "green" REC options in aggregation contracts is a transitional mechanism to increase renewable energy adoption nation-wide. Energy supply options that invest in renewable energy options on the local grid will have greater impact on GHG reduction. Solar development, both distributed generation (on site) installations on homes and businesses, and community solar subscriptions to arrays in the Ameren Illinois territory is increasing in Bloomington-Normal. This will decrease participation in aggregation programs, and decrease GHG emissions in the Bloomington-Normal community and state.

According to Figure 4.8, which shows a snapshot of fuel sources for Ameren Illinois, one of two major suppliers of electricity to the Bloomington-Normal community, there is a trend of decreasing coal-fired power and increasing use of natural gas, nuclear, and wind power. While actual Bloomington-Normal fuel source compositions may vary locally, particularly due to municipal aggregation, this data still

Figure 4.8

Fuel sources for Ameren Illinois supplied electricity, 2008-2017



illustrates the larger energy and emission related changes occurring at the supplier level. Since the carbon intensity (and thus carbon emissions) of coal is about 82% higher than that of natural gas, the decrease in coal-fired power likely had some positive impact on the community's emissions between 2008 and 2015.

National data demonstrates a trend similar to what is occurring in Illinois. The U.S. Environmental Protection Agency (EPA) reported that natural gases share of the electricity generation mix jumped from 19% in 2005 to 32% in 2017.[19] Because natural gas's carbon intensity is lower than that of coal, gross U.S. Greenhouse Gas Emissions have decreased since 2005. However, in 2016, carbon dioxide emissions from natural gas surpassing those from coal, for the first time (Figure 4.9).[20]

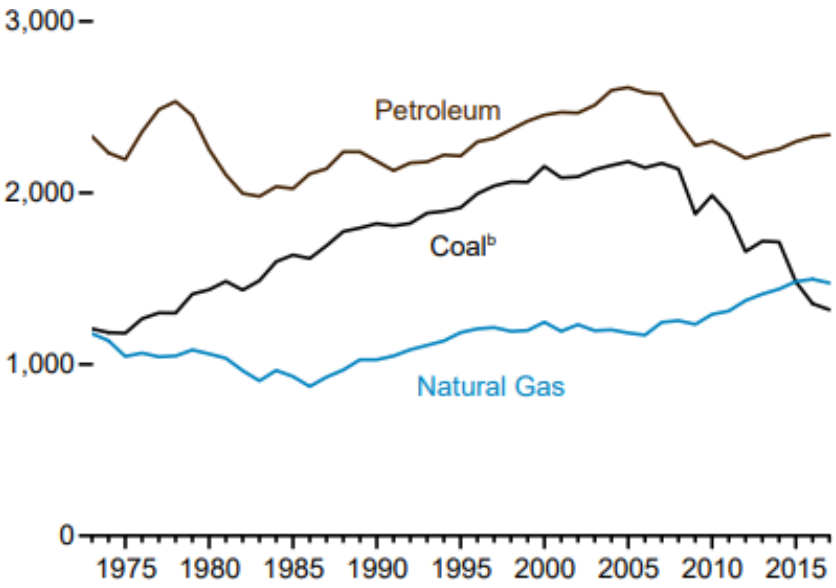


Figure 4.9
Carbon dioxide emissions from energy consumption by source (million metric tons of carbon dioxide)

[19] U. S. Energy Information Administration. (2021, November). British thermal unit conversion factors. eia.gov. Retrieved December 21,2021, from https://www.eia.gov/totalenergy/data/monthly/pdf/sec12_2.pdf

[20] Goren, E., & Lindstrom, P. (2016, August 17). U.S. Energy Information Administration - EIA - independent statistics and analysis. Energy-related CO2 emissions from natural gas surpass coal as fuel use patterns change - Today in Energy - U.S. Energy Information Administration (EIA). Retrieved December 21, 2021, from https://www.eia.gov/todayinenergy/detail.php?id=27552

ON-ROAD VEHICULAR TRANSPORTATION EMISSIONS

On-road vehicular transportation GHG emissions are based on total Vehicle Miles Traveled (VMT) for all sectors in Bloomington-Normal: municipal (LGO), residential, commercial, and industrial. In addition to representing all sectors of the Bloomington-Normal community, the data also includes all vehicle classes, fuel types and road classifications. Because there is not local data on percentage breakdown of vehicle class, ClearPath software allows estimates on segregated emissions based on fuel type using default proportions. For more information on VMT calculations, see the methodology section.

B-N Community On-Road Transportation Emissions +5.30% MT CO_2e

These numbers give us the best possible big-picture illustration of the impact of on-road transportation on local emissions. In reality, conducting a detailed analysis of on-road transportation emissions is extremely complex because it includes vehicle emissions from all sectors commuting within Bloomington-Normal boundaries, and emissions from all sectors entering and leaving its boundaries
each day of the year. Figure 5.1 helps illustrate this complexity by demonstrating the number of people that traveled into, within, and outside of Bloomington and Normal for work alone in 2015. This figure illustrates only a small portion of possible daily on-road emissions for this community.

Figure 5.0
B-N Community GHG Emissions from mixed-sector on-road vehicular transportation

