PREPARED FOR ENVIRONMENTAL CHANGE GRAND CHALLENGE INITIATIVE

ENVIRONMENTAL RESILIENCE INSTITUTE

2019 Resilience Cohort
Results Summary

April 2020

M^cKINNEY FAMILY
FOUNDATION

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Introduction

In 2019, Indiana University's Environmental Resilience Institute (ERI) launched the Resilience Cohort, a program that guided 14 Indiana cities, towns, and counties through the process of conducting community-wide greenhouse gas inventories. The Cohort was supported by staff at ERI and ICLEI-Local Governments for Sustainability through strategy consulting, webinar training, and technical assistance. Some Cohort participants participated in Sustain IU's Indiana Sustainability Development Program (ISDP) and hosted an IU student extern for 10 weeks during the Cohort program to help with the inventory process. For many participants, this was the first GHG inventory conducted in their community, providing a fundamental benchmark for local governments committed to reducing carbon emissions and increasing energy efficiency city- or county-wide. Participants conducted their inventories using one of the two accepted methodologies: the [Global Protocol for Community-Scale Greenhouse Gas Emission Inventories (GPC)](#) and the [US Community Protocol for Accounting and Reporting Greenhouse Gas Emissions (](#)US Community Protocol). Additionally, seven communities conducted local-government operations inventories alongside their community-wide inventories to provide a more detailed look at government-specific emissions.

A greenhouse gas (GHG) inventory quantifies the amount of GHGs released by man-made sources within a defined boundary in a twelve-month period. The GPC and US Community Protocol measure carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), perfluorocarbons (PFCs), hydrofluorocarbons (HFCs), and sulfur hexafluoride (SF_6) emissions. Carbon dioxide is the most common and well-known GHG, so total emissions are often reported in terms of carbon dioxide equivalent (CO_2e). Each GHG has a different global warming potential (GWP), or measure of how much heat each greenhouse gas traps in the atmosphere within a defined time period. These GWPs are used to convert each greenhouse gas into a carbon dioxide equivalent so each GHG can be measured using a standard unit. Conducting a greenhouse gas inventory is an important first step for local governments to understand community emission sources and to set a benchmark to guide and track GHG reductions.

For the community-wide inventories, local governments collected data on energy use (e.g., amount of electricity and natural gas used in the residential, commercial, and industrial sectors), solid waste sent to the landfill (e.g., tons of waste), water use and treatment (e.g., the volume of digester gas produced per day), and transportation (e.g., vehicle miles traveled estimates) occurring within the defined boundary, among other sources. Communities that conducted government operations inventories collected data on employee commutes (e.g., estimated miles traveled), government solid waste generation (e.g., tons of solid waste sent to the landfill), government building energy use (e.g., amount of electricity and natural gas used), and fuel used by the city, town, or county fleet, among other sources. These data were converted to CO_2e, the standard unit of measurement for carbon footprints. Each community choose how to report their results; some opted for public reports and press conferences, some posted the results on their websites, some shared it with a local news agency, and some are still deciding whether or not to publicly release the data.

2019 Cohort members included: Bloomington, Carmel, Columbus, Delaware County/Muncie, Evansville, Fishers, Fort Wayne, Goshen, Gary, Greencastle, Michigan City, Oldenburg, Richmond, and West Lafayette. This report outlines each community's high-level results and links to any detailed reports that were released to the public.

Communities who received ISDP externs were Bloomington, Carmel, Delaware County/Muncie, Evansville, Fort Wayne, Gary, Goshen, and Michigan City.

Please note – Although we have compiled these data into one report, **it is not accurate to compare one community's emissions to another**. Each community has different amounts of industry, different roads going through its boundaries, experiences different weather patterns, and has access to different datasets. In addition, some communities included sources that others did not. Examples of optional emission sources include industrial products, industrial processes, agricultural, livestock, boats, and more.

Figure 1 provides an overview of the national profile of greenhouse gas emissions in 2017, broken down by economic sector.
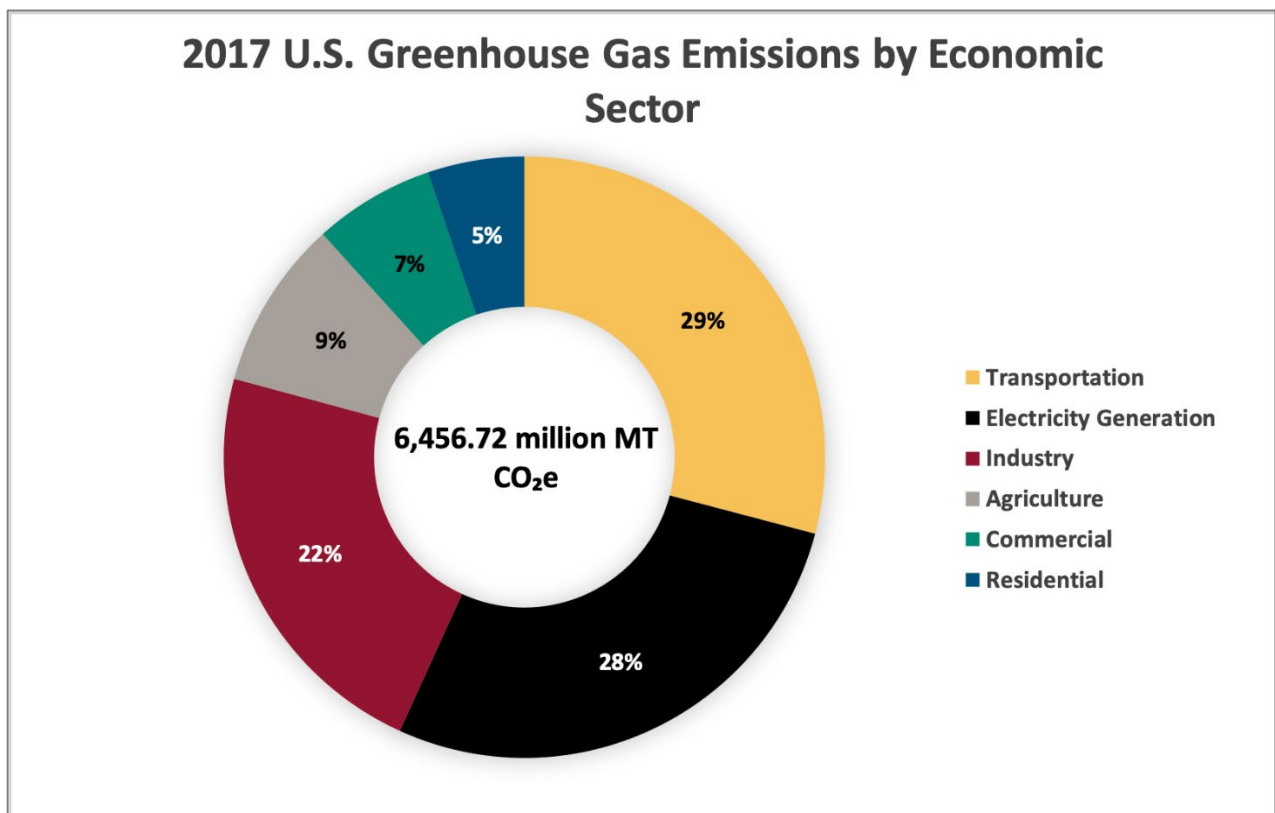

Figure 1. Percentage of total U.S. CO₂e emissions by economic sector (Source: U.S. EPA's Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2017.
https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks

Community Results

All 14 Cohort members completed one or more community greenhouse gas inventory. The communities chose their own report year, and many completed an inventory for more than one year. This section outlines the results of these inventories.

As you review the results, please remember that greenhouse gas emissions inventories are estimates. Although researchers are working on new accounting methodologies, obtaining a perfectly accurate accounting of emissions is not possible with current technologies. Nevertheless, the results of a greenhouse gas inventory should <u>not</u> be discounted. The process and results allow communities to obtain standard measurements which can be tracked and reduced over time.

Image 1. City of Gary staff Miriam Stevens and Resilience Cohort and ISDP Extern Reena Azlan organized a greenhouse gas inventory kickoff meeting for stakeholders.

Each community's results include a pie chart providing a breakdown of emissions by sector, as well as a table detailing total CO_2e emissions, population, and per capita CO_2e emissions. Population estimates used in this report were obtained from the US Census Fact Finder on January 16, 2020 (https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=bkmk).

Bloomington
Inventory year: 2018 | Full Report

In 2018, an estimated 1,290,030 metric tons of carbon dioxide equivalent (CO_2e) were emitted within Bloomington city limits. Figure 2 shows the contribution of each sector.
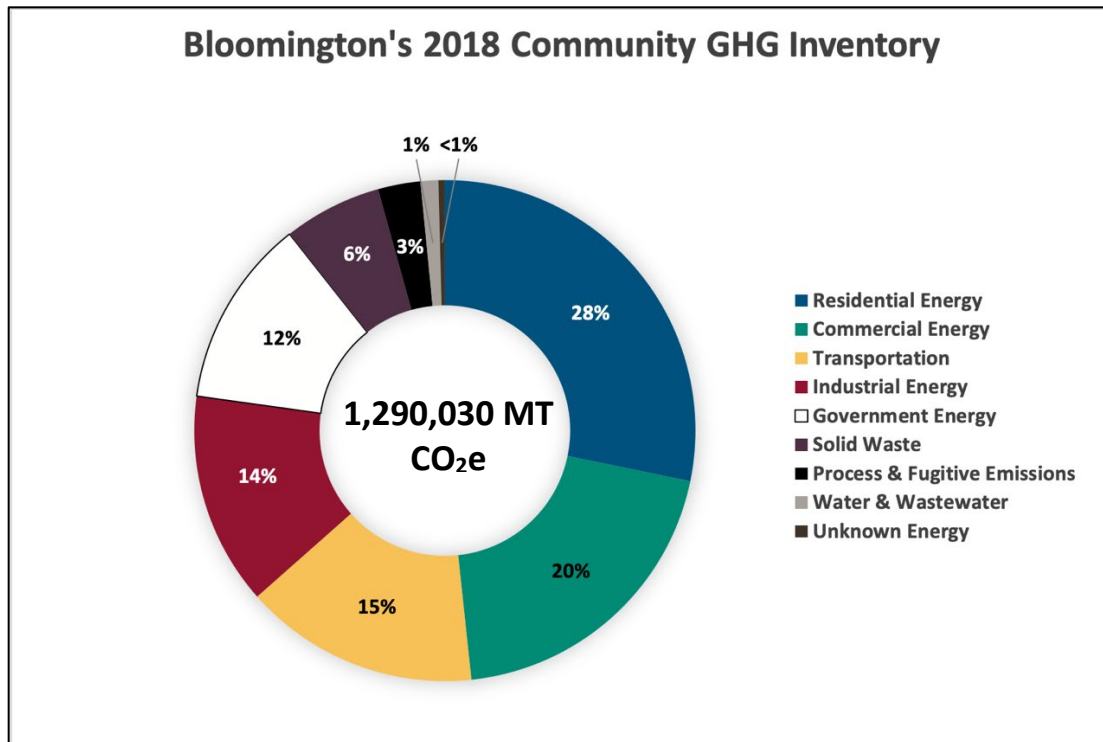

