Michigan City

Inventory of Community Greenhouse Gas Emissions

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Foreword:

The City of Michigan City which sits on the largest network of freshwater in the world, the Great Lakes, is made up of many people who value clean air and water. Good government engages its employees and citizens to discuss and propose solutions to problems. As such, Mayor Ron Meer and the Michigan City leadership saw an opportunity to partner with Abhishek Jagdale, the Indiana Sustainability Development Program's extern from Indiana University, Bloomington along with ICLEI Local Governments for Sustainability. This partnership seeks to do three things. First, we measure our greenhouse gas emissions and establish a baseline for this measurement. You can't manage something that you haven't measured. Second, we propose practical action steps that Michigan City employees and citizens can take to achieve cleaner air quality. Thirdly, we engage with a great learning institution, Indiana University, in order to form a relationship over time where we can achieve win-win solutions for their students and faculty and for our City. We thank all who participated in this effort and we challenge each and every Michigan City employee and citizen to participate in taking the recommended actions of this report to make Michigan City a cleaner city.

Richard Murphy
City Controller – Michigan City

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Executive Summary

The City of Michigan City recognizes that greenhouse gas (GHG) emissions from human activity are catalyzing profound climate change, the consequences of which pose substantial risks to the future health, wellbeing, and prosperity of our community. Furthermore, Michigan City has multiple opportunities to benefit by acting quickly to reduce community GHG emissions. Reducing energy and transportation costs for residents and businesses, creating green jobs, improving health of residents, making your community a more attractive place to live and locate a business by reducing waste and increasing the green cover in the city.

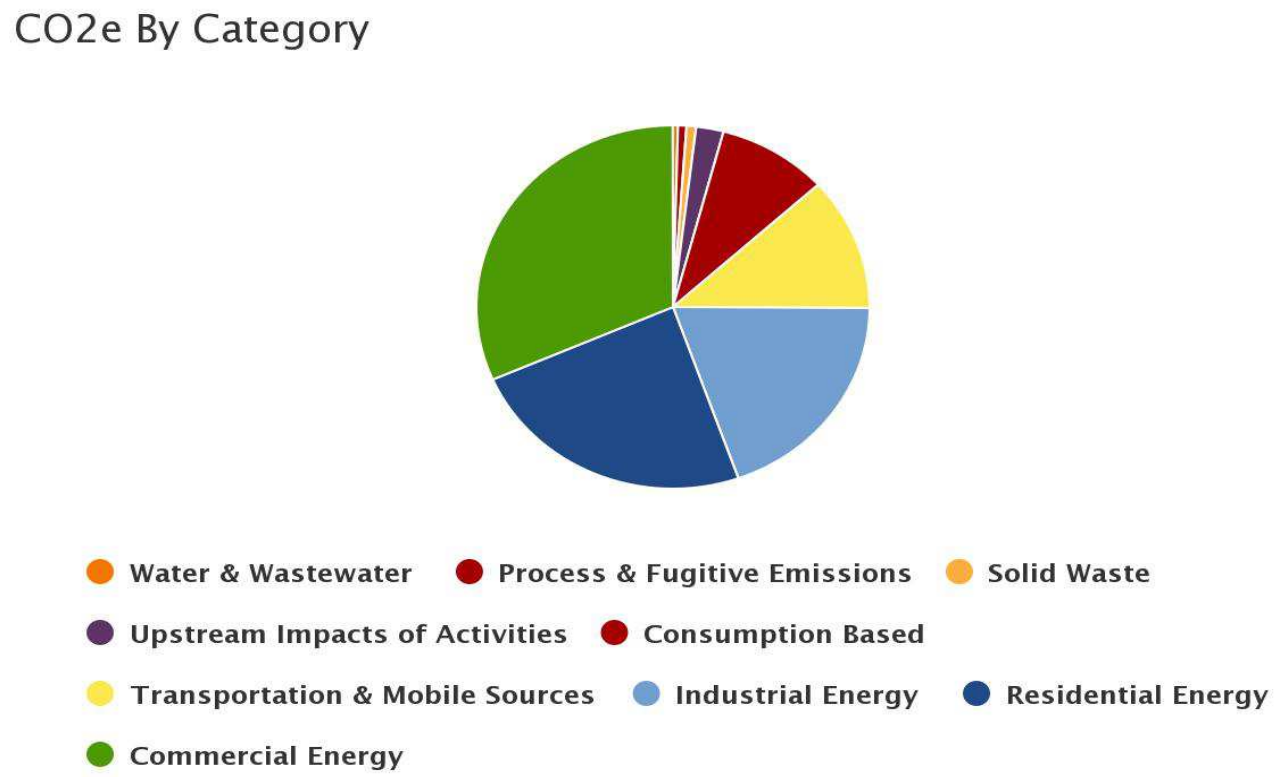
Michigan city has already formed a Sustainability Commission and has begun the climate action planning process, starting with inventorying emissions. This report provides estimates of greenhouse gas emissions resulting from activities in Michigan City as a whole in 2017.

Key Findings

Community-Wide Emissions Subject to Local Government Significant Influence

There are a variety of emissions sources and activities included in the community-wide inventory. A subset of these, identified as local government significantly influenced emissions, are most policy relevant. Figure 1 shows the significantly influenced emissions. The largest contributor in this set is Commercial Energy with 31.53% of emissions. The next largest contributor is Residential Energy with 23.84% of emissions. Actions to reduce emissions in both of these sectors will be a key part of a climate action plan. Industrial, Transport and Solid Waste were responsible for the remainder of significantly influenced emissions.

Figure 1: Community-Wide Emissions Subject to Local Government Significant Influence



Next Steps

- **These preliminary results are cogent, but imperfect with incomplete data for few sectors.**
- **Inventory is used as a baseline for the City to devise an effective climate actions plan.**
- **Focus on the emissions that the City can exert influence on; low hanging fruits (i.e.; energy efficiency, waste minimization).**

Climate Change Background

Naturally occurring gases dispersed in the atmosphere determine the Earth's climate by trapping solar radiation. This phenomenon is known as the greenhouse effect. Overwhelming evidence shows that human activities are increasing the concentration of greenhouse gases and changing the global climate. The most significant contributor is the burning of fossil fuels for transportation, electricity generation and other purposes, which introduces large amounts of carbon dioxide and other greenhouse gases into the atmosphere. Collectively, these gases intensify the natural greenhouse effect, causing global average surface and lower atmospheric temperatures to rise.

Michigan City could be impacted by increased water levels in Lake Michigan, Irregularities in seasons, increased number of hot days in a year, increased and irregular rainfall.

Many communities in the United States have taken responsibility for addressing climate change at the local level. Reducing fossil fuel use in the community can have many benefits in addition to reducing greenhouse gas emissions. More efficient use of energy decreases utility and transportation costs for residents and businesses. Retrofitting homes and businesses to be more efficient creates local jobs. In addition, money not spent on energy is more likely to be spent on a local business and added to the local economy. Reducing fossil fuel use improves air quality and increasing opportunities for walking and bicycling improves residents' health.