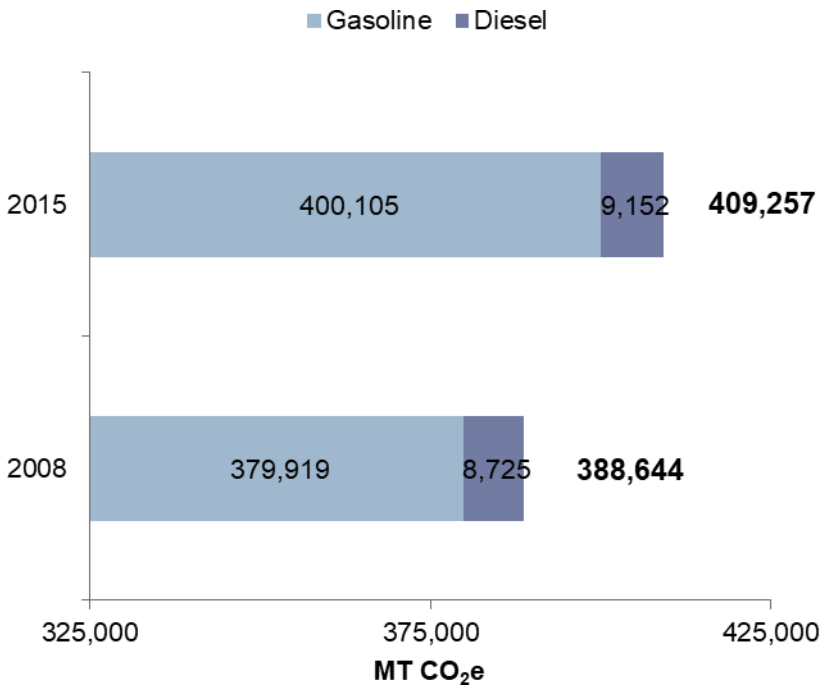
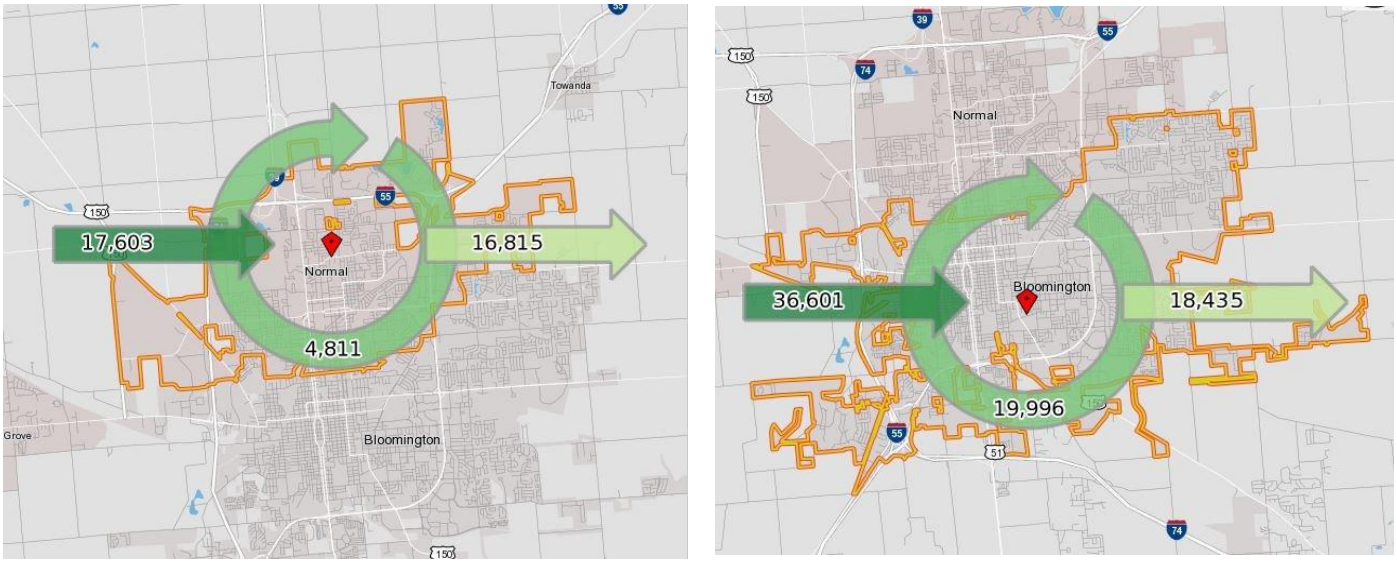


Figure 5.1

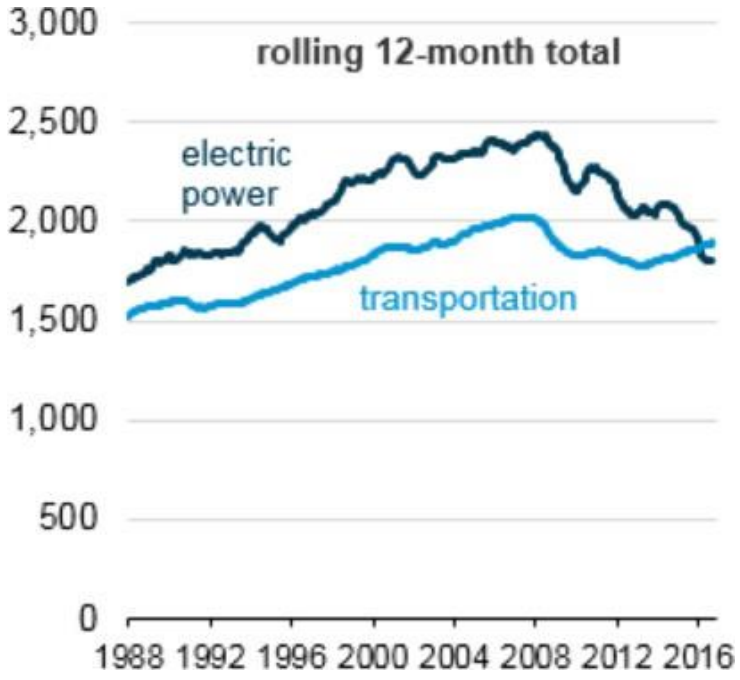
2015 Inflow/outflow for Normal, IL and Bloomington, IL, based on where individuals travel for work. Only one of many sources of on-road transportation-based emissions.



Although emissions from electric power are trending downward, Figure 5.2 shows that national transportation-related emissions are again on the rise. As Bloomington-Normal continues to grow, so too does road traffic and our need to more closely manage emissions from on-road vehicular transportation sources.