Figure 2. Percentage of total CO_2e emissions by sector (Bloomington, 2018)

Table 1. Bloomington's total and per capita emissions

INVENTORY YEAR	TOTAL CO₂E (MT)	POPULATION	PER CAPITA CO₂E (MT)
BLOOMINGTON (2018)	1,290,030	84,981	15.18

Carmel
Inventory years: 2015 and 2018

Carmel completed community inventories for 2015 and 2018. In 2015, an estimated 1,134,830 metric tons of carbon dioxide equivalent (CO_2e) were emitted within Carmel city limits. In 2018, an estimated 1,180,989 metric tons of CO_2e were emitted within Carmel city limits. Figures 3 and 4 on the next page show the contribution of each sector in 2015 and 2018, respectively. Emissions increased by an estimated 4.07% between 2015 and 2018 (1.36% per year), while population grew 6.02% over the same time period (2.01% per year).
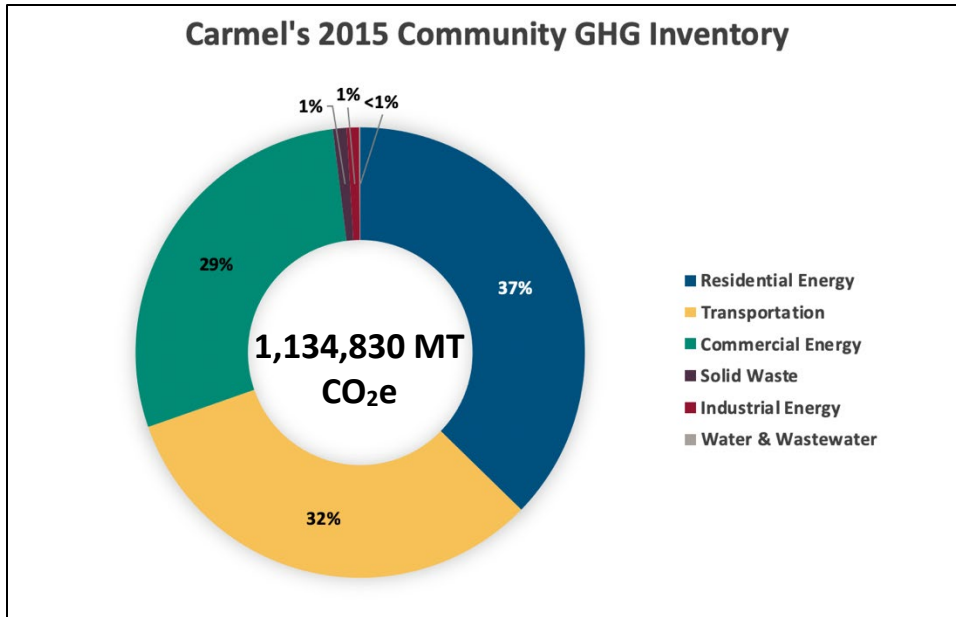
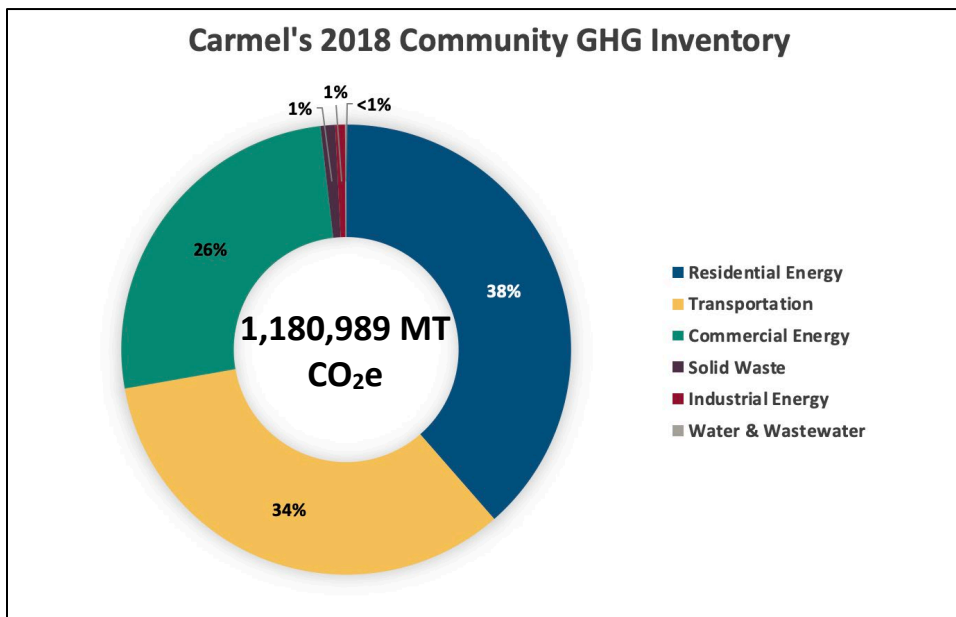*Figure 3. Percentage of total CO_2e emissions by sector (Carmel, 2015)*

Figure 4. Percentage of total CO_2e emissions by sector (Carmel, 2018)

Table 2. Carmel's total and per capita emissions

INVENTORY YEAR	TOTAL CO_2E (MT)	POPULATION	PER CAPITA CO_2E (MT)
CARMEL (2015)	1,134,830	92,747	12.24
CARMEL (2018)	1,180,989	98,332	12.01

Columbus

Due to staff constraints, Columbus was not able to begin their inventory until December 2019. At the time of the publishing of this report, the inventory was not complete. This report will be updated when the results are received.

Delaware County
Inventory years: 2015 and 2017

Delaware County completed community inventories for 2015 and 2017. In 2015, an estimated 1,537,204 metric tons of carbon dioxide equivalent (CO_2e) were emitted within Delaware County limits. In 2017, an estimated 1,566,357 metric tons of CO_2e were emitted within Delaware County limits. Figures 5 and 6 on the next page show the contribution of each sector in 2015 and 2017, respectively. Emissions increased by an estimated 1.90% between 2015 and 2017 (.95% per year), while population declined .32% over the same time period (-.16% per year).

Image 2. Sustain IU's Danni Schaust meets with ISDP and Resilience Cohort extern Nicky Harrison and Delaware Muncie Metropolitan Plan Commission staff Marta Moody and Lori Stinton.
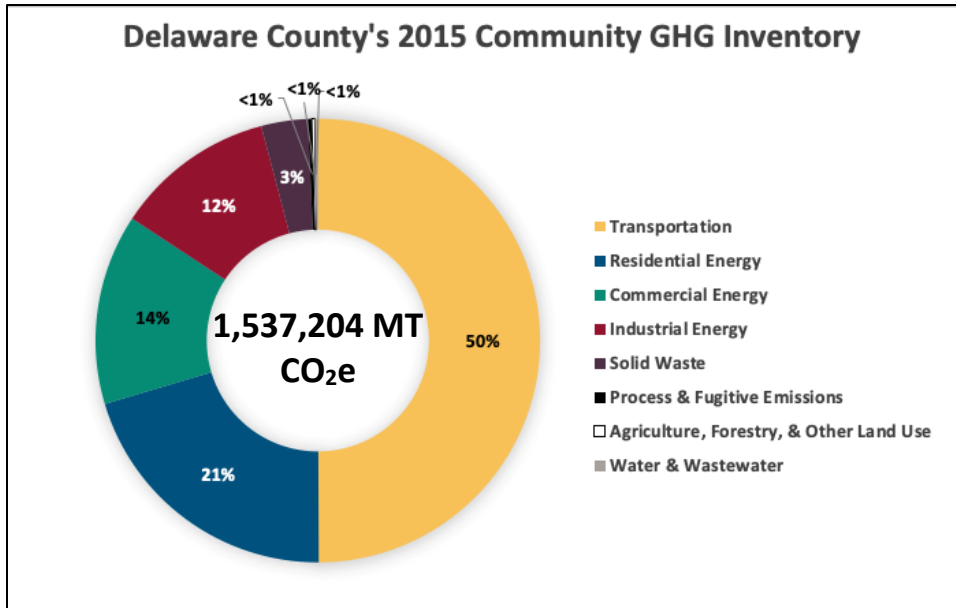
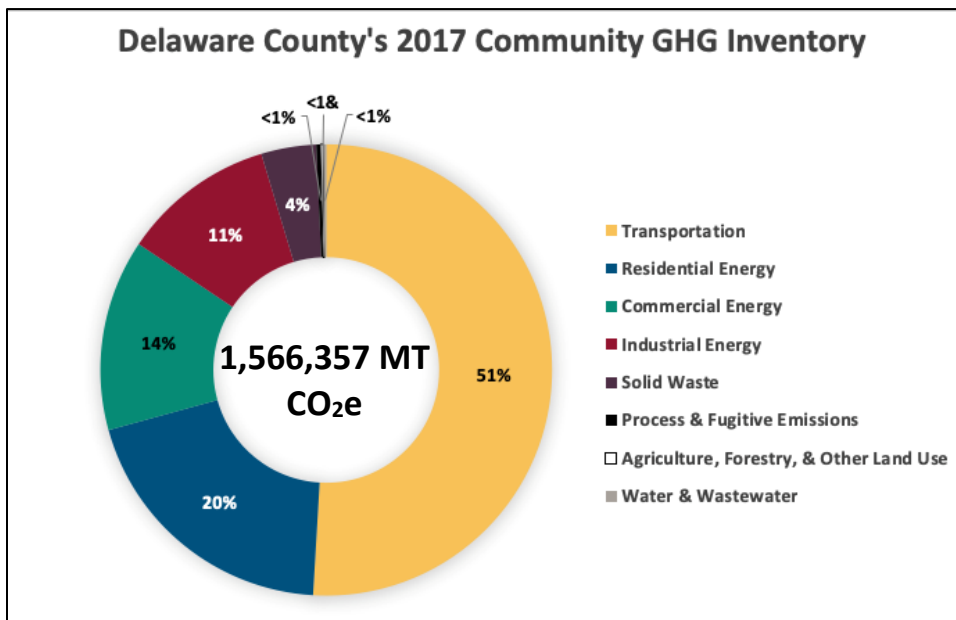Figure 5. Percentage of total CO$_2$e emissions by sector (Delaware County, 2015)

Figure 6. Percentage of total CO$_2$e emissions by sector (Delaware County, 2017)

Table 3. Delaware County's total and per capita emissions

INVENTORY YEAR	TOTAL CO$_2$E (MT)	POPULATION	PER CAPITA CO$_2$E (MT)
DELAWARE COUNTY (2015)	1,537,204	115,765	13.28
DELAWARE COUNTY (2017)	1,566,357	115,389	13.57

