JUNE 2020

2020 GREENHOUSE GAS INVENTORY REPORT

COMMUNITY-SCALE

City of Elkhart INDIANA
the city with a heart

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With Assistance from ICLEI - Local Governments for Sustainability USA

LETTER FROM THE MAYOR -

Climate change represents a major threat to the health of our plant and community. The Intergovernmental Panel on Climate Change (IPCC) warns that, “warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice and rising global average sea level,” (1). The urgency of climate change and its wide-reaching impacts calls for a significant global and regional response. We are already experiencing the impacts of climate change here in Elkhart.

The following greenhouse gas inventory report is the first step in acting to minimize or halt these impacts. With support from Indiana University programs including the IU Environment Resilience Institute and the Indiana Sustainability Development Program and ICLEI, this data has been collected and analyzed.

It is important for our community to measure emissions and implement strategies to reduce these emissions. With the urgency of climate change in mind, the City of Elkhart will complete a climate action plan later this summer, addressing emissions and reduction strategies. The City of Elkhart is committed to providing a resilient and sustainable future to our community and will continue to improve upon and develop the greenhouse gas inventory report and the climate action plan in the years to come.

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INTRODUCTION

The impacts of climate change are threatening natural systems and societies around the world at all scales. The City of Elkhart recognizes these impacts and the threats climate change poses to the resiliency of the City and its residents. These threats include temperature and precipitation increase, more heat waves, less frost, and severe storms, all of which will cause severe consequences. The City of Elkhart is taking action to limit these threats and mitigate future contributions to climate change. To do this, Elkhart must reduce the threat by limiting fossil fuel use, avoiding creation of new risks, and preparing and adapting for the unavoidable.

Reducing fossil fuel use is vital to climate change mitigation efforts. Fossil fuel use emits greenhouse gases such as carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), and fluorinated gases like hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF6). These gases trap heat in the atmosphere, though each gas differs in global warming potential (GWP). Some sources for greenhouse gas emissions include the production, transport, and use of coal, natural gas, and oil, agricultural activities, and other industrial processes. In order to reduce fossil fuel use and emissions, a baseline must be determined. As these gases are produced at increasing rates, the planet is warming and many natural cycles are being disrupted.

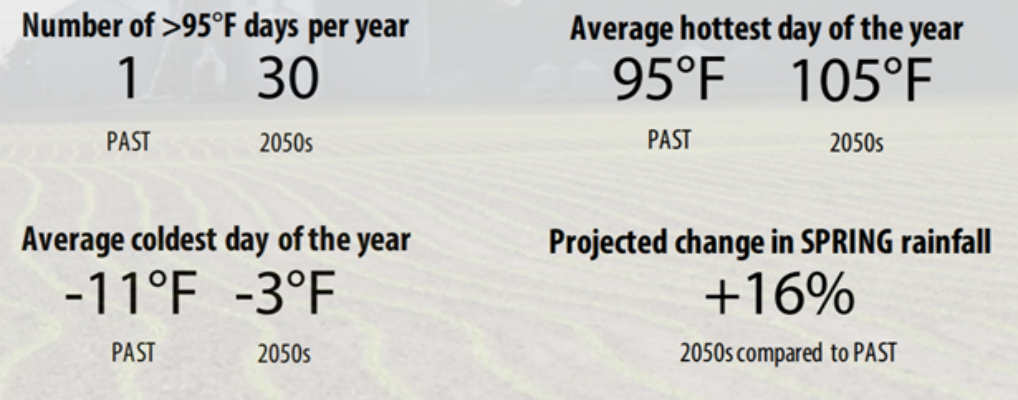
In partnership with Indiana University's Resilience Cohort, a community scale greenhouse gas inventory was conducted for the City of Elkhart in 2020. The Environmental Resilience Institute at IU established the Resilience Cohort that is now made up of 11 Indiana cities and towns, all conducting greenhouse gas inventories. This inventory estimated emissions from the Elkhart community and various sectors including transportation and building efficiency.

CLIMATE CHANGE BACKGROUND

Human activities are amplifying and changing Earth's natural processes. One such process is known as the greenhouse effect. The greenhouse effect occurs when naturally abundant gases are released into the atmosphere and trap solar radiation. As humans add more greenhouse gases to the atmosphere than produced and absorbed by natural cycles, this effect is amplified and the global surface temperature increases.