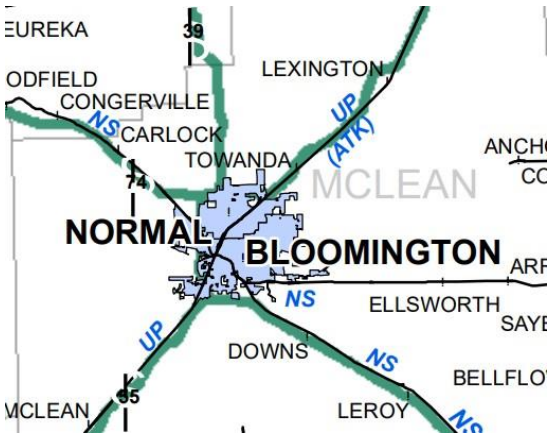
Figure 5.2

U.S. energy-related carbon dioxide emissions (January 1988-September 2016), million metric tons of carbon dioxide



RAIL TRAVEL EMISSIONS

In Bloomington-Normal, rail travel-related emissions are largely beyond the direct control of the community and local governing bodies since all rail lines are part of long-distance supply chains driven by regional economic activity. GHG emissions from rail travel in this community are not significant. There is only one passenger rail line, Amtrak (ATK), and two commercial rail lines, Norfolk Southern (NS) and Union Pacific (UP), that pass through the Bloomington-Normal Community.



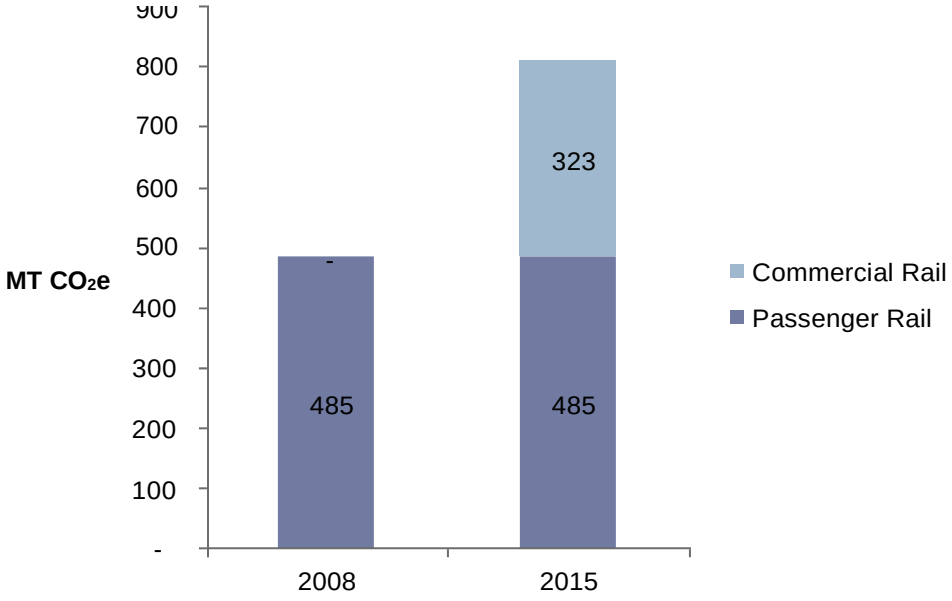
Amtrak emissions did not change between 2008 and 2015 for several reasons: 1. the number of daily trains through this community did not change; 2. Amtrak provided the same fuel usage rate for both years; and 3. the same in-boundary track mileage was used for 2008 and 2015.

The increase in total rail travel-related emissions is the result of the addition of commercial rail emissions data in the 2015 inventory. A new freight study conducted by the MCRPC in 2014 made it possible to estimate commercial rail emissions.

B-N Community Rail Travel-Related Emissions

+/-0.00% MT CO_2e
& New Variable

Figure 5.3
B-N Community GHG Emissions from commercial and passenger rail travel



AIR TRAVEL EMISSIONS

The Bloomington-Normal jurisdiction hosts the Central Illinois Regional Airport (CIRA), which provides both passenger and freight services, generating air travel emissions. These emissions typically include airports facility operation, passenger and cargo planes, travel services, and emissions associated with both residents and non-residents using the airport.

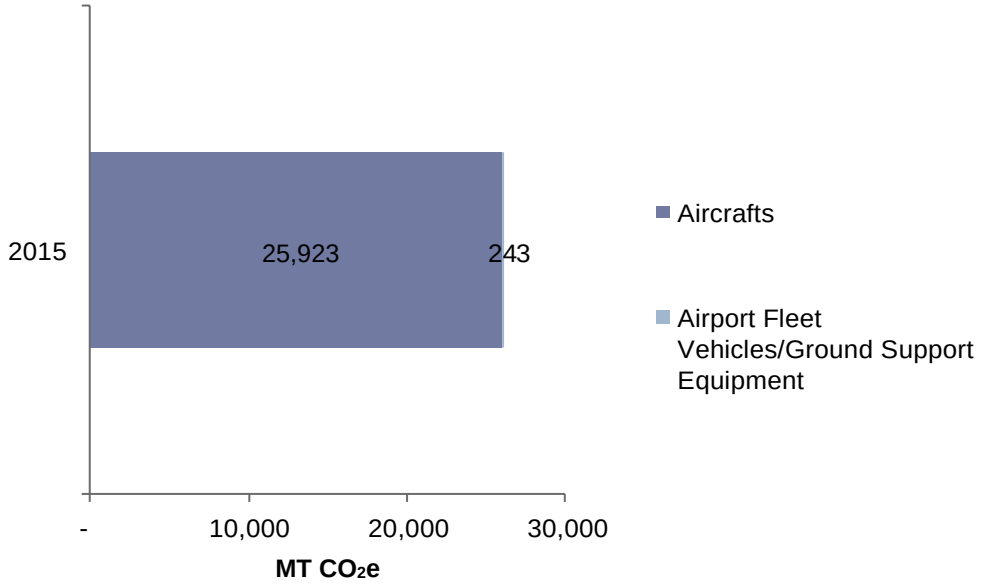
For this inventory update, CIRA provided the 2015 fuel data that allowed a rough estimate of emissions produced by aircrafts and airport fleet vehicles. The 2008 inventory did not include fuel data, and methodology for calculating cargo transport emissions was not available. It is important to note CIRA airlines only carried 1,730 lbs. of air freight in 2008 (there was no air cargo exclusive activity).