Evansville
Inventory year: 2017

In 2017, an estimated 1,500,577 metric tons of carbon dioxide equivalent (CO_2e) were emitted within Evansville city limits. Figure 7 shows the contribution of each sector.
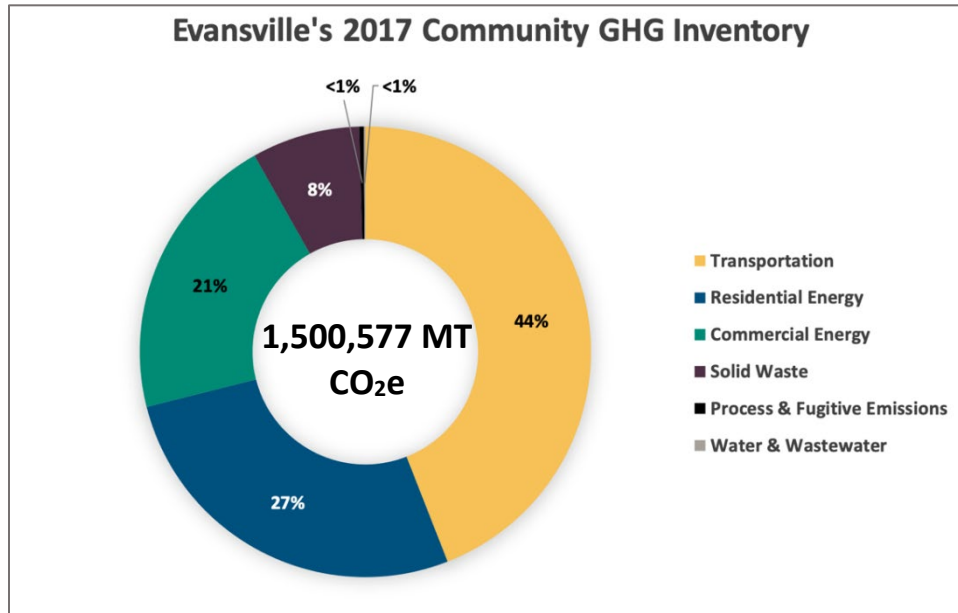

Figure 7. Percentage of total CO_2e emissions by sector (Evansville, 2017)

Table 4. Evansville's total and per capita emissions

INVENTORY YEAR	TOTAL CO_2E (MT)	POPULATION	PER CAPITA CO_2E (MT)
EVANSVILLE (2017)	1,500,577	118,288	12.69

Fishers
Inventory years: 2015 and 2018

Fishers completed community inventories for 2015 and 2018. In 2015, an estimated 1,250,455 metric tons of carbon dioxide equivalent (CO_2e) were emitted within Fishers city limits. In 2018, an estimated 1,266,986 metric tons of CO_2e were emitted within Fishers city limits. Figures 8 and 9 on the following page show the contribution of each sector in 2015 and 2018, respectively. Emissions increased by an estimated 1.32% between 2015 and 2018 (.44% per year), while population grew 5.25% over the same time period (1.75% per year).
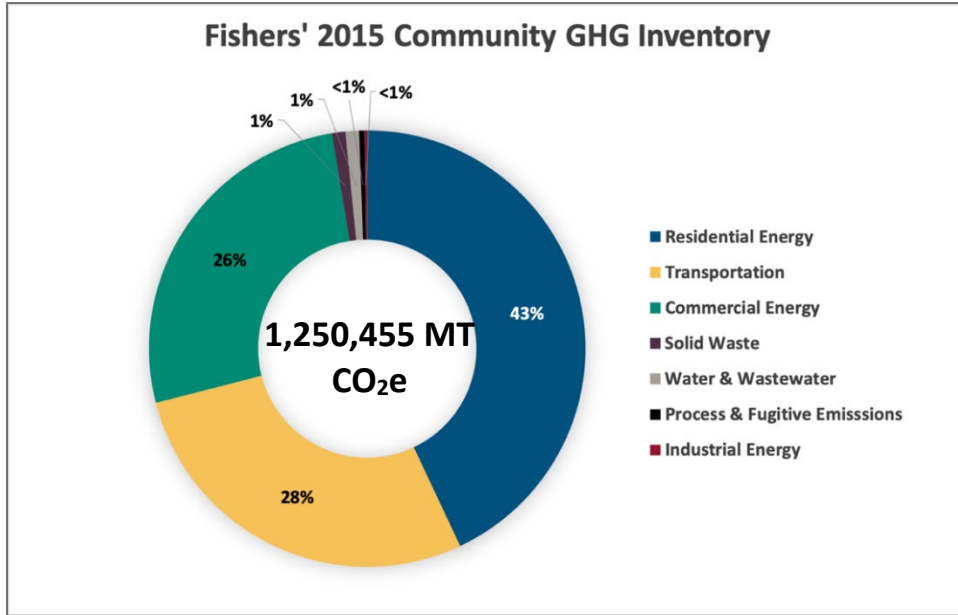
Figure 8. Percentage of total CO$_2$e emissions by sector (Fishers, 2015)
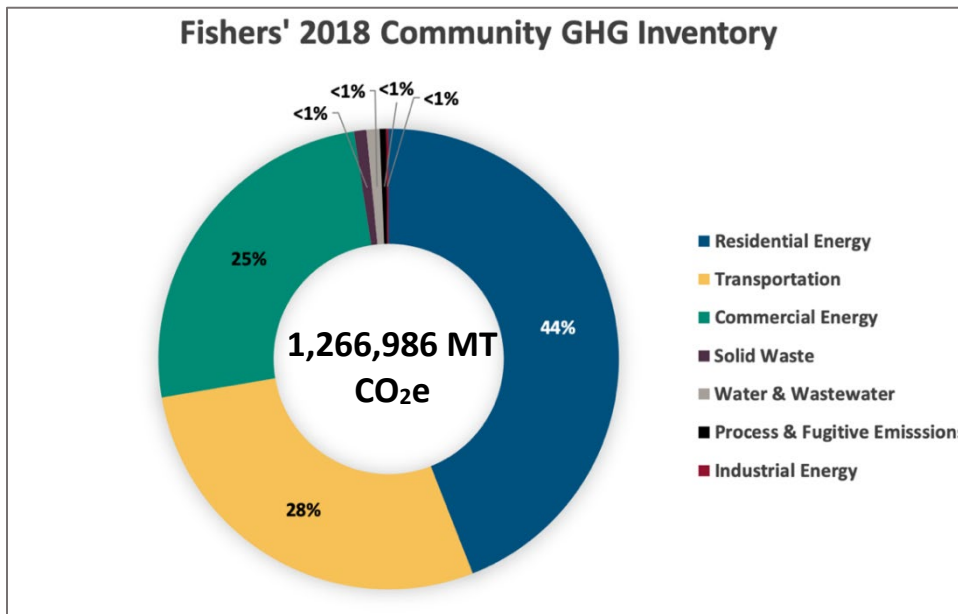

Figure 9. Percentage of total CO$_2$e emissions by sector (Fishers, 2018)

Table 5. Fishers' total and per capita emissions

INVENTORY YEAR	TOTAL CO$_2$E (MT)	POPULATION*	PER CAPITA CO$_2$E (MT)
FISHERS (2015)	1,250,455	88,708	14.10
FISHERS (2018)	1,266,986	93,362	13.57

Fort Wayne
Inventory year: 2017

In 2017, an estimated 2,940,637 metric tons of carbon dioxide equivalent (CO_2e) were emitted within Fort Wayne city limits. Figure 10 shows the contribution of each sector.
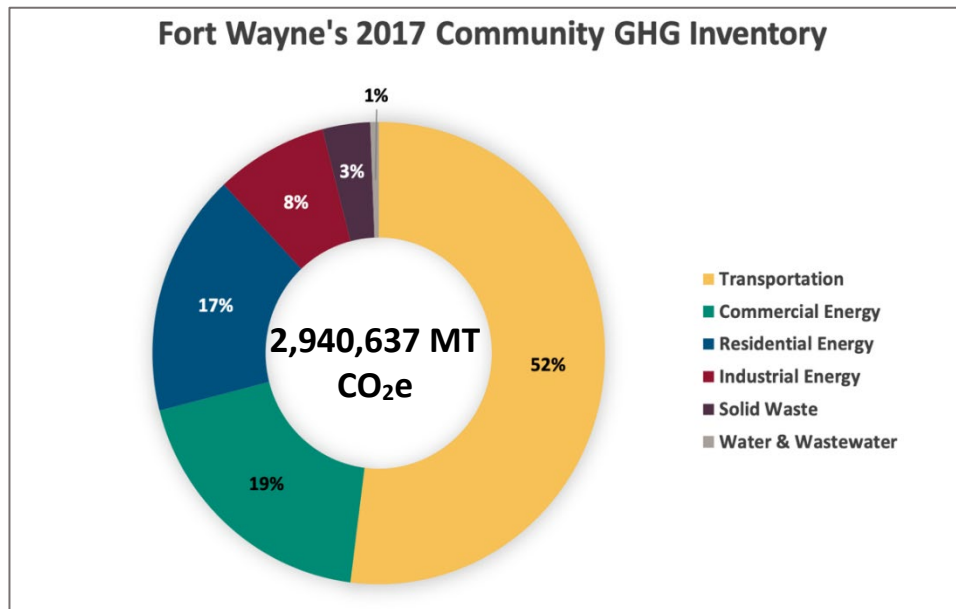

Figure 10. Percentage of total CO_2e emissions by sector (Fort Wayne, 2017)

Table 6. Fort Wayne's total and per capita emissions

INVENTORY YEAR	TOTAL CO₂E (MT)	POPULATION*	PER CAPITA CO₂E (MT)
FORT WAYNE (2017)	2,940,637	265,455	11.08

Gary
Inventory year: 2017

In 2017, an estimated 12,580,068 metric tons of carbon dioxide equivalent (CO_2e) were emitted within Gary city limits. Figure 11 on the following page shows the contribution of each sector.