Evidence of Human-Caused Climate Change

The Intergovernmental Panel on Climate Change (IPCC)'s Fifth Assessment Report affirms 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] Researchers have made progress in their understanding of how the Earth's climate is changing in space and time through improvements and extensions of numerous datasets and data analyses, broader geographical coverage, better understanding of uncertainties and a wider variety of measurements.[2] These refinements expand upon the findings of previous IPCC Assessments – today, observational evidence from all continents and most

[1] IPCC, 2014: Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R.K Pachauri, and L.A. Meyer (eds.)]. Geneva, Switzerland, 151 pp

[2] IPCC, 2014: Summary for Policymakers. In: Climate Change 2014: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M.Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

oceans shows that "regional changes in temperature have had discernible impacts on physical and biological systems."

The Fifth Assessment asserts that "it is *extremely likely* that more than half of the observed increase in global average surface temperature from 1951 to 2010 was caused by the anthropogenic increase in GHG concentrations and other anthropogenic forcing together. Globally, economic and population growth continued to be the most important drivers of increases in CO2 emissions from fossil fuel combustion. Changes in many extreme weather and climate events have been observed since about 1950. Some of these changes have been linked to human influences, including a decrease in cold temperature extremes, an increase in warm temperature extremes, an increase in extreme high sea levels and an increase in the number of heavy precipitation events in a number of regions". As shown in Figure 3, indicators such as global averaged sea level change and globally averaged combined land and ocean surface temperature anomaly have all increased since the beginning of the 20th century and are continuing to trend upward.

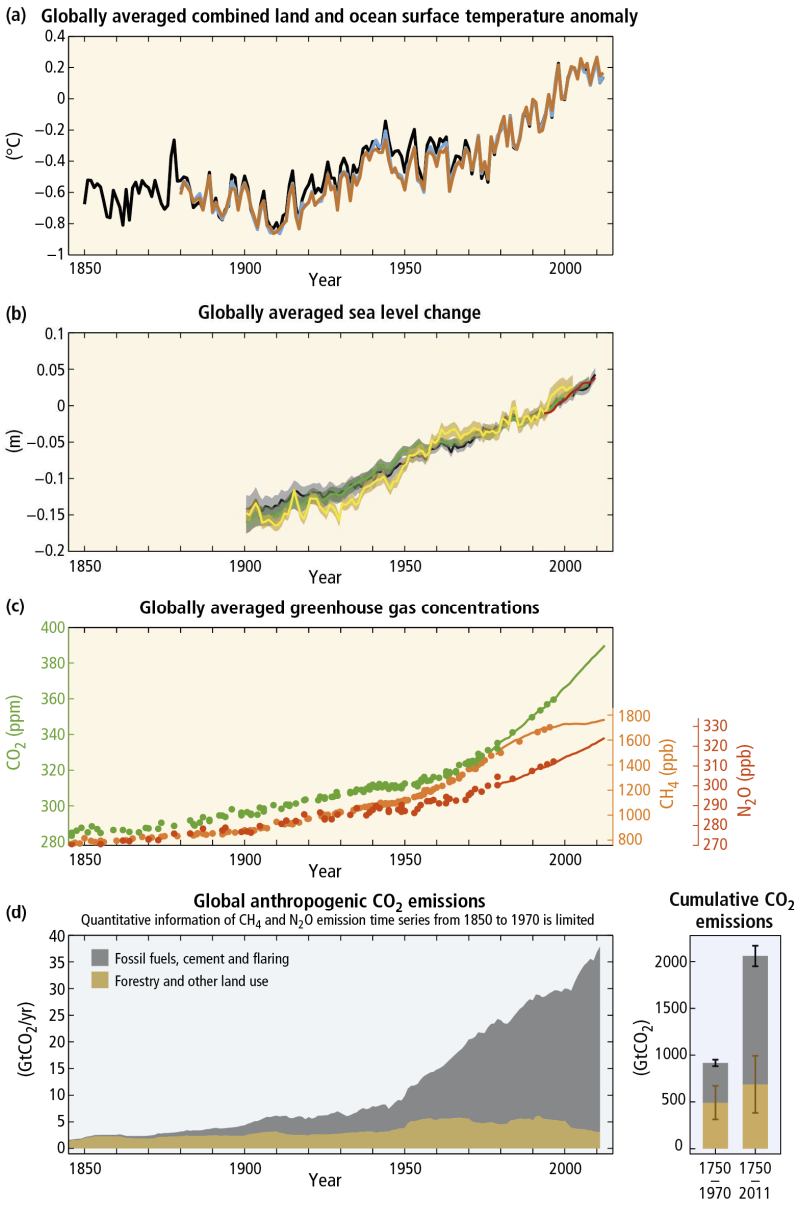
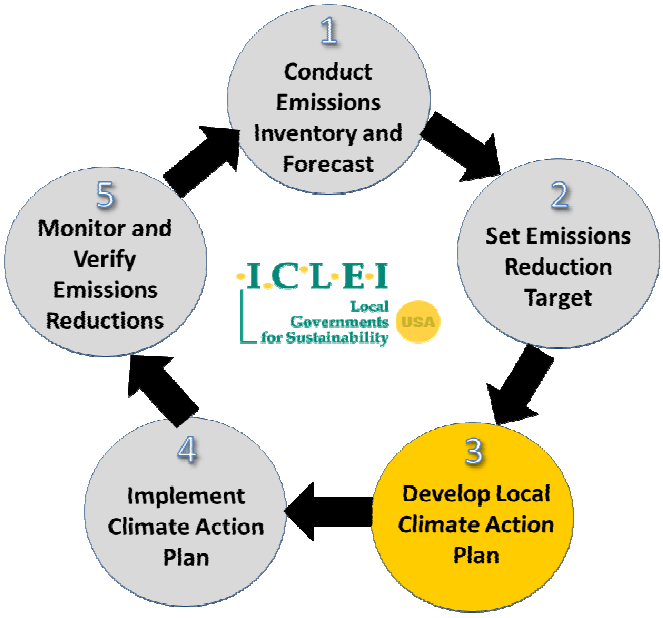


Figure 3: Observations and other indicators of a changing global climate system

In short, the Earth is already responding to climate change drivers introduced by mankind.



Regional and Local Impacts

Michigan City has experienced days with significantly lower temperatures for a summer followed by heavy rainfall and thunderstorm followed by days of extreme heat. All this accompanying increased lake levels in Lake Michigan. A Climate Action Plan will help the city tackle these problems more effectively.