B-N Community Air Travel-Related Emissions New Variable

Since 2008, FedEx has joined CIRA, so total air cargo increased to 1,375,982 lbs. in 2015 and includes both CIRA airlines and FedEx freight. Stationary emissions related to air travel facilities are not included in this section since they are already accounted for under the Stationary Energy Use section of the Community-Scale inventory.

There was a 29% reduction in passenger travel at CIRA in 2015 compared to 2008 (Figure 5.5). Since aircraft emissions represent more than 90% of air travel-related emissions (whereas direct and indirect emissions are rarely more than 5% total emissions), passenger travel and its ability to impact the number of flights could play a role in emission reductions or increases from year to year. Furthermore, national economic situations may also impact local emissions.

Figure 5.4
B-N Community GHG Emissions from air travel



Despite a decrease in air passengers since 2008, according to the McLean County Regional Planning Commission's freight study, there is potential for air travel-related emissions to play a larger role in local air quality emissions in the future:

"The airport's two runways are 6,500, and 8,000 feet in length, which means the airport can support larger jet operations. For example, the 8,000-foot runway is long enough to support takeoff of a fully-loaded Boeing 767.4 This length and its capacity for large aircraft make the airport capable of handling air freight movements. Prior to 2015, FedEx used Peoria's airport as an air cargo facility but relocated to McLean County because of the county's greater number of interstate highway connections. While CIRA's tonnages are lower, the airport has the capacity to grow and has transportation assets like highway connections that may be attractive to other air shippers. The relocation of FedEx demonstrates the potential value of McLean County's location for air freight firms." [21]

The accuracy of air travel-related emissions would improve with the completion of an airport-specific emissions inventory.

Figure 5.5
Total passengers for the Central IL Regional Airport

Passengers	2008	2015
Enplanements	268,860	190,772
Deplanements	264,010	188,414
TOTAL	**532,870**	**379,186**

[21] Prepared by CPCS Transcom Inc., prepared for McLean County Regional Planning Commission, "Freight Study for Bloomington-Normal, IL Metropolitan and McLean County Region," 2018.

SOLID WASTE EMISSIONS

Per inventory protocols communities estimate the emissions that result from waste sent to landfills by the community, regardless of whether or not the receiving landfill or landfills are located inside or outside of the community boundary. This data is calculated because GHG emissions from decaying organic material in a landfill include CO_2, CH_4, and N_2O in varying proportions based on the landfill management process and materials landfilled. Waste generated but not landfilled, including materials composted or recycled, are not included since these processes typically do not result in methane emissions.

B-N Community Solid Waste Emissions -2.37% MT CO_2e

Recall that methane and nitrous oxide have a global warming potential 21 and 310 times more potent than CO_2. In the chart below, the metric tons (MT) of methane generated by landfilled waste are shown for educational purposes only, demonstrating that landfilling solid waste produces significantly more methane than other human activities. Total emissions for solid waste landfilled is calculated by combining landfill waste emissions and total process emissions. For more information on the calculation of solid waste GHG emissions, see the methodology section.

Figure 5.6
Variables related to the landfilling of solid waste produced by the B-N community

Variable	2008	2015
**Tons of waste landfilled	123,463	122,297
**MT CH_4 emissions (for demonstration only)	1,667	1,651
Landfilled waste emissions (MT CO_2e) (sum of CO_2, N_2O and CH_4 emissions with GWP potential values applied to CH_4)	**41,669**	**41,275**
Process Emissions (MT CO_2e) - emissions associated with powering equipment required to manage the landfill	**2,025**	**2,006**
Collect & Transport Emissions	Included in On-road Vehicular Transportation	Included in the On-road Vehicular Transportation
Total GHG Emissions from landfilling solid waste—includes landfilled waste emissions & process emissions	**43,694 MT CO_2**	**43,281 MT CO_2**

**not included in calculation of Total Emissions from Solid Waste Landfilled

5 CONCLUSION

SUMMARY OF RESULTS

In 2015, the Bloomington-Normal community generated 1.9 million metric tons of greenhouse gas emissions in carbon dioxide equivalents. Bloomington-Normal community emissions decreased 4.3% from 2,056,367 $MTCO_2e$ in 2008 to 1,967,847 $MTCO_2e$ in 2015, despite a population increase of 6.7% and 4.1% for Bloomington and Normal respectively.

Emissions from all sectors of the City of Bloomington and Town of Normal LGOs increased. The Town of Normal LGO increased 10% from 16,220 $MTCO_2e$ in 2008 to 17,860 $MTCO_2e$ in 2015. The City of Bloomington increased almost 12% from 31,339 $MTCO_2e$ in 2008 to 35,065 $MTCO_2e$ in 2015. Local trends mimic national trends: in both the Community-Scale and LGO inventories, stationary energy is the predominant source of GHG emissions.

According to Figure 5.7, although the local LGOs have greater control over their emissions, emissions produced by Bloomington and Normal municipal governments account for only 2% of all community emissions.

Within each LGO, both direct (scope 1) and indirect (scope 2) emissions are on the rise (Figure 5.9).