Goshen
Inventory year: 2017 | [Full Report](#)

In 2017, an estimated 562,476 metric tons of carbon dioxide equivalent (CO_2e) were emitted within Goshen city limits. Figure 12 on the following page shows the contribution of each sector.
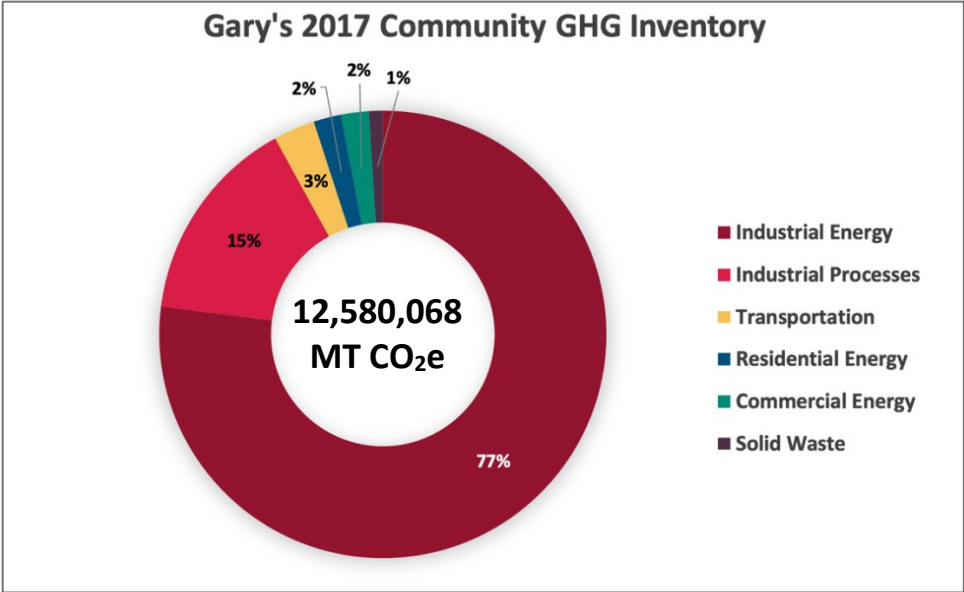
Figure 11. Percentage of total CO_2e emissions by sector (Gary, 2017)

Table 7. Gary's total and per capita emissions

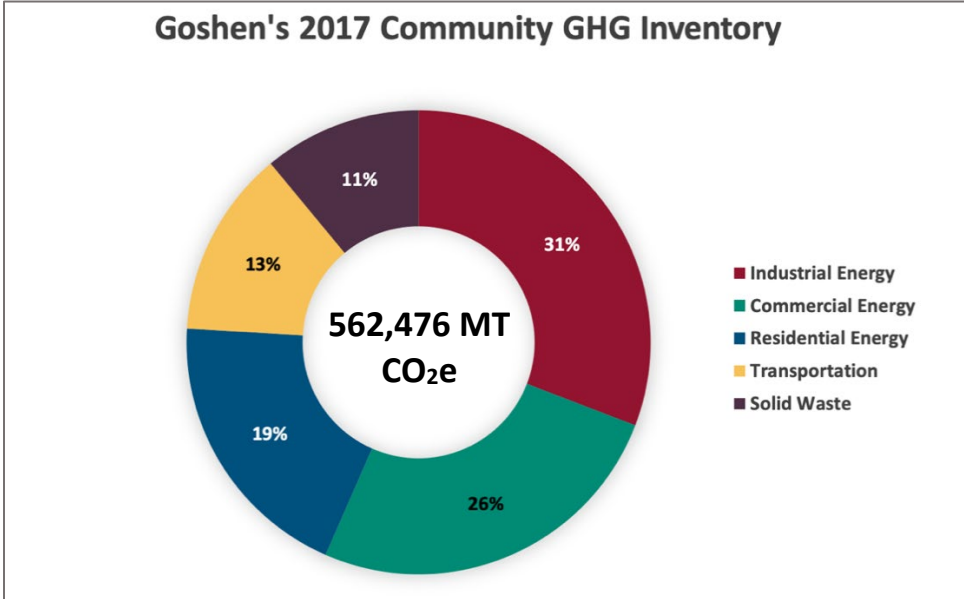| INVENTORY YEAR	TOTAL CO_2E (MT)	POPULATION	PER CAPITA CO_2E (MT)
GARY (2017)	12,580,068	75,881	165.79

Figure 12. Percentage of total CO_2e emissions by sector (Goshen, 2017)

Table 8. Goshen's total and per capita emissions

INVENTORY YEAR	TOTAL CO_2E (MT)	POPULATION	PER CAPITA CO_2E (MT)
GOSHEN (2017)	562,476	32,997	17.05

Greencastle
Inventory year: 2018

In 2018, an estimated 153,140 metric tons of carbon dioxide equivalent (CO_2e) were emitted within Greencastle city limits. Figure 13 shows the contribution of each sector.

Image 3. The DePauw University Center for Sustainability hosted the team that conducted Greencastle 's inventory.
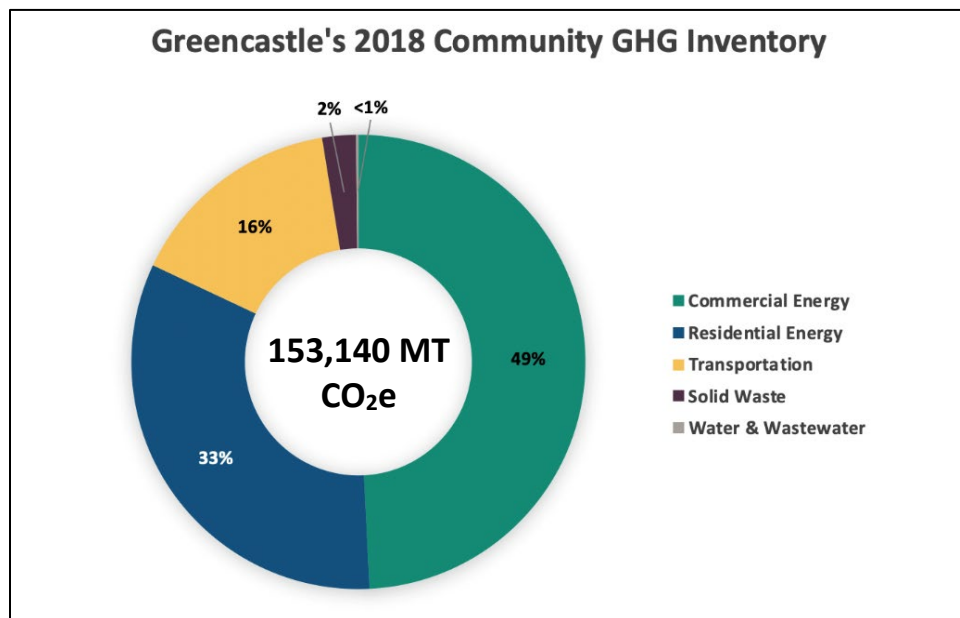

Image 4. Downtown Greencastle

Greencastle's 2018 Community GHG Inventory

153,140 MT CO_2e

- 2%
- <1%
- 16%
- 49%
- 33%

- Commercial Energy
- Residential Energy
- Transportation
- Solid Waste
- Water & Wastewater

Figure 13. Percentage of total CO_2e emissions by sector (Greencastle, 2018)

Table 9. Greencastle's total and per capita emissions

INVENTORY YEAR	TOTAL CO₂E (MT)	POPULATION	PER CAPITA CO₂E (MT)
GREENCASTLE (2018)	153,140	10,530	14.54

Michigan City
Inventory year: 2017

In 2017, an estimated 595,414 metric tons of carbon dioxide equivalent (CO_2e) were emitted within Michigan City limits. Figure 14 shows the contribution of each sector.
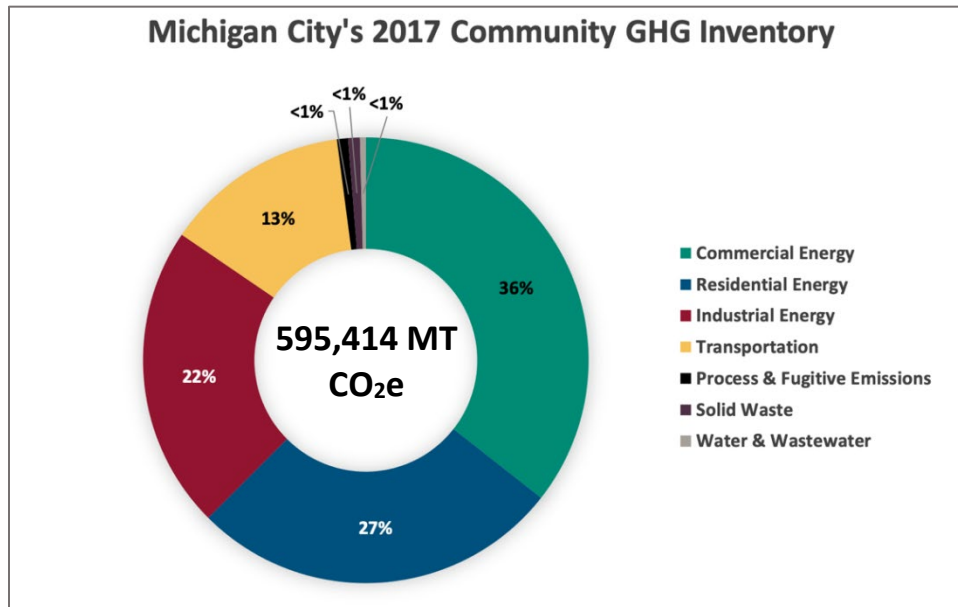

Figure 14. Percentage of total CO_2e emissions by sector (Michigan City, 2017)