ICLEI Climate Mitigation Program

In response to the problem of climate change, many communities in the United States are taking responsibility for addressing emissions at the local level. Since many of the major sources of greenhouse gas emissions are directly or indirectly controlled through local policies, local governments have a strong role to play in reducing greenhouse gas emissions within their boundaries. Through proactive measures around land use patterns, transportation demand management, energy efficiency, green building, waste diversion, and more, local governments can dramatically reduce emissions in their communities. In addition, local governments are primarily responsible for the provision of emergency services and the mitigation of natural disaster impacts.

ICLEI provides a framework and methodology for local governments to identify and reduce greenhouse gas emissions, organized along Five Milestones, also shown in Figure 4:

1. Conduct an inventory and forecast of local greenhouse gas emissions;
2. Establish a greenhouse gas emissions reduction target;
3. Develop a climate action plan for achieving the emissions reduction target;
4. Implement the climate action plan; and,
5. Monitor and report on progress.

This report represents the completion of ICLEI's Climate Mitigation Milestone One for the community as a whole and provides a foundation for future work to reduce greenhouse gas emissions in Michigan City.

Sustainability & Climate Change Mitigation Activities in Michigan City

Michigan City has already implemented programs that have or will lead to ancillary benefits in the form of energy conservation and greenhouse gas mitigation. Some of them are as follows:

- **Citywide Energy Savings Project**
- **Switching Conventional Lighting to LED**
- **Michigan City Area Schools (Krueger Middle School) Cafeteria Recycling Program**

Inventory Methodology

Understanding a Greenhouse Gas Emissions Inventory

The first step toward achieving tangible greenhouse gas emission reductions requires identifying baseline emissions levels and sources and activities generating emissions in the community. This report presents emissions from the Michigan City as a whole community. The government operations inventory is a subset of the community inventory; for example, data on commercial energy use by the community includes energy consumed by municipal buildings, and community vehicle-miles-traveled estimates include miles driven by municipal fleet vehicles.

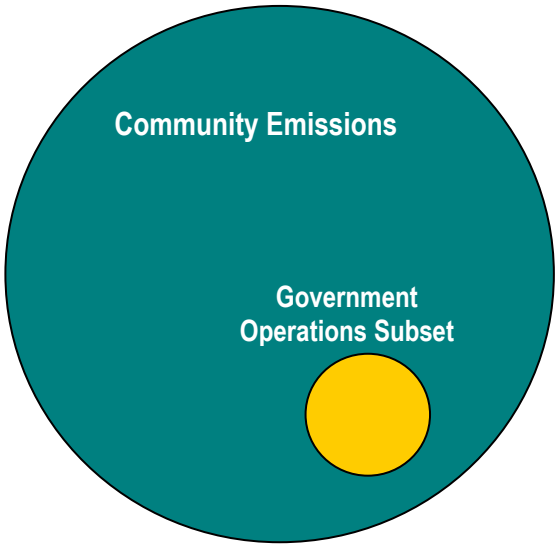


Figure 5: Relationship of Community and Government Operations Inventories

As local governments have continued to join the climate protection movement, the need for a standardized approach to quantify GHG emissions has proven essential. This inventory uses the approach and methods provided by the Community Greenhouse Gas Emissions Protocol (Community Protocol)[3].

Community Emissions Protocol

The Community Protocol was released by ICLEI in October 2012 and represents a new national standard in guidance to help U.S. local governments develop effective community GHG emissions inventories. It establishes reporting requirements for all community GHG emissions inventories, provides detailed accounting guidance for quantifying GHG emissions associated with a range of emission sources and community activities, and provides a number of optional

[3] http://www.icleiusa.org/tools/ghg-protocol/community-protocol

reporting frameworks to help local governments customize their community GHG emissions inventory reports based on their local goals and capacities.

Quantifying Greenhouse Gas Emissions

Sources and Activities

Communities contribute to greenhouse gas emissions in many ways. Two central categorizations of emissions are used in the community inventory: 1) GHG emissions that are produced by "sources" located within the community boundary, and 2) GHG emissions produced as a consequence of community "activities".

Source	Activity
Any physical process inside the Michigan City boundary that releases GHG emissions into the atmosphere	The use of energy, materials, and/or services by members of the community that result in the creation of GHG emissions.

By reporting on both GHG emissions sources and activities, local governments can develop and promote a deeper understanding of GHG emissions associated with their communities. A purely source-based emissions inventory could be summed to estimate total emissions released within the Michigan City boundary. In contrast, a purely activity-based emissions inventory could provide perspective on the efficiency of the community, even when the associated emissions occur outside the Michigan City boundary.

Base Year

The inventory process requires the selection of a base year with which to compare current emissions. Michigan City's community greenhouse gas emissions inventory utilizes 2017 as its base year.

The reason for selecting the specific year lies with the fact that utilities do not have the data available for the current or a year previous. Many of the factor sets and models used for calculations are modified at intervals of 2 or 5 years, so it makes sense to choose the year closest to the year of the latest factor set available (E-grid data set-2016 & NIRPC DVMT data set-2016) as well as the year for which all utilities have the data available readily.

Quantification Methods

Greenhouse gas emissions can be quantified in two ways:

- **Measurement-based methodologies refer to the direct measurement of greenhouse gas emissions (from a monitoring system) emitted from a flue of a power plant, wastewater treatment plant, landfill, or industrial facility.[4]**
- **Calculation-based methodologies calculate emissions using activity data and emission factors. To calculate emissions accordingly, the basic equation below is used: *Activity Data x Emission Factor = Emissions.***

All emissions sources in this inventory are quantified using calculation-based methodologies. Activity data refer to the relevant measurement of energy use or other greenhouse gas-generating processes such as fuel consumption by fuel type, metered annual electricity consumption, and annual vehicle miles traveled. Please see appendices for a detailed listing of the activity data used in composing this inventory.

Known emission factors are used to convert energy usage or other activity data into associated quantities of emissions. Emissions factors are usually expressed in terms of emissions per unit of activity data (e.g. lbs. CO_2/kWh of electricity).

[4] Michigan City's community inventory includes emissions data provided by the NIPSCO, Sanitary District, Dept. of Water Works, NICTD, MC Transit, Municipal Airport etc. that was gathered through DIRECT MEASUREMENT

Community Emissions Inventory Results

Following the Community Protocol, this inventory report organizes emissions in several frames. Each frame includes a particular set of emissions sources and activities, and each helps to tell a different story about community emissions. This report looks at Michigan City's community emissions through three frames:

- **Local Government Significant Influence**
- **Community-Wide Activities**

Community Profile

To put emissions inventory data in context, it is helpful to have some basic information about community such as population and number of households. This information is provided in Table 1.

Table 1: Michigan City Community Indicators

Estimated [base year] Population	**# 31056**
Estimated [base year] Households	**# 12729**

Significantly Influenced Emissions Frame

Michigan City has chosen first to focus on emissions over which the City government has significant influence. This frame emphasizes policy relevance, highlighting a set of emission sources and activities that Michigan City has the greatest opportunity to address. This frame includes all the five Basic Emissions Generating Activities required by the community protocol Table 2 summarize significantly influenced emissions by source and activity.