Figure 5.7
Percent change in emissions between 2008 and 2015

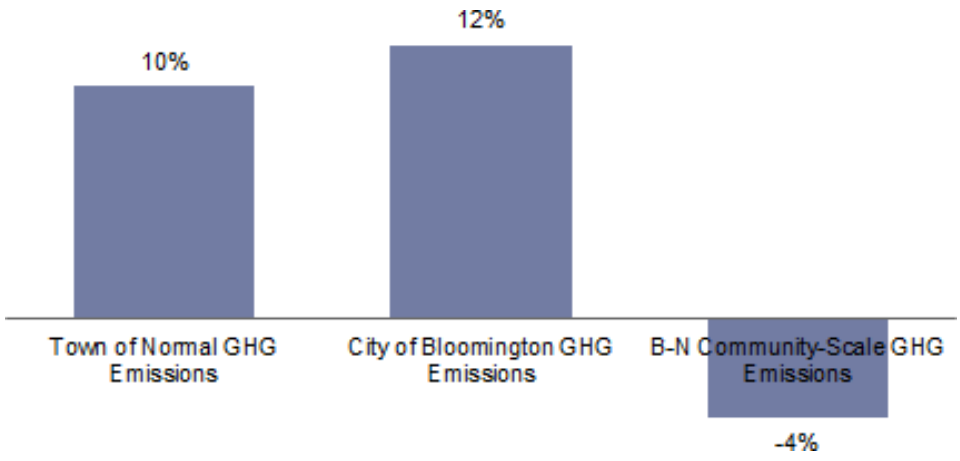


Figure 5.8
Proportion of LGO emissions to remaining residential, commercial and industrial community emissions

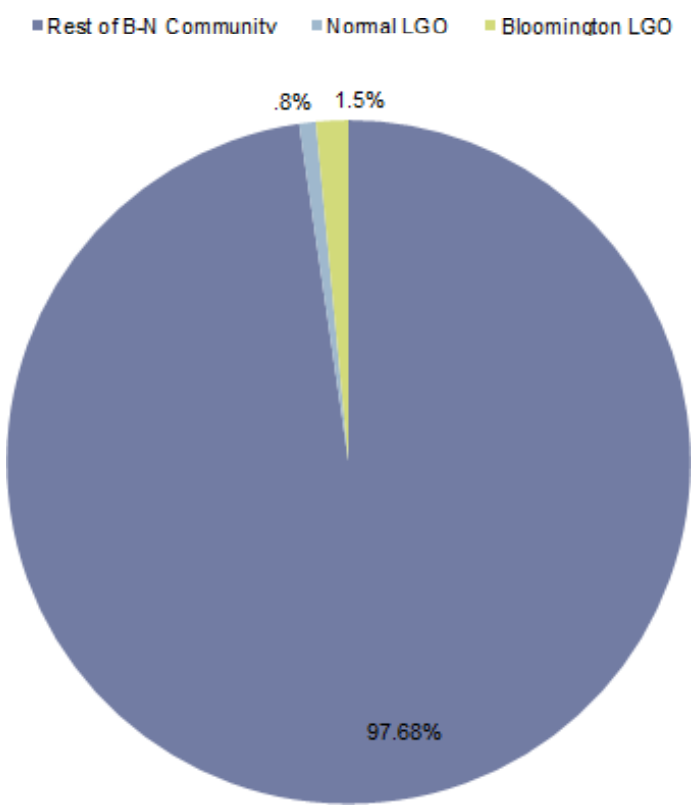


Figure 5.9
Change in LGO GHG emissions by scope.
Totals include new 2015 variables.

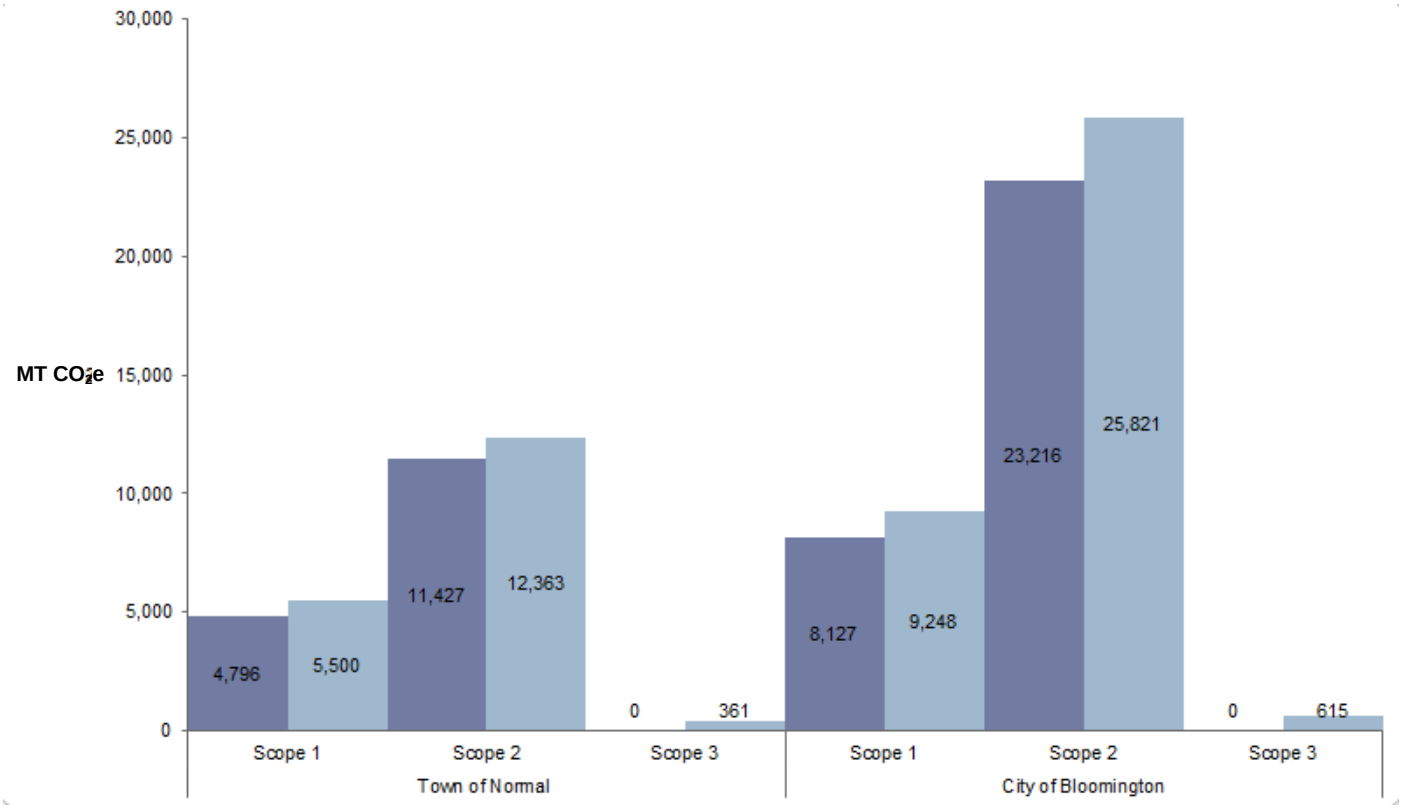


Figure 6.0
Comparison of per capita GHG emissions to other cities that have completed GHG inventories.