Climate change impacts are already occurring and expected to increase in Elkhart County. Some of these changes and projections are shown below. In summary, hot weather extremes will increase as cold weather extremes decrease, and precipitation will increase greatly. In addition, more dramatic climate change impacts will be seen. Figure 3 below, is an estimate based on climate research conducted by the Purdue Climate Change Research Center (PCCRC) and is specific to Elkhart County. By 2050, Elkhart County can expect:

Figure 3: Climate Change Impacts for Elkhart County



- **Agriculture:** longer growing seasons and higher yields offset by extreme weather events
- **Forests:** ecosystems will be disrupted as tree species ranges shift northward
- **Public Health:** increased heat wave intensity and humidity, degraded air and water quality
- **Rainfall:** extreme rainfall events and flooding increases causing erosion
- **Great Lakes:** changes in range and distribution of fish species, increased invasive species and algae blooms, ice cover decrease

ABOUT THE INVENTORY

Greenhouse gas inventories are useful because they provide a method for quantifying greenhouse gas emissions. By including different emissions-generating activities and sectors of a community, the total emissions generated in a year can be calculated. This allows for a baseline starting point to be determined for reducing emissions and informs the effectiveness of given reduction strategies. The results from this inventory will inform which climate mitigation and adaptation efforts can be utilized. This inventory measured 6 main greenhouse gases:

- Carbon dioxide (CO2)
- Methane (CH4)
- Nitrous oxide (N2O)
- Hydrofluorocarbons (HFCs)
- Perfluorocarbons (PFCs)
- Sulfur hexaflouride (SF6)

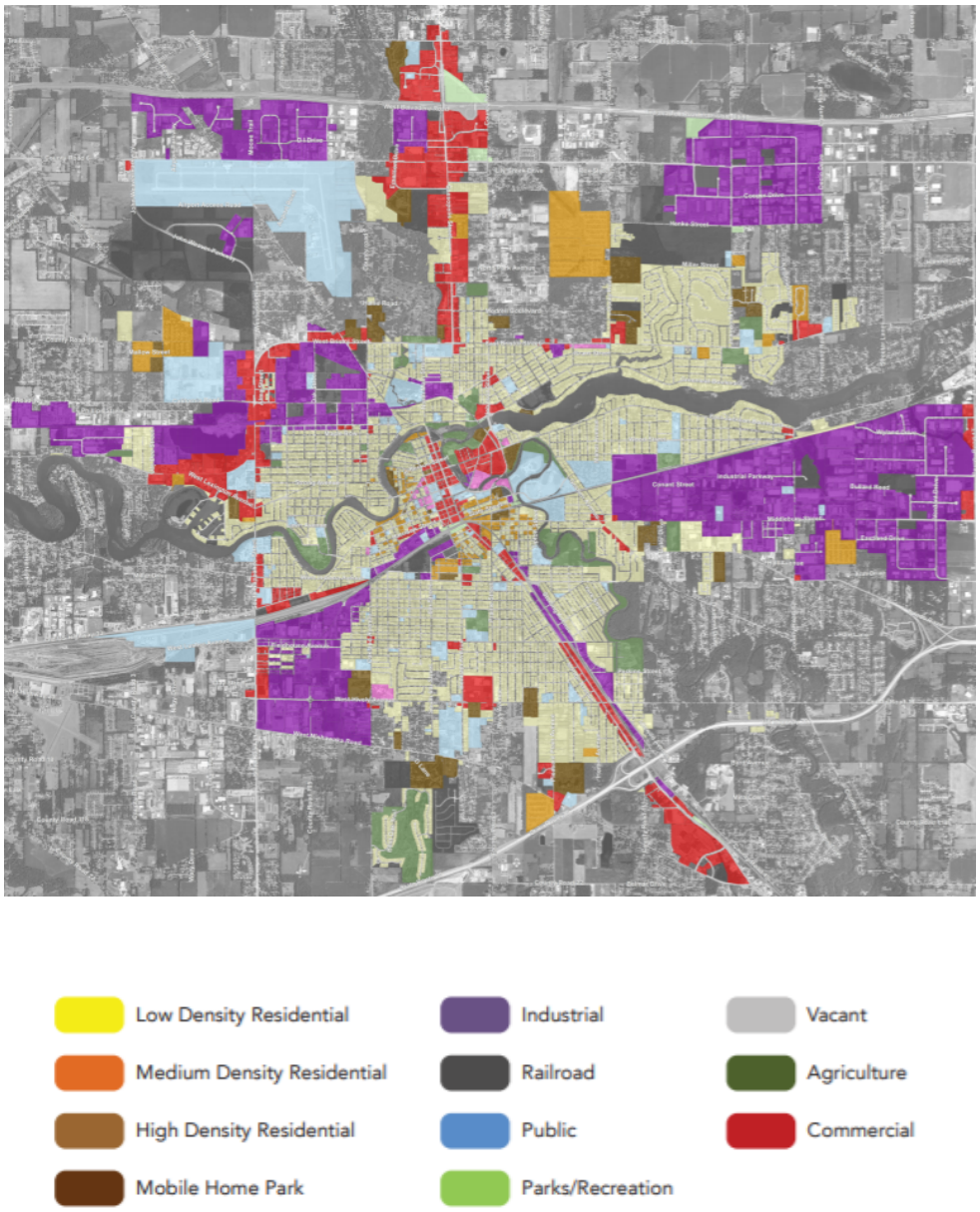
For the inventory, each of these gases will be calculated in terms of MTCO2e (metric tons of carbon dioxide equivalent). This measurement is used to describe emissions from all 6 greenhouse gases measured in the survey as each gas has a different GWP (see Table 1 below).