Table 10. Michigan City's total and per capita emissions

INVENTORY YEAR	TOTAL CO_2E (MT)	POPULATION	PER CAPITA CO_2E (MT)
MICHIGAN CITY (2017)	595,414	31,116	19.14

Muncie
Inventory years: 2015 and 2017

Muncie completed community inventories for the years 2015 and 2017. In 2015, an estimated 535,999 metric tons of carbon dioxide equivalent (CO_2e) were emitted within Muncie city limits. In 2017, an estimated 525,704 metric tons of CO_2e were emitted within Muncie city limits. Figures 15 and 16 on the next page show the contribution of each sector in 2015 and 2017, respectively. Emissions decreased by an estimated 1.92% between 2015 and 2017 (.96% per year). Population declined .26% over the same time period (-.13% per year).
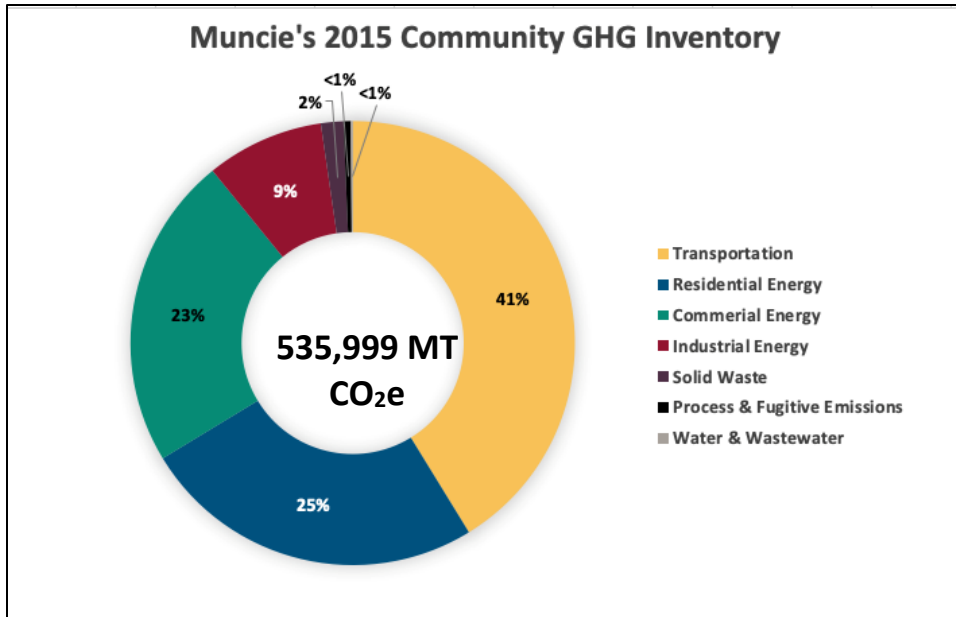
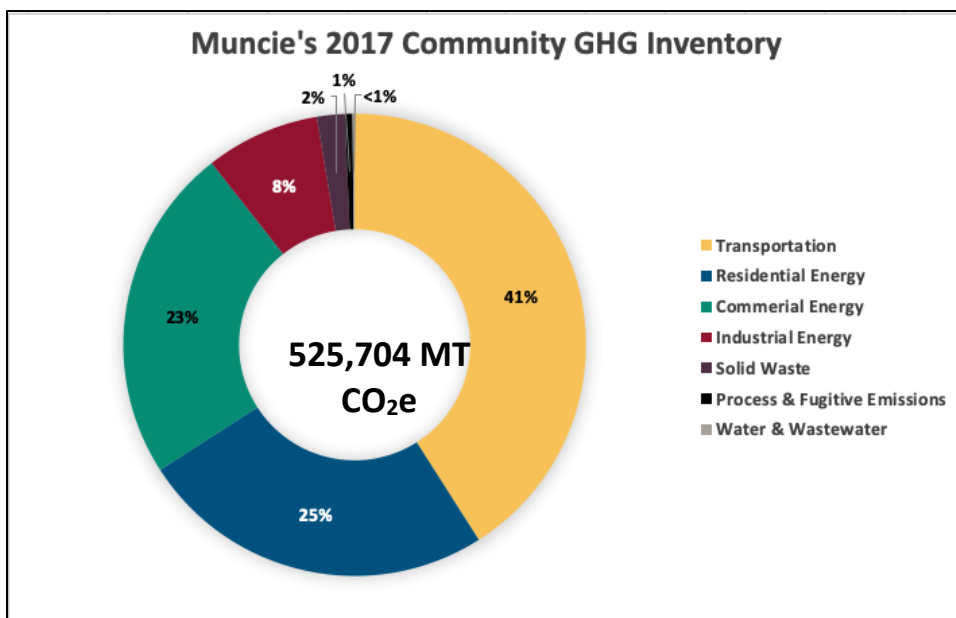*Figure 15. Percentage of total CO₂e emissions by sector (Muncie, 2015)*

Figure 16. Percentage of total CO₂e emissions by sector (Muncie, 2017)

Table 11. Muncie's total and per capita emissions

INVENTORY YEAR	TOTAL CO₂E (MT)	POPULATION	PER CAPITA CO₂E (MT)
MUNCIE (2015)	535,999	69,134	7.75
MUNCIE (2017)	525,704	68,951	7.62

Oldenburg
Inventory year: 2017

In 2017, an estimated 9,517 metric tons of carbon dioxide equivalent (CO_2e) were emitted within Oldenburg town limits. Figure 17 shows the contribution of each sector.
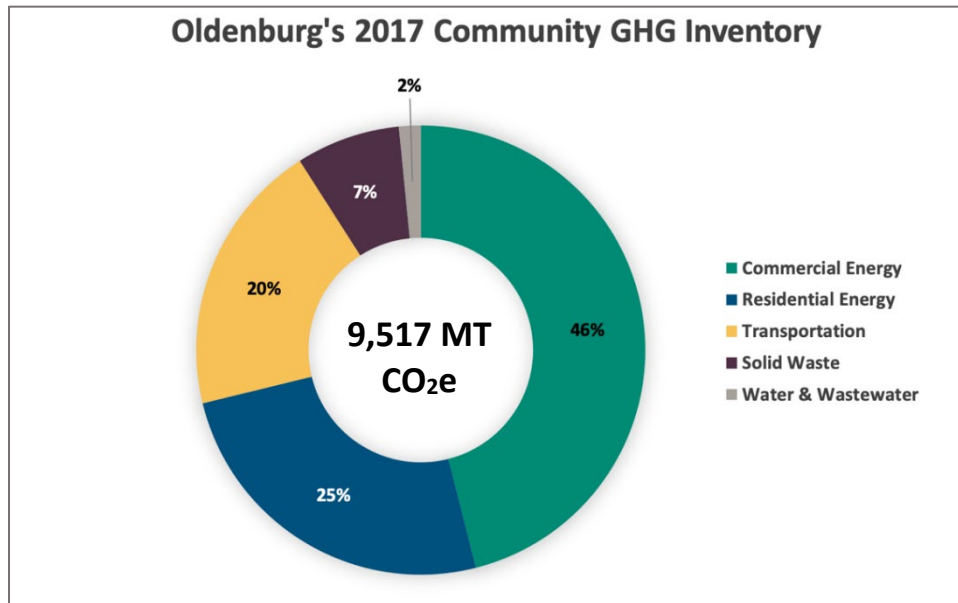

Figure 17. Percentage of total CO_2e emissions by sector (Oldenburg, 2017)

Table 12. Oldenburg's total and per capita emissions

INVENTORY YEAR	TOTAL CO_2E (MT)	POPULATION*	PER CAPITA CO_2E (MT)
OLDENBURG (2017)	9,517	657	14.49

Richmond
Inventory year: 2018

In 2018, an estimated 845,320 metric tons of carbon dioxide equivalent (CO_2e) were emitted within Richmond city limits. Figure 18 on the following page shows the contribution of each sector.

West Lafayette
Inventory year: 2017

In 2017, an estimated 411,173 metric tons of carbon dioxide equivalent (CO_2e) were emitted within West Lafayette city limits. Figure 19 on the following page shows the contribution of each sector.
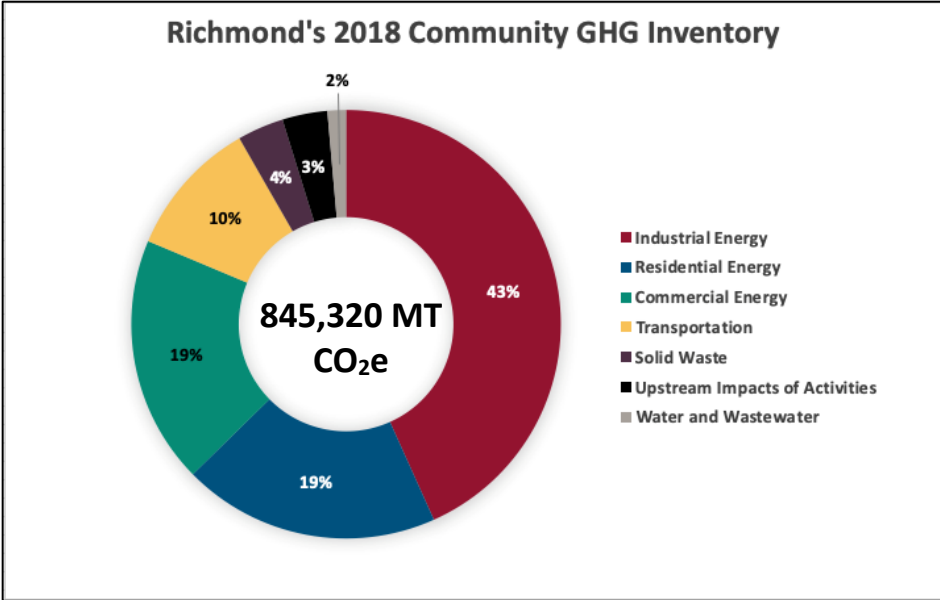
Figure 18. Percentage of total CO_2e emissions by sector (Richmond, 2018)

Table 13. Richmond's total and per capita emissions

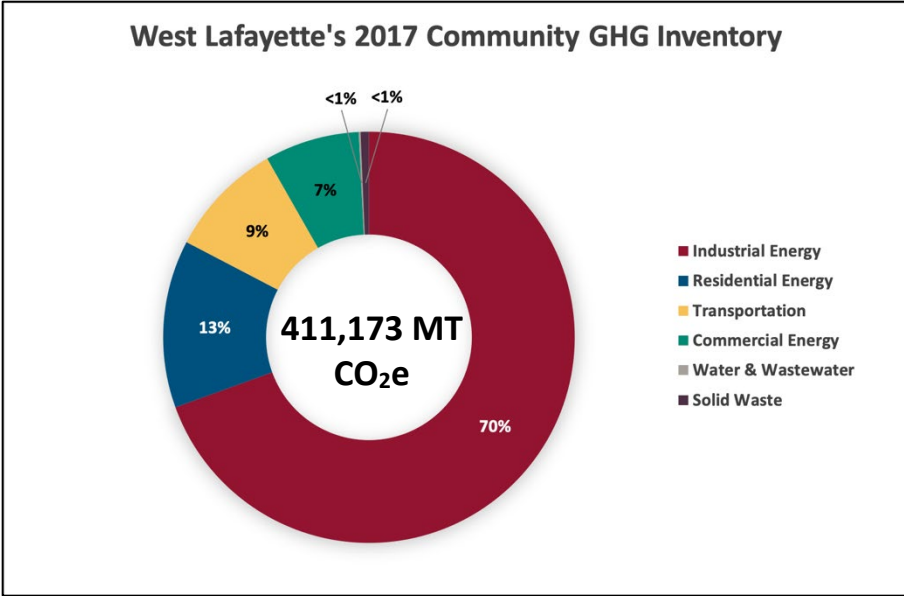| INVENTORY YEAR	TOTAL CO_2E (MT)	POPULATION	PER CAPITA CO_2E (MT)
RICHMOND (2018)	845,320	35,353	23.91

Figure 19. Percentage of total CO_2e emissions by sector (West Lafayette, 2017)

Table 14. West Lafayette's total and per capita emissions

INVENTORY YEAR	TOTAL CO_2E (MT)	POPULATION*	PER CAPITA CO_2E (MT)
WEST LAFAYETTE (2017)	411,173	47,593	8.64

Image 5. Resilience Cohort and ISDP Extern Abhishek Jagdale works on Michigan City's greenhouse gas inventory.
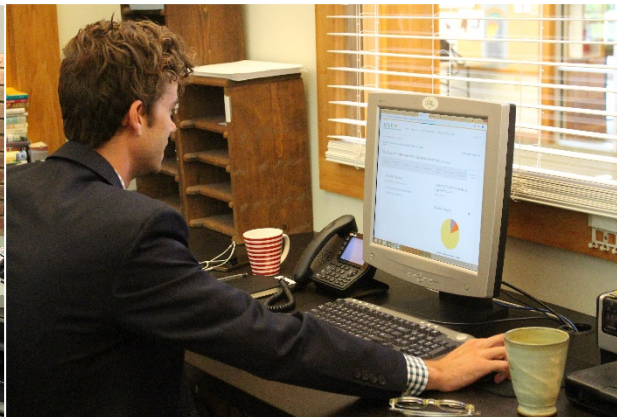

Image 6. Resilience Cohort and ISDP Extern Bronson Bast works on Goshen's greenhouse gas inventory.