Year of GHG emissions study	City	Population	Community-Scale GHG Emissions (MT CO_2e)	Emissions per capita (MT CO_2e)
2015	Bloomington-Normal, IL	132,370	1.9 million MT CO_2e	15.1
2013	Naperville, IL	144,779	2.09 million MT CO_2e	14.4
2015	Iowa City, IA	74,220	987,735 MT CO_2e	13.3
2016	Bloomington, IN	84,465	1.3 million MT CO_2e	16.3
2010	Columbia, MO	109,423	2.3 million MT CO_2e	21.7
2010	Ann Arbor, MI	114,133	2.21 million MT CO_2e	19.3
2016	Boulder, CO	107,601	1.59 million MT CO_2e	14.7
2015	Eugene, OR	163,499	1.59 million MT CO_2e	9.7

PROGRESS & INITIATIVES

The Bloomington-Normal community has numerous projects in progress to help decrease local GHG, recognizing that GHG emissions come from a variety of sectors and require action and participation by residents, businesses, and municipal governments.

Administration

- Illinois State University in Normal established its Office of Sustainability, 2010
- Illinois State University awarded the Governor's Green Award for Efficiency and Conservation, 2012
- Town of Normal and City of Bloomington mayors signed[22] the *Mayors National Climate Action Agenda*[23], 2017

Energy

- Heartland Community College's wind turbine online generating around 50% of the campus' electricity, 2012
- The Ecology Action Center's three Solar Bloomington-Normal programs (2016, 2018, 2019) added 977kW of new solar generation on 75 homes and businesses.
- Community Solar became available to Illinois residents through the passage of the Future Energy Jobs Act.
- The Illinois Solar for All (ILSFA) program also launched with the passage of the Future Energy Jobs Act, and was strengthened with the Climate & Equitable Jobs Act. ILSFA aims to increase access to solar for income-qualifying residents, non-profits, and public facilities that serve critical functions by removing financial barriers to participation. This program has added over 500kW of new solar to the community between 2019 and 2024.

Transportation

- WGLT and ISU launched the Good to Go commuter challenge in 2009 (now managed by the McLean County Regional Planning Commission) - for one week in the spring this program challenges residents to commute to work sustainably (walking, biking, carpooling, public transit
- Normal Bike and Pedestrian Master Plan completed, 2009
- EVTown electric car initiative in partnership with Mitsubishi celebrated the launch of the MiEV, 2011
- Normal Sustainability Plan adopted with specific attention to greenhouse gas emissions, 2011
- Bike BloNo bicycle commuter advocacy group formed, 2012
- Bloomington Bike Master Plan process initiated, 2014
- Connect Transit (Bloomington-Normal's public transit system) has updated nearly half of their fleet to electric buses
- Town of Normal launched Bike Share 309 program (2017-2020)

Waste Management

- Approval of the *Twenty-Year Materials Recovery and Resource Management Plan for McLean County, Bloomington and Normal, Illinois* by the McLean County Board, City of Bloomington Council and the Town of Normal Council, 2018[24]

[22] WGLT. (2017, June 9). Bloomington-Normal Mayors Sign Climate Pledge. WGLT.org.

[23] climatemayors.org. (2021, April 21). Climate mayors. Climate Mayors. Retrieved December 21, 2021, from https://climatemayors.org/

[24] Ecology Action Center. (2017, December 27). Solid waste planning and management. Ecology Action Center. Retrieved December 21, 2021, from https://ecologyactioncenter.org/waste-and-recycling/solid-waste-planning-management/

NEXT STEPS

The 2015 GHG emissions inventory for the Bloomington-Normal community and its LGOs provides an update to the 2008 baseline inventory. This and future regular inventory updates allow the community to better understand its energy footprint, track emission trends, and customize solutions for reducing GHG emissions in the future. While some communities perform an inventory on an annual or biennial basis, every five years is a reasonable compromise between the need for frequent data collection and a cost-effective program. However, because many different factors play a role in the amount of fuel and energy consumed by a community in a year, infrequent emissions inventories may be deceptive. The true value in an inventory lies in its ability to show a trend over time.

The Ecology Action Center is using the conclusions drawn from the 2008 and 2015 GHG inventories to develop a Bloomington-Normal Community Energy Strategic Plan (BNCESP), which will establish specific goals and strategies related to community energy use. In addition to addressing community GHG emissions and mitigating possible non-compliance with clean air standards, BNCESP will facilitate local cost savings, increase local livability and air quality, reduce the need for energy infrastructure Expansion, and encourage job creation in alternative, sustainable energy industries. An effective CESP requires participation from all entities: residents, businesses, industry, and local government.

In 2017, mayors from the Town of Normal and City of Bloomington mayors signed the Mayors National Climate Action Agenda after the U.N Paris Climate Accord, which demonstrates their intention to reduce GHG emissions by 80% by 2050. They did this despite the Trump Administration removing the United State from the pact,[25] which demonstrates their commitment to next steps. Conducting regular GHG inventories, and implementing the BNCESP will enable Bloomington-Normal to:

Be a national leader & collaborator

- Join 7,518 cities in combating climate change by committing to the Global Covenant of Mayors for Climate and Energy[26]
- Submit results of this inventory to Carbon Cities Climate Registry (cCCR), the leading global reporting platform for local climate action and a free service offered by ICLEI.
- Become a member of the International Council for Local Environmental Initiative's (ICLEI) Cities for Climate Protection campaign (CCP).
- Continue to seek out clean, emission-free sources of energy and fuel.