Table 1: Global Warming Potential per Greenhouse Gas

Greenhouse Gas	Global Warming Potential
Carbon Dioxide	1
Methane	21
Nitrous Oxide	310

This inventory accounts for estimated emissions generated by Elkhart's population of 52,358 within the city limits, in 2019. Elkhart encompasses 27.26 square miles with a population density of 1,986 people per square mile (see Figure 1 below).

Figure 1: Map of Elkhart by Existing Land Use



The 2019 community-scale inventory was completed and reported using the tool, ClearPath. This tool is an online software created by ICLEI for municipalities to measure and manage greenhouse gas emissions. Elkhart has followed national and global protocols in reporting greenhouse gas emissions ensuring accurate and transparent data. As part of the Resilience Cohort, created by IU's Environmental Resilience Institute, Elkhart will join Carmel, Evansville, Fishers, Fort Wayne, Gary, Goshen, Michigan City, Richmond, West Lafayette, and Zionsville in climate action planning.

The 7 greenhouse gas emission sectors measured for the community-scale inventory were:

- Residential Energy
- Commercial Energy
- Industrial Energy
- Transportation & Mobile Sources
- Solid Waste
- Waste & Wastewater
- Process & Fugitive Emissions

This inventory uses data from 2019 as its base year for emissions. Emissions are included from three scopes (shown right, Figure 2).

Figure 2: Explanation of Emissions by Scope

Scope 1

This scope includes direct emissions from vehicle tailpipes and smokestacks

Scope 2

Indirect emissions from energy-related activities like electricity use

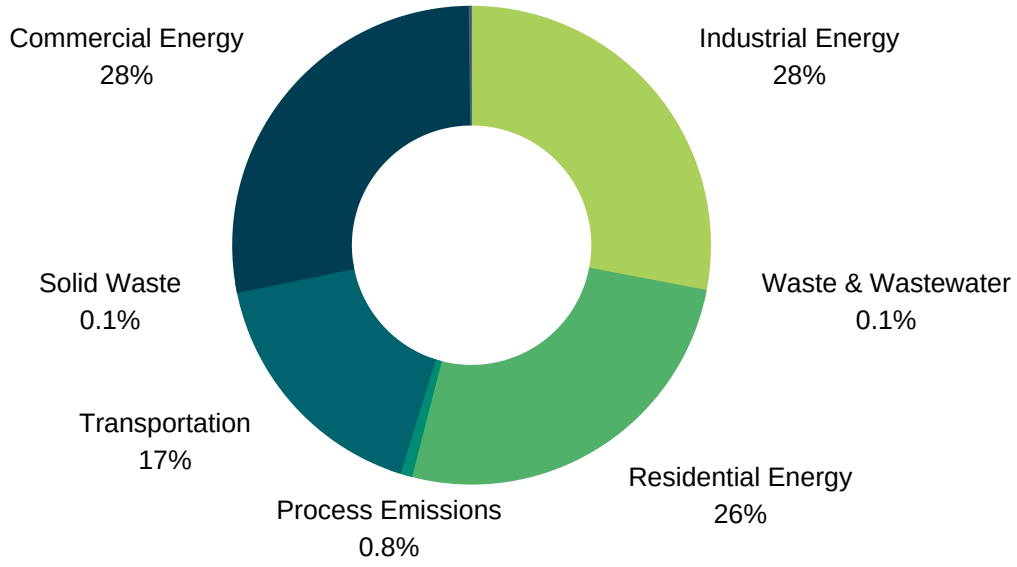
Scope 3

Other indirect emissions not included in Scope 2, for example emissions from solid waste

OVERVIEW OF RESULTS

This section contains an overview of Elkhart's community GHG inventory results. For 2019, **1,115,755** CO2e (MT) were emitted by the community. These results are summarized per sector in the figure below (see Graph 1 below).

Graph 1: Summary of Emissions by Sector



The breakdown of emissions by metric ton of CO2e per sector is shown below:

- Total CO2e emissions from Transportation & Mobile Sources: **194,632**
- Total CO2e emissions from Waste & Wastewater: **510**
- Total CO2e emissions from Residential Energy: **285,126**
- Total emissions per capita: **21.3**
- Total CO2e emissions from Commercial Energy: **309,320**
- Total CO2e emissions from Industrial Energy: **308,960**
- Total CO2e emissions from Process & Fugitive sources: **12,984**
- Total CO2e emissions from Solid Waste: **4,233**

How does Elkhart compare to other Midwest cities?