The results of these inventories demonstrate an opportunity for activities that contribute towards reduced emissions among all categories, but especially in transportation, residential energy, and commercial energy across all communities. Partnerships with transit agencies, local employers, neighborhood associations, and local nonprofits will lead to reductions in all of these categories. The cities of Gary, Goshen, Richmond, and West Lafayette will need to work closely with their industrial sector to reduce their top emissions category. The results of the inventories also demonstrate a need for every resident to take steps to reduce their personal carbon footprint.

Government Operations Results

Seven cohort members completed local government operations greenhouse gas inventories in addition to their community-wide inventories. Government operations inventories provide a more detailed look at emissions produced by the day-to-day activities of municipal and county governments.

It is **not accurate to compare greenhouse gas inventories to one another**. Each community followed the Local Government Operations Protocol, but opted to include or exclude different categories depending on data availability. Additionally, greenhouse gas emissions inventories are estimates; obtaining a perfectly accurate accounting of emissions is not possible with current technologies. Nevertheless, the results of a greenhouse gas inventory should not be discounted. The process and results allow communities to obtain standard measurements which can be tracked and reduced over time to measure their own progress.

Bloomington, Carmel, Evansville, Fishers, Fort Wayne, Gary, and Goshen completed local government operations inventories. This section shows the results of these inventories.

Bloomington
Local government inventory year: 2018

In 2018, measured City of Bloomington operations emitted an estimated 28,245 metric tons of carbon dioxide equivalent (CO_2e). Figure 20 shows the contribution of each government sector.
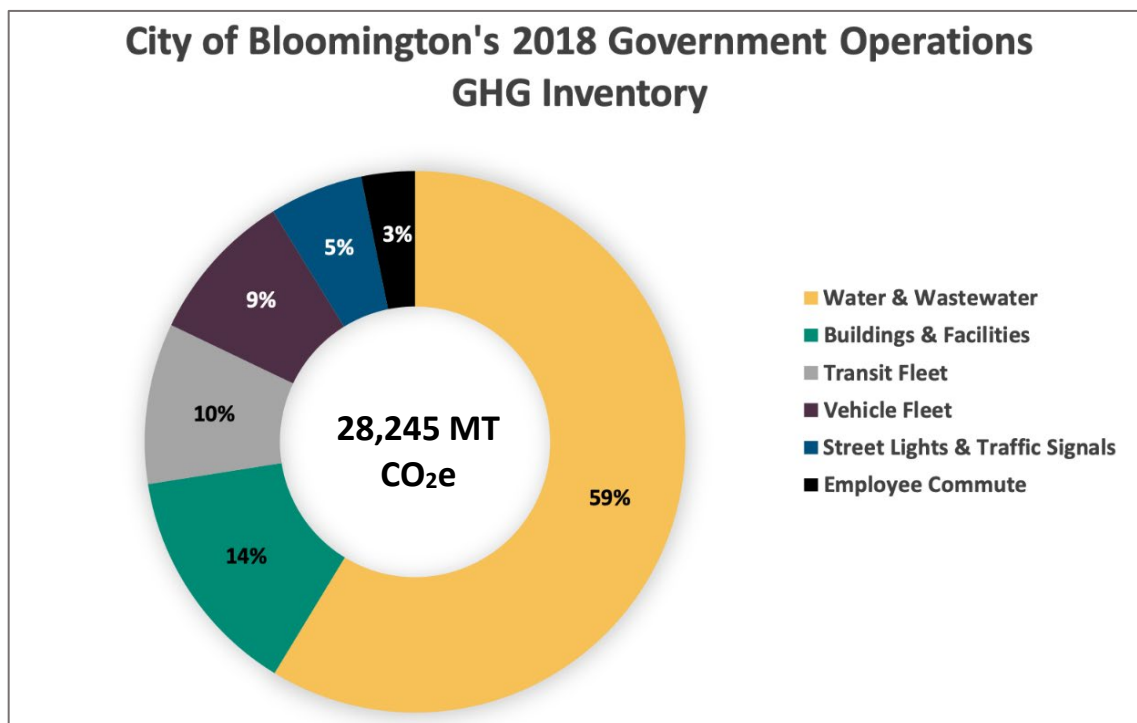

Figure 20. Percentage of total government CO_2e emissions by sector (Bloomington, 2018)

Carmel
Local government inventory years: 2015 and 2018

Carmel completed government operations inventories for the years 2015 and 2018. In 2015, measured City of Carmel operations emitted an estimated 29,790 metric tons of carbon dioxide equivalent (CO_2e). In 2018, measured City of Carmel operations emitted an estimated 32,122 metric tons of CO_2e. Note that Carmel's 2015 government operations inventory did not include employees' commute, while the 2018 inventory did. Figures 21 and 22 on the following page show the contribution of each government sector in 2015 and 2018, respectively.

Image 5. City of Carmel staff Sue Maki and Alexia Lopez, Resilience Cohort and ISDP extern Miranda Frausto, and Sustain IU's Danni Schaust meet to discuss progress on Carmel's greenhouse gas inventory.
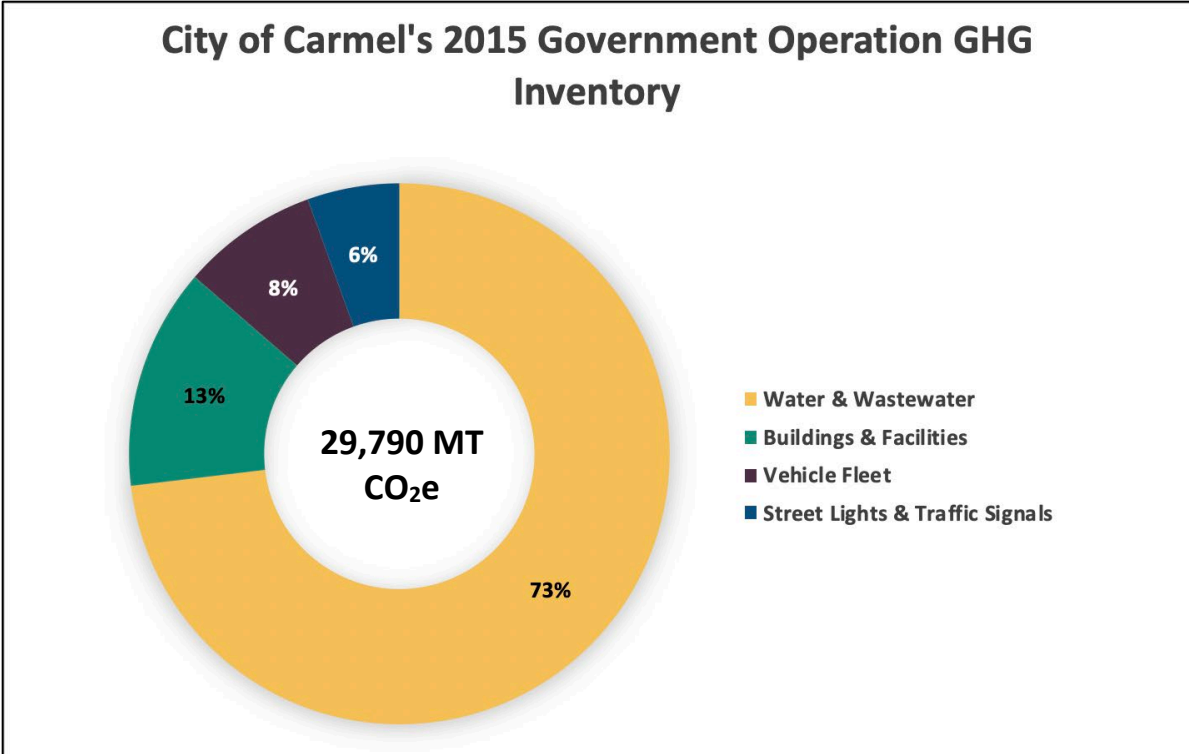
Figure 21. Percentage of total government CO$_2$e emissions by sector (Carmel, 2015)
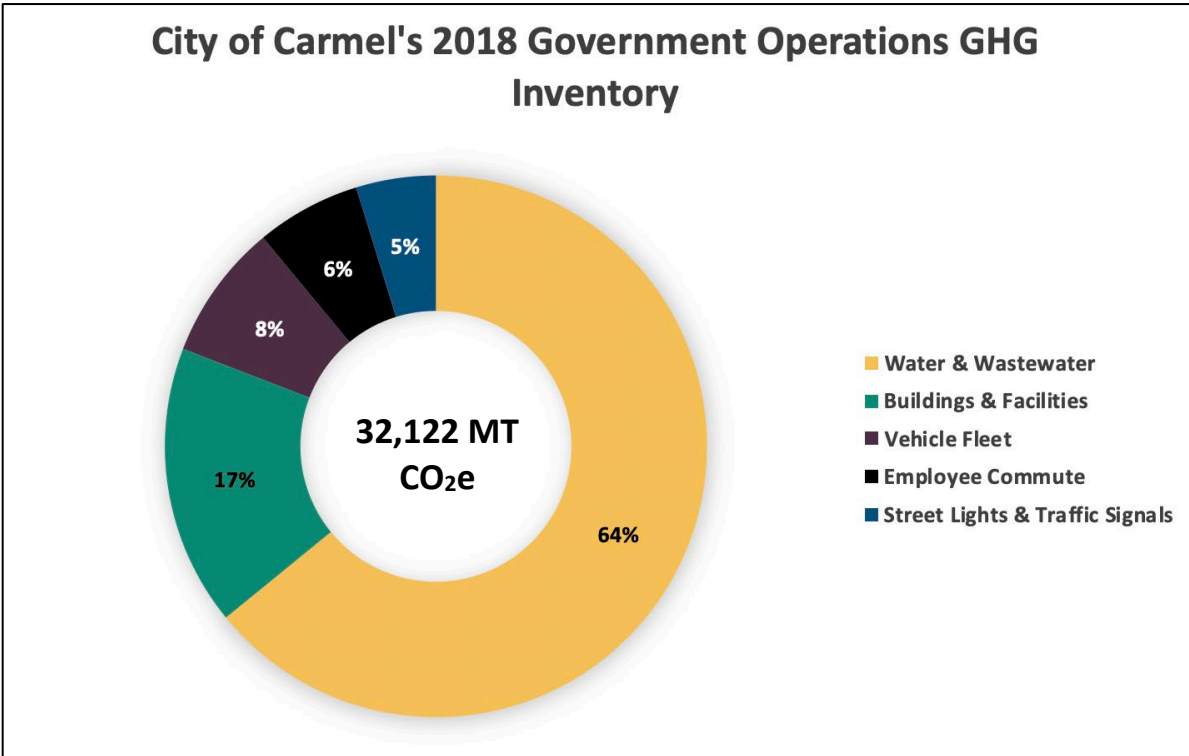