[25] Intergovernmental Panel on Climate Change. (2016). Global Warming of 1.5 ºC. Global warming of 1.5 ºc. Retrieved December 21, 2021, from https://www.ipcc.ch/sr15/

[26] Global Covenant of Mayors for Climate and Energy, https://www.globalcovenantofmayors.org/

Establish municipal and community targets

- Establish GHG reduction goals, targets, and strategies to achieve them through a Community Energy Strategic Plan. Use the BNCESP to develop new programs and capitalize on existing programs designed to increase energy efficiency and public transportation, since these are the leading sources of GHG emissions. Use this plan to inform future decisions, investments and land use planning, transportation policymaking, and building and energy standards.
- Demonstrate leadership by prioritizing efforts to reduce greenhouse gas emissions in municipal operations through efficiency upgrades, lighting retrofits, weatherization, other energy efficiency measures for new construction and renovations, and adoption of distributed generation renewable energy.
- Conduct a comprehensive energy audit for the most significant energy consuming municipal facilities and perform energy retrofits.
- Evaluate the footprint of carbon emissions produced by households and their potential for reduction.
- Collaborate with the McLean County Regional Planning Commission to curb increasing emissions related to transportation.

Improve access to GHG emission-related data for future inventories

- Work with LGOs to improve internal information systems, allowing them to track increasingly segregated and detailed energy use data, thus optimizing their efficiency efforts.
- Identify gaps in data collection that could result in more detailed future greenhouse gas emission inventories.
- Prepare an airport specific inventory. The Central Illinois Regional airport is used by both Bloomington-Normal residents, as well as by residents from communities located outside of Bloomington-Normal. This would allow emissions from air travel activity may to be more accurately estimated through a comprehensive inventory of airport fuel and energy use. Local airport authority and operators can find guidance for preparing airport specific inventories from The Transportation Research Board's Airport Cooperative Research Program (ACRP).

Invest in GHG and climate-related resources and training

- Obtain Urban Greenhouse Gas Inventory Specialist certification developed by the City Climate Planner program in partnership with Green Business Certification Inc., World Resources Institute and ICLEI.[27]
- Track the participation and impact of the Bloomington-Normal's developing community solar program.
- Collaborate with LGOs and local planning organizations to seek out dedicated staffing and funding to support increased sustainability, emissions and climate protection initiatives.
- Fund regular occurring GHG Inventories at approximately five year intervals.

[27] Green Business Certification Inc. (2021). Building Low Carbon, climate-resilient cities. City Climate Planner | Advancing local climate action. Retrieved December 23, 2021, from https://cityclimateplanner.org/

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Appendix

ICLEI PROTOCOL INVENTORY PRINCIPLES

The ICLEI Protocol identifies five general principles to aid in conducting a GHG inventory.

Relevance

The greenhouse gas inventory shall appropriately reflect the greenhouse gas emissions of the local government or the community within the local government area and should be organized to reflect the areas over which local governments exert control and hold responsibility in order to serve the decision-making needs of users.

Completeness

All greenhouse gas emission sources and activities within the chosen inventory boundary shall be accounted for. Any specific exclusion should be disclosed.

Consistency

Consistent methodologies to allow for meaningful comparisons of emissions over time shall be used. Any changes to the data, inventory boundary, methods, or any relevant factors in the time series, shall be disclosed.

Transparency

All relevant issues shall be addressed in a factual and coherent manner to provide a clear audit trail, should auditing be required. Any relevant assumptions shall be disclosed and include appropriate references to the accounting calculation methodologies and data sources used, which may include this Protocol and any relevant Supplements.

Accuracy

The quantification of greenhouse gas emissions should not be systematically over or under the actual emissions. The degree of accuracy should be sufficient to enable users to make decisions with reasonable assurance as to the integrity of the reported information.

REPORT SUMMARY TABLE: LGO INVENTORY

	2008 Activity Data	2015 Activity Data	Accounting method used
LGO Inventory - Public Transit Fleet			
mixed diesel & gasoline (gallons)	309,300	320,000	Local Government
LGO Inventory - Wastewater Treatment			
electricity (kWh)	11,800,000	12,320,987	Local Government Operations Protocol, 6.1
natural gas (therms)	125,000	221,164	Local Government Operations Protocol, 6.1
gasoline (gallons)	3,000	5,154	Local Government Operations Protocol, 7.1
diesel (gallons)	11,750	10,889	Local Government Operations Protocol, 7.1
digester gas, methane outputs (cubic feet/day)	82,117	85,000	Local Government Operations Protocol, 10.3
LGO Inventory - Town of Normal			
building/facility electricity (kWh)	9,742,538	10,806,032.40	Local Government Operations Protocol, 6.1
building/facility natural gas (therms)	138,746.10	210,325.00	Local Government Operations Protocol, 6.1
vehicle fleet diesel (gallons)	99,501.90	110,128.10	Local Government Operations Protocol, 7.1
vehicle fleet gasoline (gallons)	116,186.70	110,672.00	Local Government Operations Protocol, 7.1
average annual VMT (miles)	-	949,428.00	GIS software, LGO staff
LGO Inventory - City of Bloomington			
building/facility electricity (kWh)	22,875,085	25,830,427	Local Government Operations Protocol, 6.1
building/facility natural gas (therms)	259,294.00	296,211	Local Government Operations Protocol, 6.1
vehicle fleet diesel (gallons)	177,336	175,362	Local Government Operations Protocol, 7.1
vehicle fleet gasoline (gallons)	175,970.50	234,174	Local Government Operations Protocol, 7.1
average annual VMT (miles)	-	1,619,316.19	GIS software, LGO staff