Table 2: Significantly Influenced GHG Emissions by activity and source

Source or Activity	Activity Data Quantity and Unit	Emissions (metric tons CO2e)
Residential Use of Electricity	119108523 kWh	96890
Commercial Industrial Use of Electricity	202245700 kWh 96304514 kWh	164518 78340
Residential Stationary Combustion	11913822 Therms	63352
Commercial & Industrial Stationary Combustion	8914625 Therms 9940134 Therms	47403 52757
On-road Passenger Vehicle Travel	161463955 Annual vehicle miles	63459
On-road Freight Vehicle Travel	8942500 Annual vehicle miles	4308
Use of Electricity in Potable Water Treatment and Distribution	2731840 kWh	2222
Use of Electricity in Wastewater Treatment	50 kWh	313
Generation of Solid Waste	13614.12 tons	5048

Michigan City will focus on these emissions sources and activities in developing a climate action plan. The total significantly influenced emissions of 671943 metric tons CO2e will be the baseline for setting an emissions reduction target and measuring future emissions reductions against.

Figure 2: Energy use across Residential Sector:

Electricity Usage: 119108523 kWh

Natural Gas Usage: 11913822 Therms

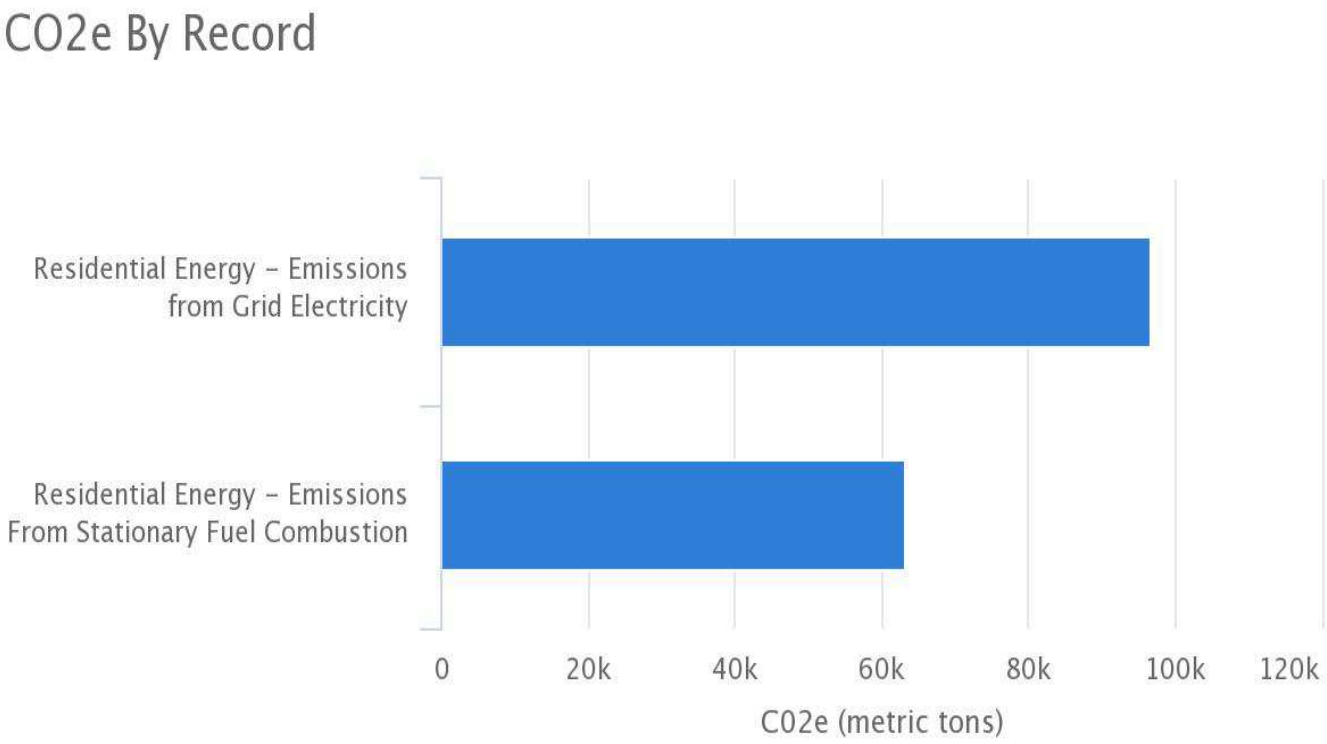


Figure 3: Energy use across Commercial Sector:

Electricity Usage: 202245700 kWh

Natural Gas Usage: 8914625 Therms

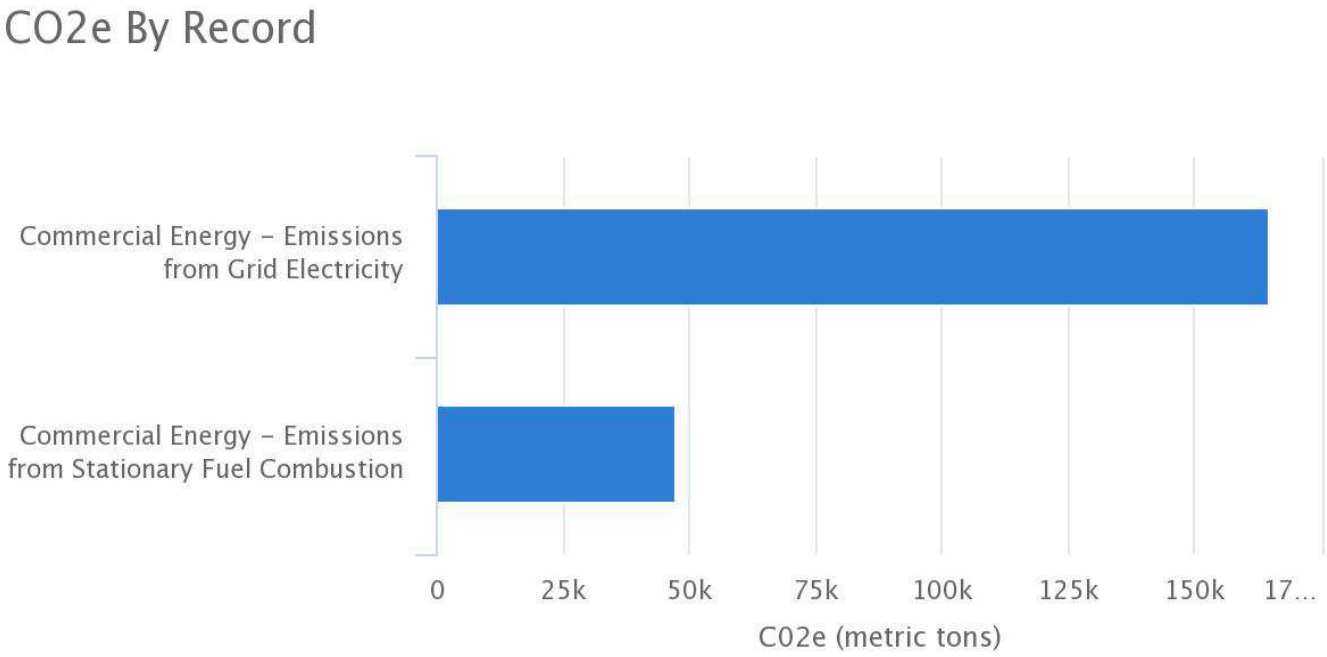


Figure 4: Energy use across industrial sector:

Electricity Usage: 96304514 kWh

Natural Gas Usage: 9940134 Therms

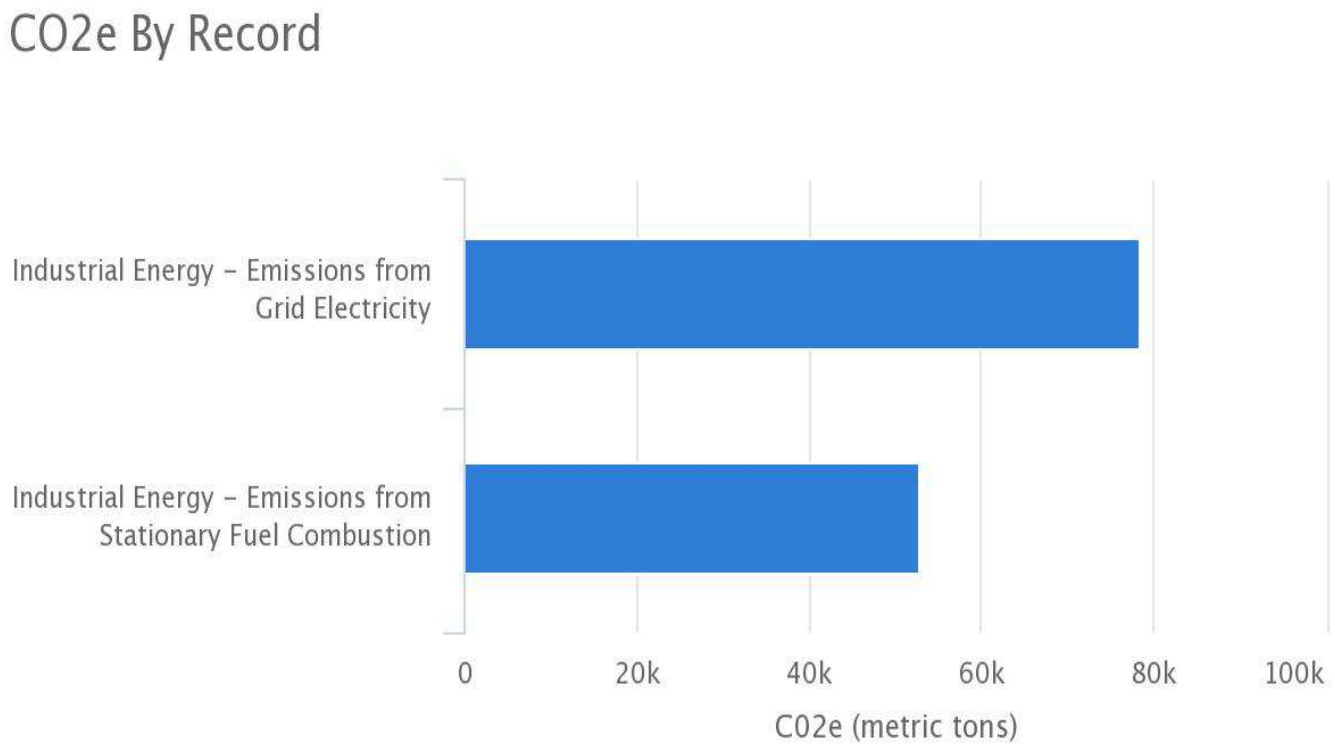


Figure 5: Emissions due to solid waste:

Waste produced within the city: 13,641 tons

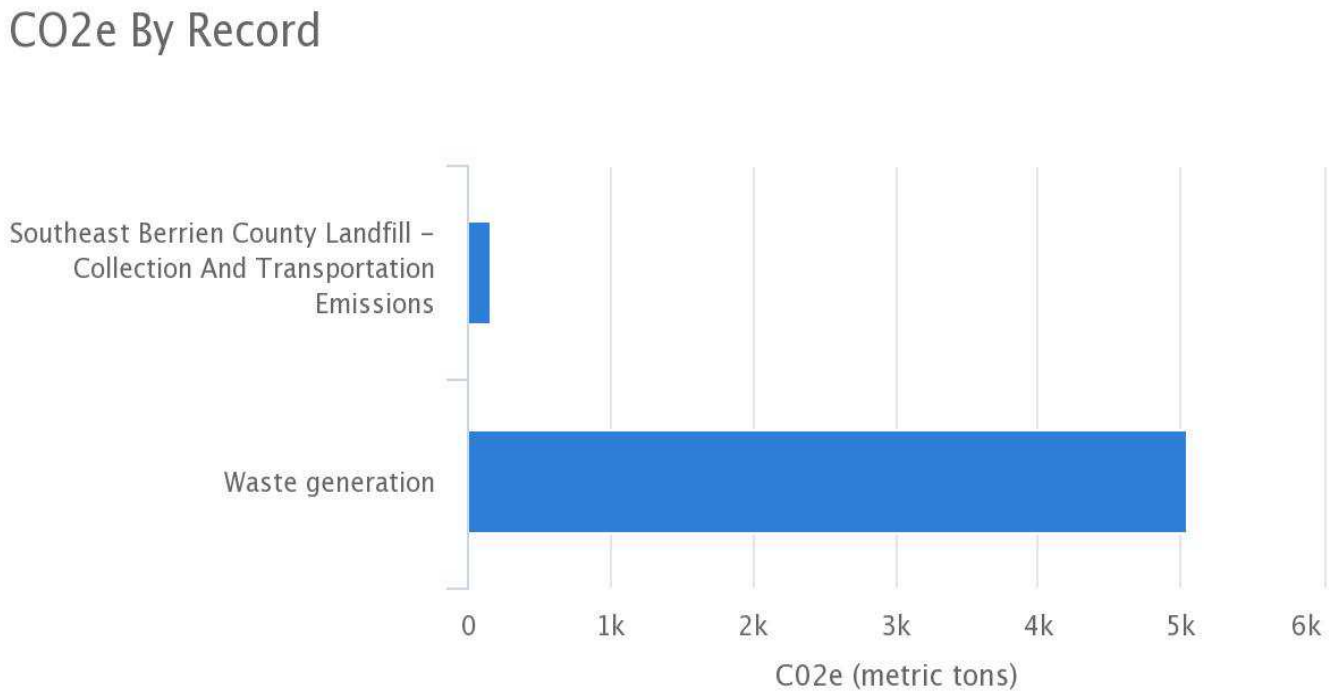


Figure 6: Emissions due to treatment of water and wastewater:

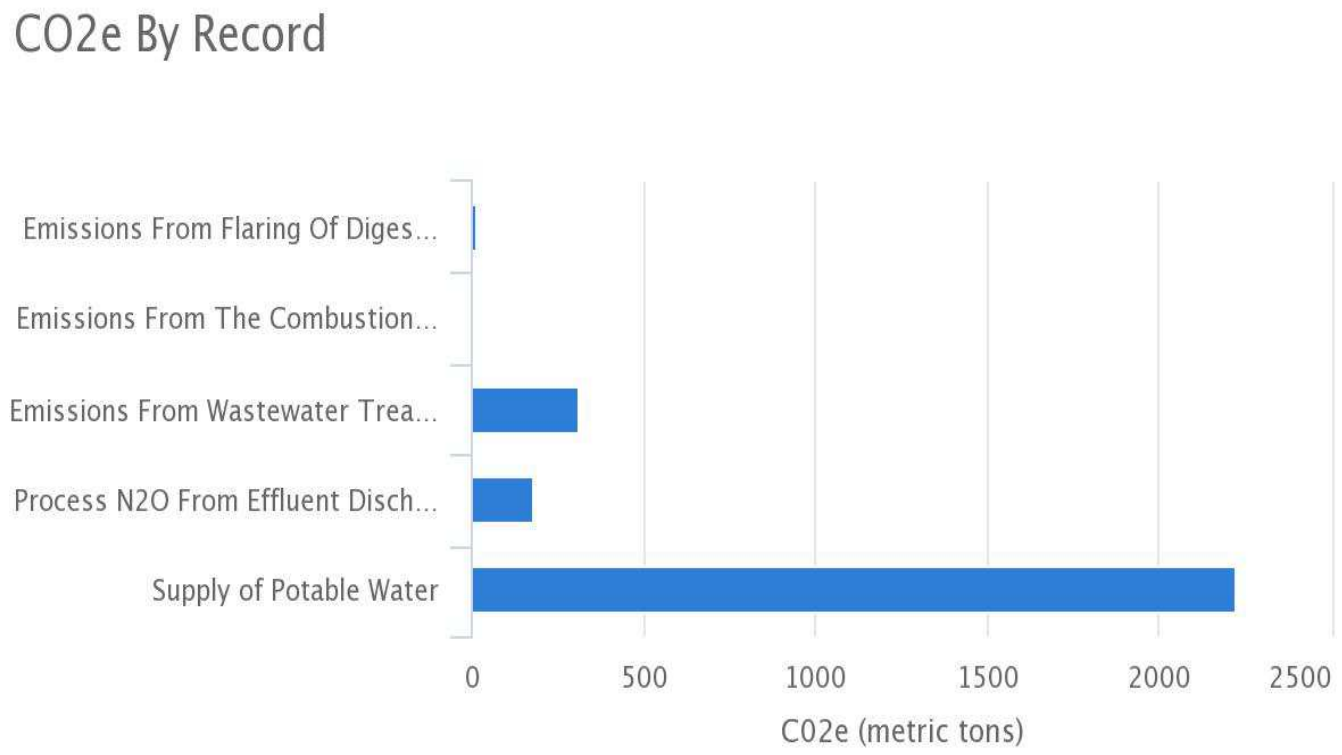


Figure 7: Fugitive Emissions:

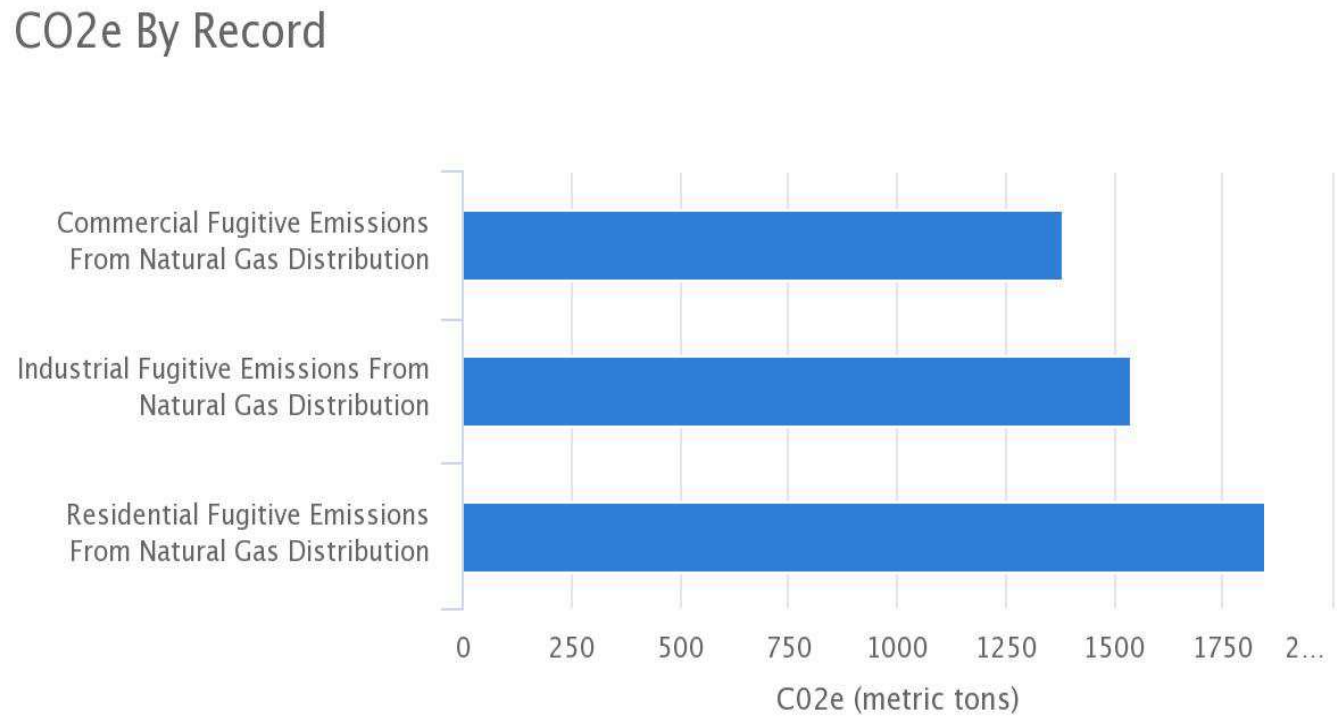


Figure 8: Upstream Emissions:

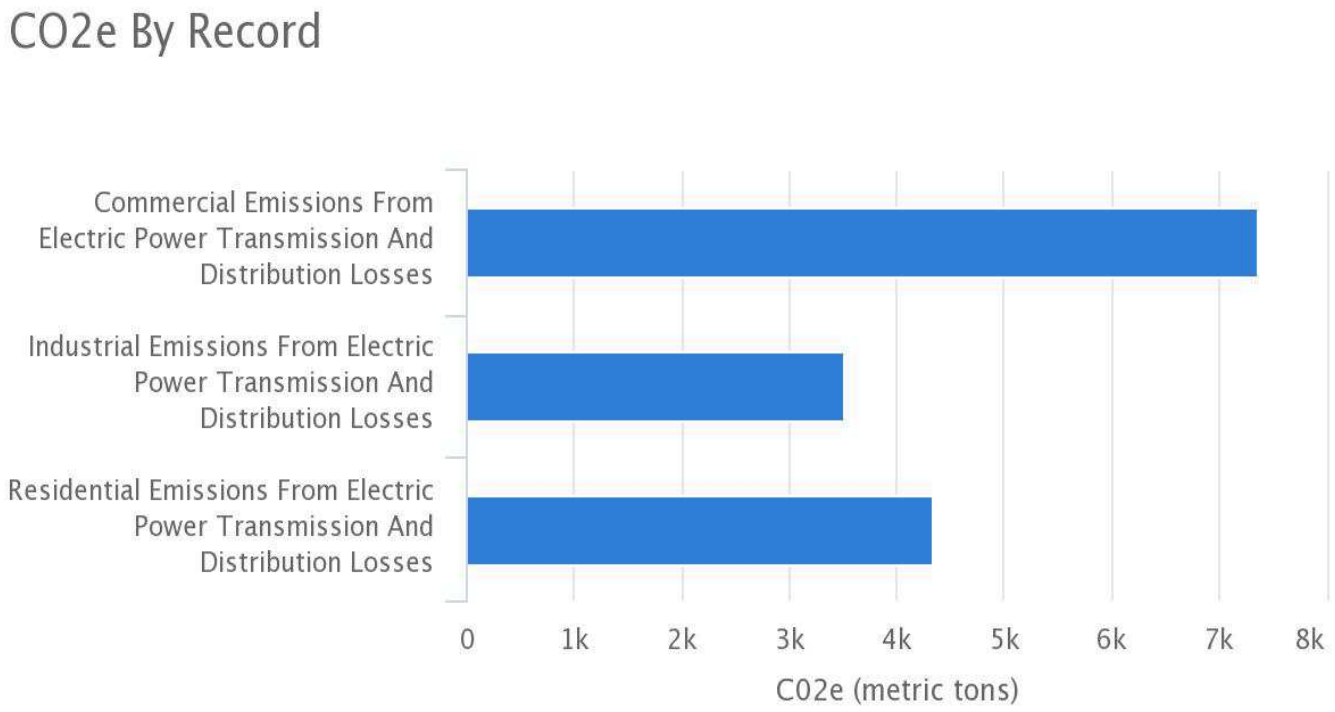


Figure 9: Consumption Based Emissions (Food)

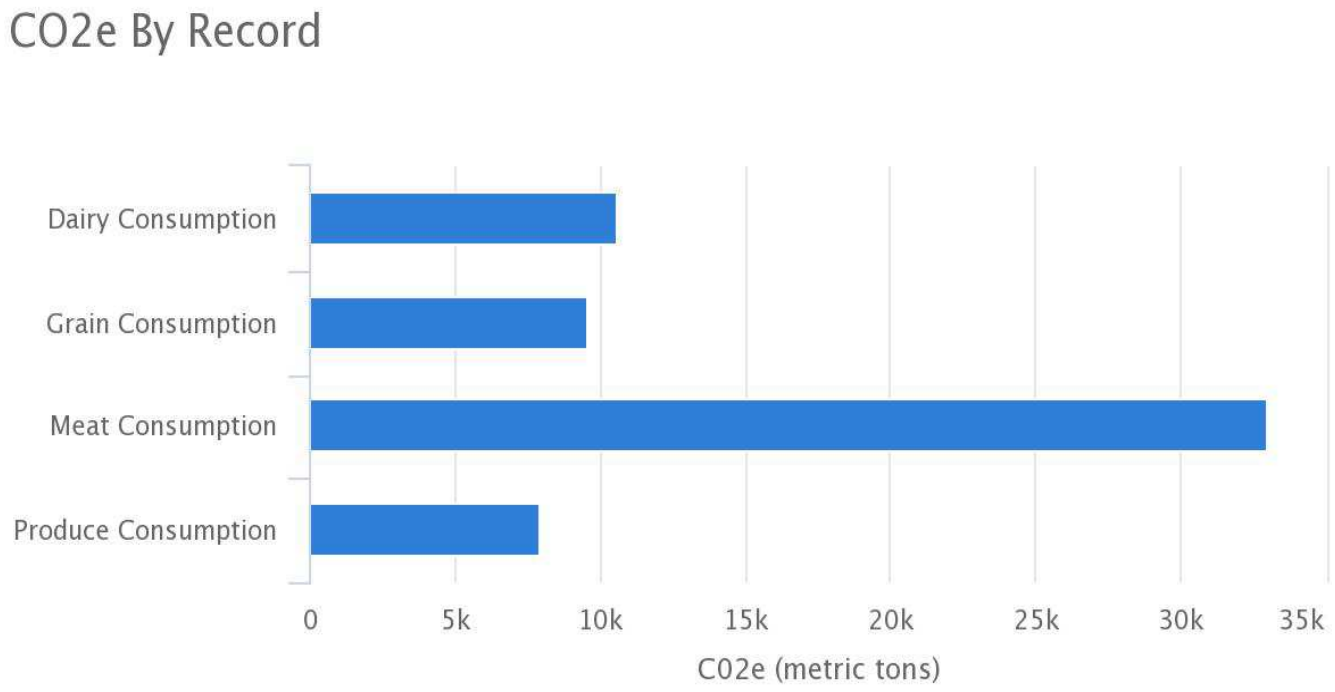
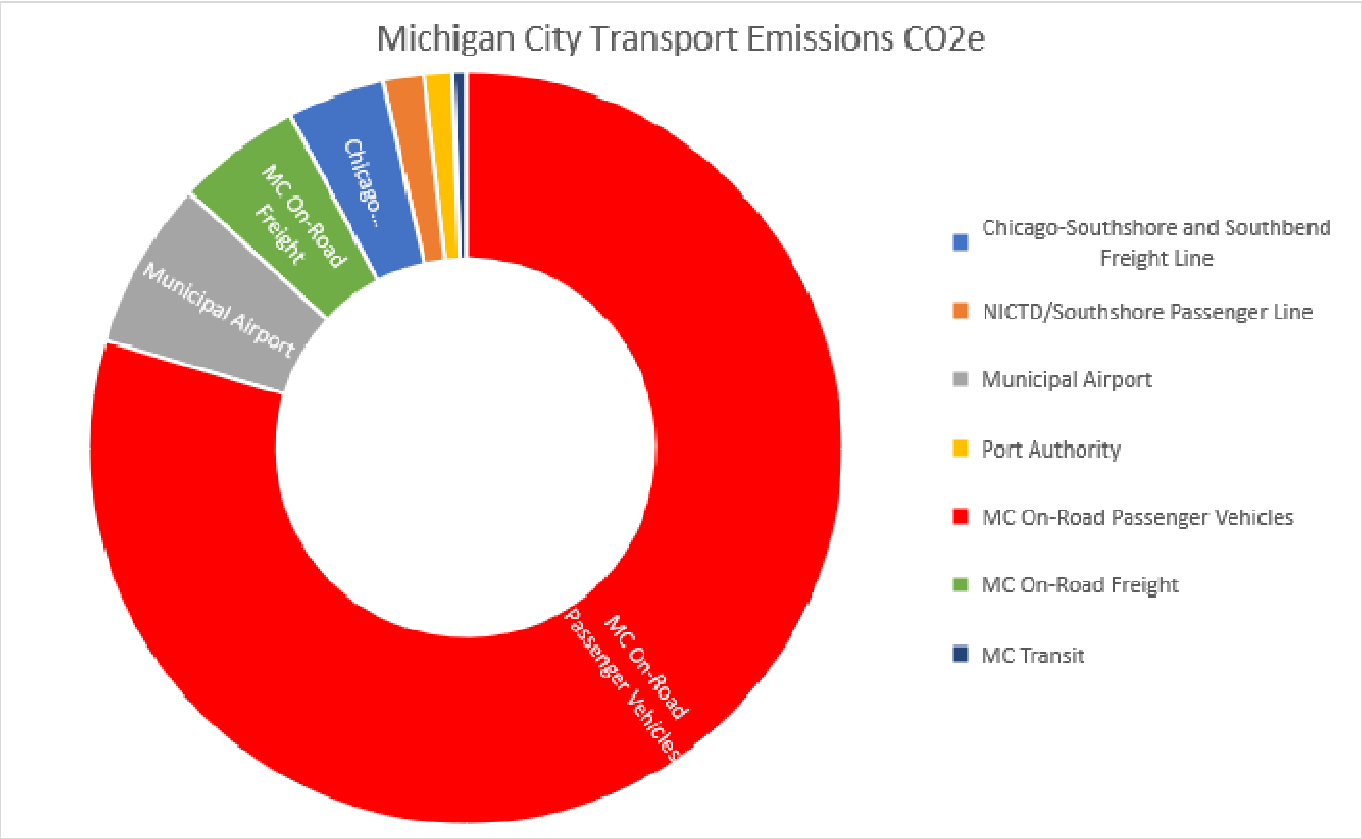