Figure 22. Percentage of total government CO$_2$e emissions by sector (Carmel, 2018)

Evansville
Local government inventory year: 2017 | <u>Article Covering Results</u>

In 2017, measured City of Evansville operations emitted an estimated 47,852 metric tons of carbon dioxide equivalent (CO_2e). Figure 23 shows the contribution of each government sector.
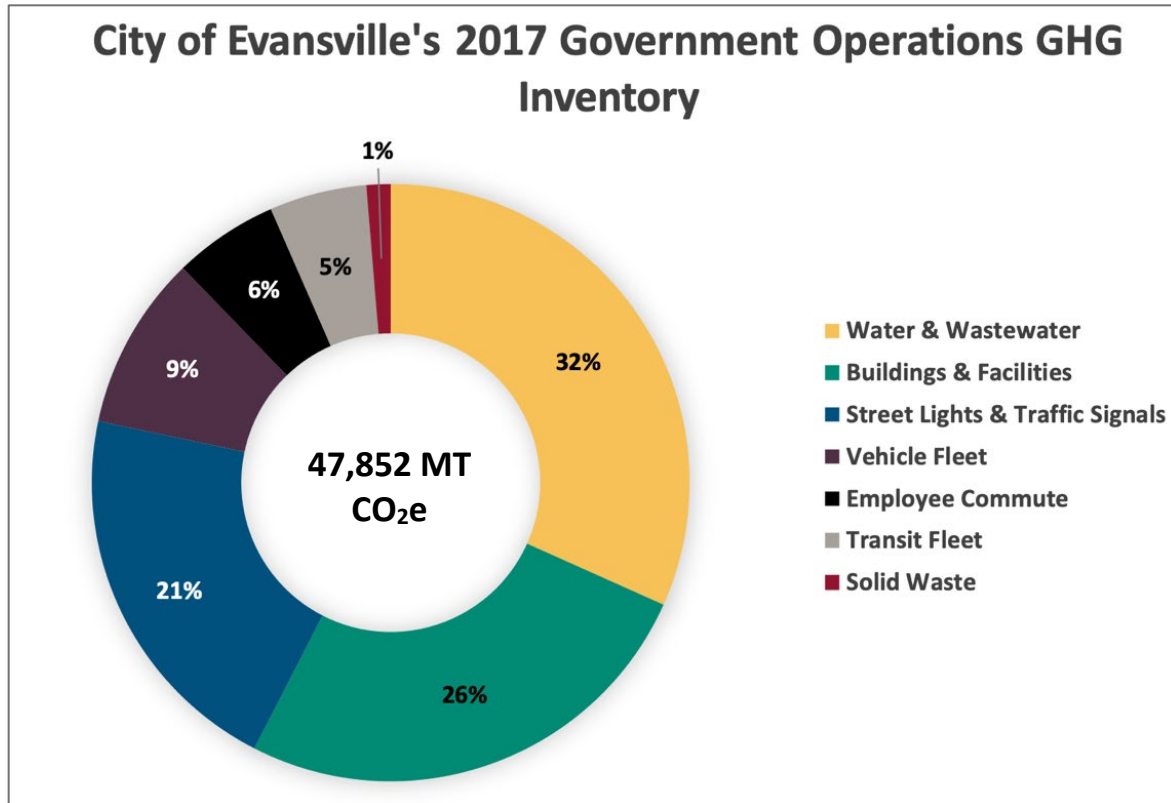

Figure 23. Percentage of total government CO_2e emissions by sector (Evansville, 2017)

Fishers
Local government inventory years: 2015 and 2018

Fishers completed government operations inventories for the years 2015 and 2018. In 2015, measured City of Fishers operations emitted an estimated 12,923 metric tons of carbon dioxide equivalent (CO_2e). In 2018, measured City of Fishers operations emitted and estimated 13,562 metric tons of CO_2e. Figures 24 and 25 on the following page show the contribution of each government sector in 2015 and 2018, respectively.
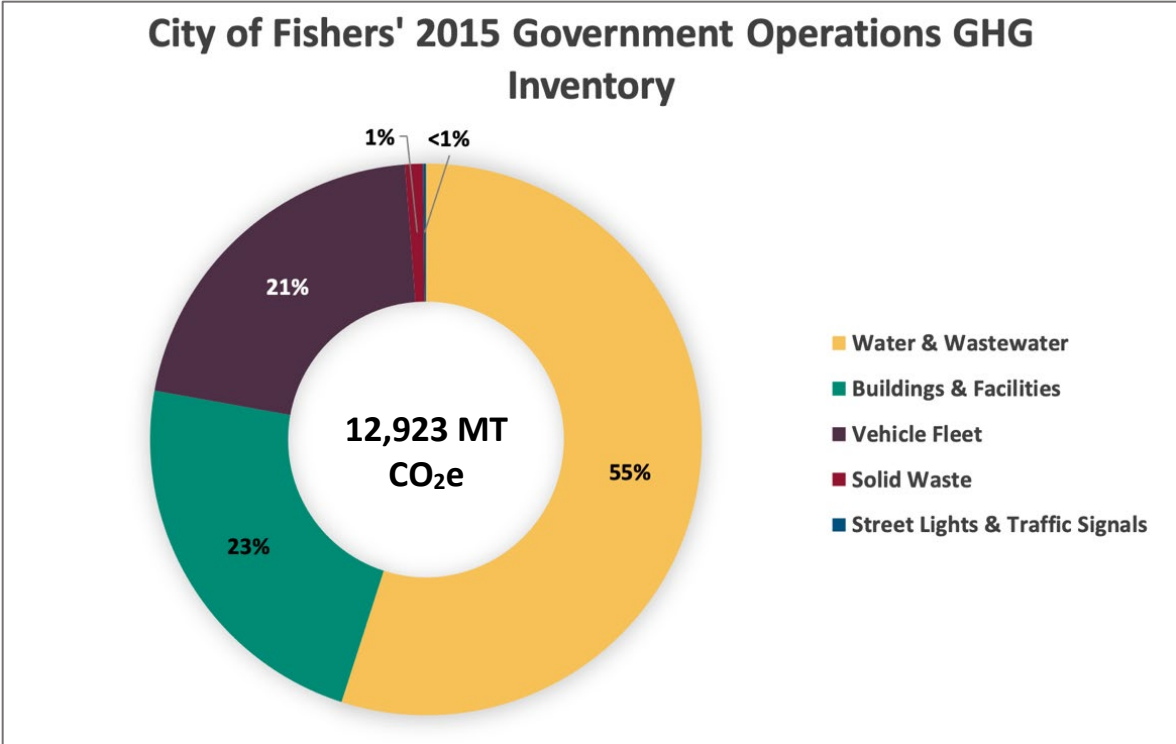
Figure 24. Percentage of total government CO$_2$e emissions by sector (Fishers, 2015)
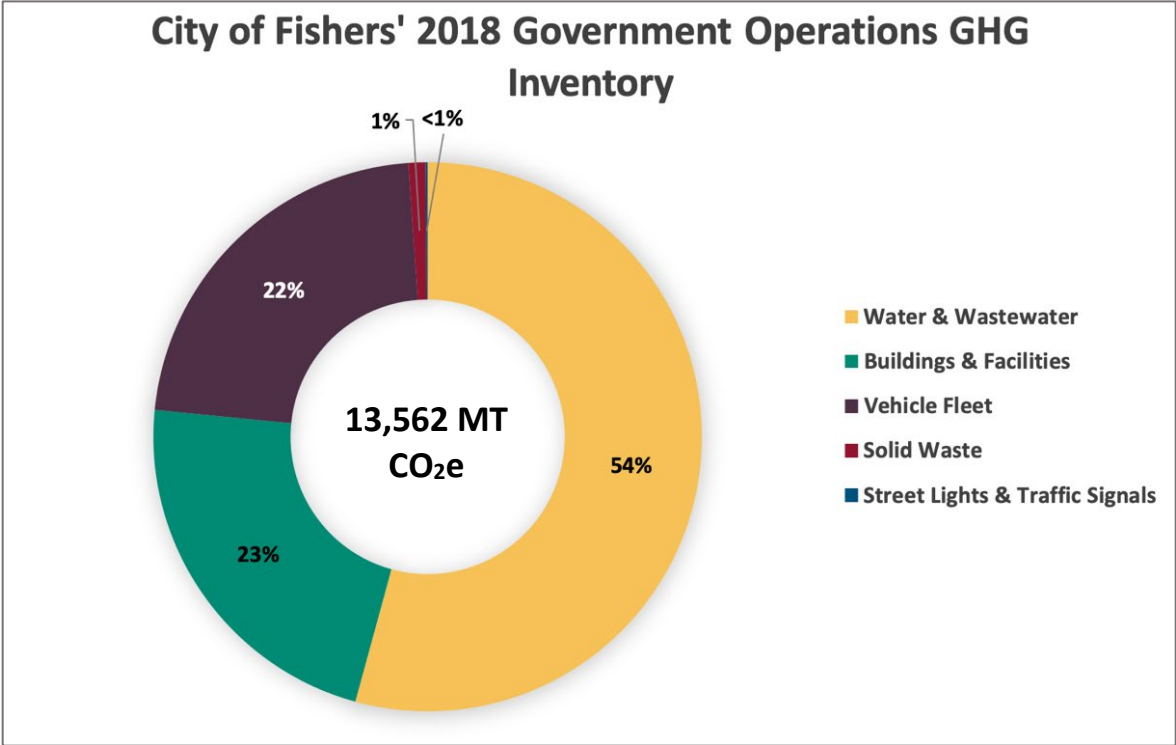

Figure 25. Percentage of total government CO$_2$e emissions by sector (Fishers, 2018)