In 2019, the City of Elkhart emitted 21.3 metric tons of CO2e per resident. Many factors contribute to the per capita emission production of a city including: population density, industrial and commercial activities, and geographic size of a city. In Elkhart's case, industrial and commercial emissions combined are over double that of residential emissions. Local context is especially important when comparing emissions per capita across the Midwest. Elkhart's per capita emissions compare most similarly to Indianapolis, another heavily industrialized city (see Table 2 below).

Table 2: Comparison of Emissions per Capita of Midwest Cities

City	Emissions per Capita (MTCO2e)
Elkhart, IN	**21.3**
Fort Wayne, IN	11.1
Evanston, IL	12.3
South Bend, IN	12.7
Bloomington, IN	19.3
Cleveland, OH	19.8
Evansville, IN	12.62
Indianapolis, IN	21.7

CONCLUSION

This analysis found that the Elkhart community produced **1,115,755** CO2e (MT) for the base year of 2019, with emissions from commercial and industrial energy sources contributing the most to this total. With a population of about 52,000 people, the per capita emissions was found to be **21.3** CO2e (MT).

With the completion of Elkhart's first greenhouse gas inventory and report, Elkhart can now begin to develop emissions reduction targets (e.g. 80% by 2050) and a climate action plan to guide the process towards reduction. This plan will identify emissions reductions opportunities across all sectors, but should have a focus on the top three emitting sectors: Commercial Energy, Industrial Energy, and Residential Energy. These reduction goals will also focus on Elkhart becoming a more resilient and sustainable community prepared to face future climate change impacts. Reducing emissions through adopting a detailed climate action plan will also provide co-benefits such as cost savings, better quality of life, and attraction of new businesses and residents.

NEXT STEPS

The City of Elkhart should continue this process by identifying emissions reductions targets by percentage and goal year. These targets should be included in the climate action plan and should be addressed with clear and feasible initiatives and implementation timelines.

Information and data from this report will be used along with the tool ClearPath to identify possible reduction strategies. After the climate action plan is developed, implementation and monitoring of the initiatives and reduction strategies should occur following the implementation timelines. Greenhouse gas inventories should be continued once every 3-5 years after the climate action plan is adopted.

This report presents the completion of the first goal in a series of five goals set by ICLEI (see Figure 4 below). This framework and methodology should be following for the rest of the process.

Figure 4: ICLEI Climate Change Mitigation Milestones

APPENDICES

Glossary of terms

- **Carbon dioxide:** a colorless gas that the greenhouse gas most commonly released through human activities such as deforestation and coal burning
- **Methane:** the most powerful greenhouse gas commonly used as a fuel source
- **Nitrous oxide:** another greenhouse gas commonly released through agriculture and wastewater treatment, and
- **Hydrofluorocarbons (HFCs):** man-made gas produced through refrigeration and insulation
- **Perfluorocarbons (PFCs):** another man-made gas most commonly produced as a byproduct of industrial manufacturing
- **Sulfur hexaflouride (SF6):** man-made gas used for insulation production
- **Climate mitigation:** These efforts are directed at stopping more climate change from occurring by decreasing greenhouse gas emissions.
- **Climate adaptation:** These efforts are directed at managing the unavoidable impacts of climate change.
- **MTCO2e:** This measurement represents a given amount of a GHG whose atmospheric impact has been standardized to one unit mass of CO2, based on the GWP of the gas.
- **MT:** metric tons
- **Greenhouse gas:** gases that trap heat in the atmosphere
- **Global warming potential:** the potential warming effect of a given greenhouse gas
- **Greenhouse gas effect:** the process that occurs when gases are trapped in the atmosphere and create heat
- **Climate change resiliency:** the ability to recover quickly from difficulties or climate change impacts
- **Fossil fuels:** fuel formed over millions of years as plants and animals decompose underground

APPENDICES

Information & Acknowledments

For more information, please contact the Elkhart Environmental Center at (574) 293-5070.

Acknowledgments
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ICLEI Local Governments for Sustainability
Indiana Sustainability Development Program
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Elkhart Environmental Center Staff

Figures
1) **Cover Picture:** https://en.wikipedia.org/wiki/Elkhart,_Indiana
2) **Mayor's Photograph:** https://twitter.com/ElkhartMayor
3) **Figure 1:** https://www.elkhartindiana.org/egov/documents/1440074776_19572.pdf
4) **Figure 3:** https://ag.purdue.edu/indianaclimate/wp-content/uploads/2019/01/ClimateFacts_Elkhart_03262018_reduced.pdf
5) **Figure 4:** https://icleiusa.org/programs/emissions-management/5-milestones/