REPORT SUMMARY TABLE: COMMUNITY INVENTORY

	2008 Activity Data	2015 Activity Data	Accounting method used
Community Scale Inventory - Stationary Energy			
natural gas (therms) - residential	39,602,732	37,496,082	Community Protocol, BE.1.1
natural gas (therms) - commercial	32,076,652	30,311,518	Community Protocol, BE.1.1
natural gas (therms) - industrial	10,749,444	10,157,917	Community Protocol, BE.1.1
electricity (kWh) - residential	476,768,071	494,746,422	Community Protocol, BE.2.1
electricity (kWh) - commercial	908,991,939	796,436,530	Community Protocol, BE.2.1
electricity (kWh) - industrial	134,052,400	119,656,198	Community Protocol, BE.2.1
Community Scale Inventory - Solid Waste			
solid waste landfilled (tons)	123,463	122,297	Community Protocol, SW.4.1 & SW.5
Community Scale Inventory - On-road Vehicular Transportation			
average annual VMT (miles)	972,524,396	1,006,861,078	Community Protocol, TR.1.B
Community Scale Inventory - Rail Travel			
passenger, diesel (gallons)	47,062	47,062	Community Protocol, TR.3
commercial, diesel (gallons)	-	7,215	Community Protocol, TR.3
commercial, diesel (gallons)	-	24,148	Community Protocol, TR.3
Community Scale Inventory - Air Travel			
gasoline, ground support vehicles/equipment (gallons)	-	14,135	Community Protocol, TR.6.C
diesel, ground support vehicles/equipment (gallons)	-	11,443	Community Protocol, TR.6.C
aviation gasoline (gallons)	-	67,889	Community Protocol, TR.6.B
Jet A kerosene (gallons)	-	2,646,588	Community Protocol, TR.6.B

TERMINOLOGY

ClearPath	This software is designed to allow local governments to organize emissions data, track changes over time, and establish feasible reductions goals.
CIRA	Central-Illinois Regional Airport
Fugitive Emissions	The unintended emissions of greenhouse gases from the transmission, processing, or transportation of fossil fuels or other materials (e.g., coolant leaks in HVAC systems or natural gas line leaks).
GHG	Greenhouse Gas, or a gas that contributes to global climate change, such as carbon dioxide.
Global Warming Potential (GWP)	A relative measure of how much heat a greenhouse gas traps in the atmosphere.
ICLEI	Local Governments for Sustainability, formerly known as International Council for Local Environmental Initiatives. ICLEI is an international association of cities and counties committed to climate action, clean energy, and sustainability. They provide tools and resources to communities working on climate change initiatives.
ICPP	The Intergovernmental Panel on Climate Change (IPCC) is a scientific intergovernmental body under the auspices of the United Nations. An internationally acknowledged authority on climate change, it produces reports which have the agreement of leading climate scientists and the consensus of participating governments.
LGO	Local Government Operations. This refers to the portion of the study that focuses solely on operations that local governments either own or control. Common sectors include local government buildings and facilities, street lights and traffic signals, water delivery systems, and wastewater treatment.
MT CO_2e	Metric Tons of Carbon Dioxide Equivalents. This is the internationally accepted unit for measuring greenhouse gas emissions. While there are several greenhouse gases of concern, carbon dioxide is the most significant. Other gases within the scope of this study were converted to MT CO_2e using standardized conversions related to the potency of those gases relative to carbon dioxide.
NH_4	Methane, a greenhouse gas 21 times as potent as CO_2. Sources include decomposition of organic matter in an anaerobic (oxygen-absent) environment, such as a landfill or wastewater treatment plant, agriculture, and industry.
N_2O	Nitrous Oxide, a potent greenhouse gas with 310 times the impact of CO_2. Sources include wastewater treatment, fossil fuel combustion, agriculture, and industry.

RESOURCES & LINKS

Carbon Dioxide Emission Coefficients by Fuel, U.S. Energy Information Administration, 2016

https://www.eia.gov/environment/emissions/co2_vol_mass.php

Climate Action Resource Guide for Local Governments, Cool California.org.

https://coolcalifornia.arb.ca.gov/local-government/toolkit

Climate Deregulation Tracker, Columbia Law School Sabin Center for Climate Change Law

http://columbiaclimatelaw.com/resources/climate-deregulation-tracker/

Identifies steps taken by the Trump administration and Congress to scale back or wholly eliminate federal climate mitigation and adaption measures.

Climate Regulation Database, Columbia Law School Sabin Center for Climate Change Law

http://columbiaclimatelaw.com/resources/climate-deregulation-tracker/database/

A database of regulations and other efforts undertaken by federal agencies to address the causes and impacts of climate change.

Community Examples

- Boulder Colorado's Climate Commitment, May 2017, https://bouldercolorado.gov/climate
- Iowa City, IA's Climate Action and Adaption Plan & GHG reduction goals, https://www.iowa-city.org/WebLink/ElectronicFile.aspx?dbid=0&docid=1803121&
- 2015 Ann Arbor Climate Action Plan Progress Report, adopted in 2012. https://www.ecocenter.org/sites/default/files/2022-01/Ann%20Arbor%202015%20Climate%20Action%20Plan%20Progress%20Report.pdf

Cool Climate Calculator for Households and Businesses

https://coolclimate.berkeley.edu/index

Global Covenant of Mayors for Climate & Energy

https://www.globalcovenantofmayors.org/

An international alliance of cities and local governments with a shared long-term vision of promoting and supporting voluntary action to combat climate change and move to a low emission, resilient society.

ICLEI ClearPath

http://icleiusa.org/clearpath/

Implementing EPA's 2015 Ozone Air Quality Standards, April 2018

https://fas.org/sgp/crs/misc/R43092.pdf

Mayors National Climate Action Agenda

http://climatemayors.org/

A bipartisan, peer-to-peer network of U.S. mayors working together to demonstrate leadership on climate change through meaningful actions in their communities, and to express and build political will for effective federal and global policy action.

National Climate Assessment

http://nca2014.globalchange.gov/

Ozone NAAQS Timeline

https://www.epa.gov/ozone-pollution/ozone-naaqs-timelines

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Trip Advisor

https://www.tripadvisor.com/LocationPhotoDirectLink-g36455-d1503396-i41714809-Bloomington_Normal_Marriott_Hotel_Conference_Center-Normal_Bloomington_Nor.html#41714809

History Museum

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