Fort Wayne
Local government inventory year: 2018

In 2018, measured Fort Wayne operations emitted an estimated 55,958 metric tons of carbon dioxide equivalent (CO_2e). Figure 26 shows the contribution of each government sector.
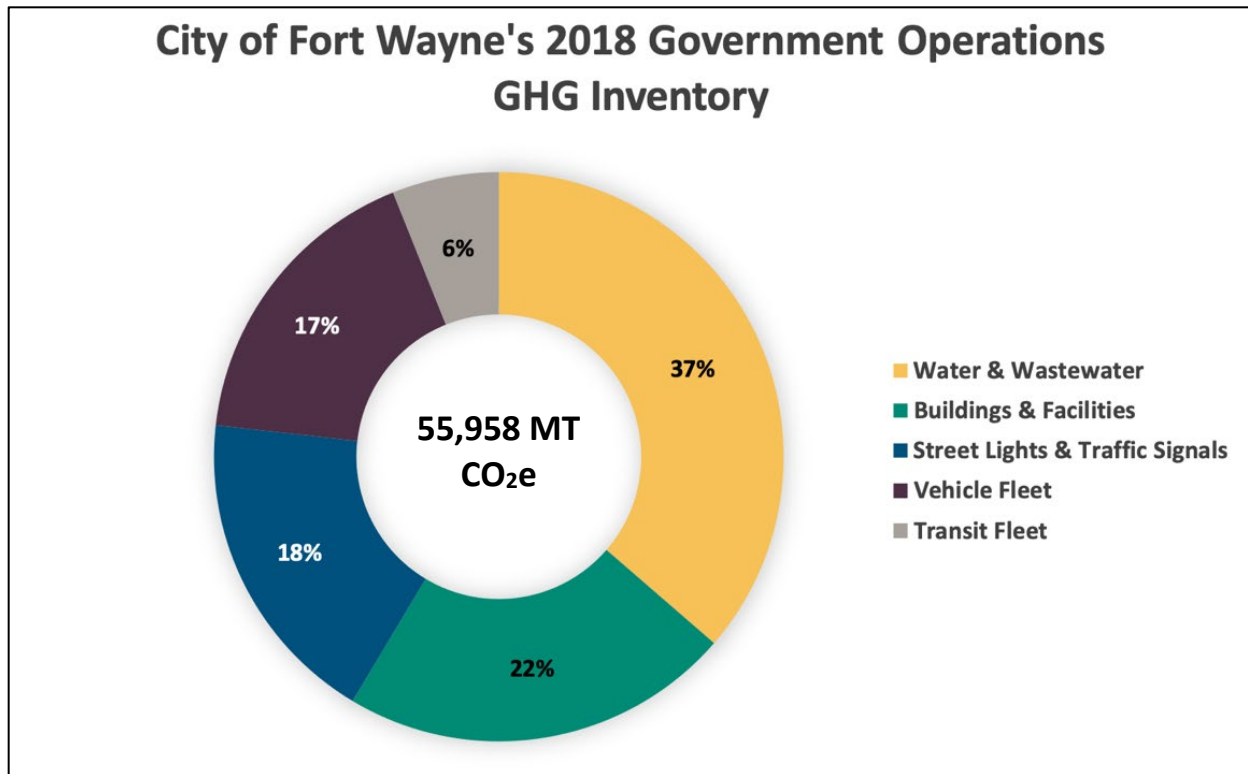

City of Fort Wayne's 2018 Government Operations GHG Inventory

55,958 MT CO_2e

- 37%
- 22%
- 18%
- 17%
- 6%

Legend:
- ■ Water & Wastewater
- ■ Buildings & Facilities
- ■ Street Lights & Traffic Signals
- ■ Vehicle Fleet
- ■ Transit Fleet

Figure 26. Percentage of total government CO_2e emissions by sector (Fort Wayne, 2018)

Gary
Local government inventory year: 2017

In 2017, measured City of Gary operations emitted an estimated 94,830 metric tons of carbon dioxide equivalent (CO_2e). Figure 27 on the following page shows the contribution of each government sector.

Goshen
Local government inventory year: 2017 | Full Report

In 2017, measured City of Goshen operations emitted an estimated 11,246 metric tons of carbon dioxide equivalent (CO_2e). Figure 28 on the next page shows the contribution of each government sector.
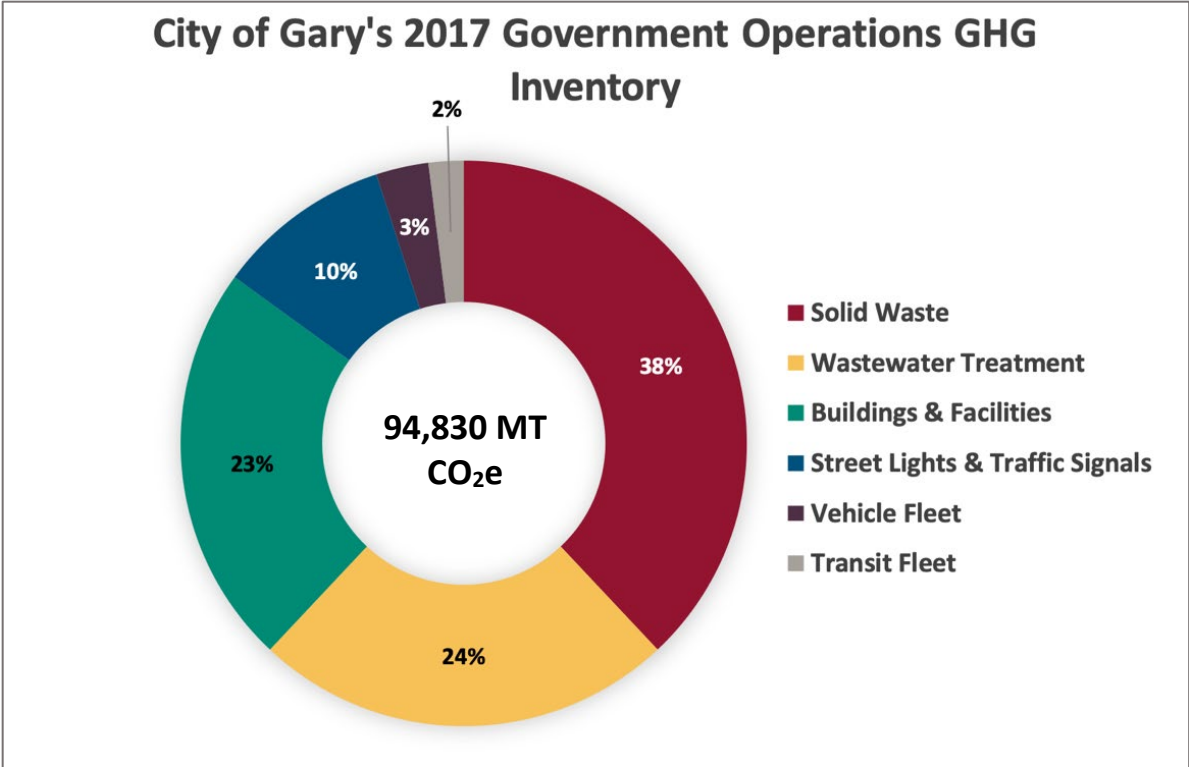
Figure 27. Percentage of total government CO_2e emissions by sector (Gary, 2017)
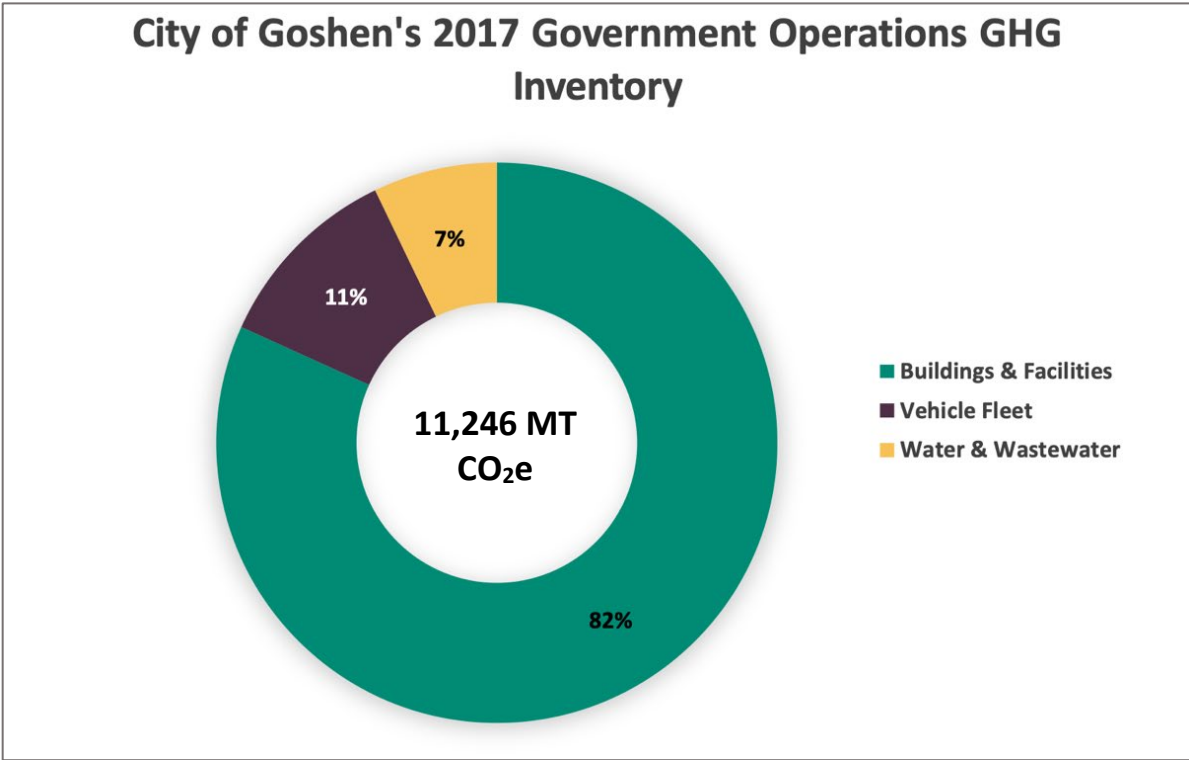

Figure 28. Percentage of total government CO_2e emissions by sector (Goshen, 2017)

The results of the local government operations inventories completed in the 2019 Resilience Cohort demonstrate an opportunity for greenhouse gas emissions reduction initiatives in all categories, but especially in the movement and treatment of water and wastewater, which was the top category of greenhouse gas emissions for five of the seven communities completing local government operations inventories. The Environmental Resilience Institute looks forward to working with these communities to discuss reduction strategies.

Image 6. Evansville Mayor Lloyd Winnecke meets with his Resilience Cohort and ISDP Extern Erin Lasher, the Director of the Evansville Environmental Protection Agency, Crystal Harper, and Sustain IU's Danni Schaust.

Conclusions and Next Steps – The 2020 Resilience Cohort

The 2019 Resilience Cohort resulted in the completion of 19 community-wide and 9 local government operations greenhouse gas inventories in 14 Indiana communities, most of which had not previously conducted an inventory. These inventories will serve as baselines to track increases and decreases in future emissions and will help communities identify which strategies will be most effective at reducing emissions within their jurisdictions.

Following the success in 2019, the 2020 Resilience Cohort will guide communities through the process of developing a greenhouse gas reduction plan, commonly known as a climate action plan. Participants will analyze the results of their inventories, select a greenhouse gas reduction target, identify greenhouse gas reduction strategies, collect and integrate community input, draft a custom climate action plan, and work with their mayors, city councils, or other oversight entities to adopt a final version. Many communities will also choose to use the Hoosier Resilience Index to integrate climate adaptation planning into their final documents. The development of a climate action plan will provide Indiana communities with a tangible set of steps they can take to reduce their emissions and adapt to the effects of climate change.

We are very proud of what these Indiana communities completed in 2019, and we are thrilled that many of them decided to continue to the next step. In addition, new communities are coming forward to take the first step to measure their emissions, following in the footsteps of the first Resilience Cohort.

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