Figure 10: Transportation:



Transportation:

Activity / Source	Emissions (CO2e MT)
Chicago Southshore and Southbend railroad - Freight line	3350
NICTD/Southshore line - Passenger line	1387
MC On-Road Passenger Vehicles	63459
MC On-Road Freight	4308
MC Transit	440
Municipal Airport	5830
Port Authority	997

Energy Sector (Residential, Commercial and Industrial) is the largest contributor to emissions over which Michigan City has significant influence. This will be an important activity to focus efforts on in developing a climate action plan. Transportation (Private passenger cars) and Solid Waste also account for a large part of significantly influence emissions and will also be important to address.

Community-Wide Activities Frame

Michigan City has chosen to also look at emissions through the community-wide activities frame. This frame includes emissions that result from the use of energy, materials, and services by all members of the community, regardless of whether Michigan City has significant influence over those emissions. These emissions may be occurring within or outside of the community boundary. This frame includes the required five Basic Emissions Generating Activities, and also includes use of air travel, use of transit, upstream impacts of fuels used for heat, electricity and transportation. When used for comparison across communities, this framework is helpful in illustrating relative urban efficiencies. Looking at the community-wide activities frame shows that, , households and businesses in Michigan City may want to consider these activities as they think about how to reduce their own emissions.

Recommendations:

Residential Energy:

- Motivating People to buy Renewable Energy from the grid.
- Solar Panels for houses/communities:
  - Use of platforms such as Solarize Indiana.
- Buying Energy Efficient Equipment.
- Energy Audits of residential properties:
  - Use of NIPSCO's No-Cost Home Energy Assessment
- Repairing any leaks (Essential for reducing Fugitive and Upstream Emissions)

Commercial & Industrial Energy:

- Development of buildings under high efficiency and sustainability & low emissions standards.
- Use of Energy Star and LEED/LEED-EBOM.
- Modernization of the sector through application of electrically efficient processes.
- Changing street lights to LEDs.

Solid Waste:

- Development of an Integrated Waste Management Plan which will include:
  - Education & Awareness
  - Installation of separate garbage bins at all public places along with clear instruction (Pictures) about what kind of waste goes in which bin.
  - Reverse Vending
  - Encouraging/Incentivizing local businesses to move towards more environmentally friendly ways of packaging.

Transportation:

- Sustainable Mobility:
  - Developing a transit system based on efficient and renewable public mobility scheme.
  - Modernization of fleet vehicles through grant money.
  - Lease option for immediate benefits with no upfront costs.
  - Right-sizing the fleet to meet the demand.
  - Using EVs and Hybrids for fleet vehicles
  - Bike Sharing.
  - Developing Electronic Charging Infrastructure in the city.

Other Recommendations:

- **Consider potential sources of carbon sinks within the city**
  - **Planned reforestation / increasing tree canopy**
- **Pass a resolution to institutionalize sustainability.**
- **Formal commitment to climate action (Signing the US Mayors Climate Protection Agreement or Global Covenant of Mayors)**
- **Leadership should ensure sustainability is prioritized in government operations and community-wide.**
- **Business engagement & recognition programs**
- **Brownfield to Brightfield**

Conclusion:

This analysis found that the Michigan City community as a whole was responsible for emitting 671943 metric tons of CO_2e in the base year 2017, with emissions from the Energy, Transport and Solid Waste sectors contributing the most to this total.

As Michigan City moves forward with considering emission reduction strategies and works to create a local climate action plan, the city should identify and quantify the emission reduction benefits of climate and sustainability strategies that could be implemented in the future, including energy efficiency, renewable energy, vehicle fuel efficiency, alternative transportation, vehicle trip reduction, land use and transit planning, waste reduction and other strategies. Through these efforts and others, Michigan City can achieve additional benefits beyond reducing emissions, including saving money and improving Michigan City's economic vitality and its quality of life.

All the data provided above, along with data received from relevant city authorities will be available with City Controller – Richard Murphy.