AGENDA

Sustainability Commission Meeting

7:00 PM - Monday, June 8, 2020

Zoom Meeting

Page

1. CALL TO ORDER
2. ROLL CALL

   Commissioner Heine
   Commissioner Drennen
   Commissioner Bayha
   Commissioner Foley
   Commissioner Greenwald
   Commissioner Cannon
   Commissioner Gibbons
   Commissioner Collins
   Commissioner Michalowski
   Councilmember Wilcoxen
   Director Akers
3. PUBLIC COMMENT (3 MINUTES)
4. AGENDA APPROVAL (5 MINUTES)

   4.1. Approval of minutes from February 10, 2020 — 3 - 5

   Sustainability 2-10-2020 Reg Minutes
5. INTRODUCTIONS
6. PRESENTATIONS
7. CONSENT AGENDA (2 MINUTES)
8. RESOLUTIONS/MOTIONS/DISCUSSIONS

   8.1. The Sustainability Commission and it's role in advocating for social, environmental, and economic justice in our community during these times of COVID19 and growing civil unrest (20 Minutes)
9. WORK SESSIONS

   9.1. Sustainability Plan — 6 - 170

   Draft Sustainability Plan - March 16 2020 [CURRENT]
   City of Ypsilanti 2020 GHG Inventory Report - 3-16 Update
   Sustainability Outline - for SC
   Environmental challenges- SC
   City of Ypsilanti 2020 GHG Inventory Report Draft 2-24-20
   Ypsilanti GHG Report Review Agenda 3-16-2020
10. COMMISSIONER REPORTS (20 MINUTES)
11. PUBLIC COMMENT (3 MINUTES)

12. PROPOSED BUSINESS (5 MINUTES)
13. ADJOURNMENT

MINUTES

City of Ypsilanti
SUSTAINABILITY COMMISSION MEETING
One South Huron Street
Ypsilanti, Michigan 48197

Monday, February 10, 2020
7:00 P.M.

I. CALL TO ORDER: 7:00 p.m.

II. ROLL CALL

Keith Michalowski	Present	Nancy Heine	Absent
Emily Drennen	Absent	Julia Bayha	Present
Bryan Foley	Present	Katy Greenwald	Present
Christian Cannon	Absent	Beth Gibbons	Present
Takunia Collins	Present		

Also Present: Council Liaison Steve Wilcoxen
Staff Liaison Ronald Akers, Public Services Director
Commission Recording Secretary, Nancy Hare-Dickerson

III. PUBLIC COMMENT- none

IV. AGENDA APPROVAL

Commissioner Michalowski: Request to add - Composting Presentation by Commissioner Collins.

Foley (Second: Greenwald) moved to approve the Agenda as amended.

Voice Vote: Unanimous **Motion: Carried**

V. MISCELLANEOUS

Commissioner Michalowski: Initiated procedural discussion as to a conflict for use of City Council chambers for the March 9th Sustainability Commission due to the upcoming Primary election.

[Commission consensus to reschedule the March 9th meeting date to March 16, 2020]

VI. PRESENTATIONS

1. A Community Approach to Building Resilience in Ypsilanti with Desmond Kirwan

Desmond Kirwan, Paige Porter and Trevor McCarty shared what they hope will end up being their University of Michigan Masters research in the School for Environment & Sustainability. Their presentation, with handouts, addressed climate resilience, how to prepare Ypsilanti to be more resilient to climate change impacts (resilience hubs), as well as project funding.

[Commissioner query, comment and discussion followed]

2. Composting with Commissioner Collins

Commissioner Takunia Collins presented, with handouts and a visual, on the most efficient and effective way to make a compost pile.

[Query/discussion followed, including how to better educate residents about the benefits and how-tos of composting]

VII. CONSENT AGENDA

1. Approval of January 13, 2020 minutes

Bayha (Second: Gibbons) moved to approve the January 13, 2020 Minutes as submitted.

Voice Vote: Unanimous **Motion: Carried**

VIII. WORK SESSION- none

IX. RESOLUTIONS/MOTIONS/DISCUSSIONS

1. Sustainability Plan Updates

Staff Liaison Akers: Gave a brief explanation of the draft Sustainability Outline and Environmental Challenge document provided to commissioners.

[Discussion followed as to additional topics to possibly add to the outline]

Commissioner Michalowski: Asked commissioners to further review the materials in preparation for discussion at next month's meeting.

2. EGLE Recycling Grant Update

Staff Liaison Akers: Explained the purpose of and outlined the criteria for the grant. Provided an update as to meetings/attendance at neighboring recycling/solid waste facilities. Shared information regarding an additional recycling grant that may be pursued. Provided an update as to the City/Ann Arbor Recycling partnership revised contract for drop off services on Ellsworth and as to planned drop off events at the City DPS site.

Council Liaison Wilcoxen: Provided an update of City Council's approval of a public engagement plan.

3. A2Zero Partner Update

Commissioner Gibbons: Provided an update that the next large outreach event is the Ann Arbor Carbon Neutrality Town Hall at Pioneer High School on February 22nd.

4. GHG Inventory and Report Status Update

Commissioner Michalowski: Indicated - no current update.

5. Resolution 2019-02 – Resolution Procedure

Commissioner Michalowski: Explained the intent behind the resolution.
[Clarifying and procedural discussion ensued]

Collins (Second: Greenwald) moved to table Resolution 2019-02 – Resolution Procedure, to allow for absent commissioner input.

Voice Vote: Unanimous **Motion: Carried**

6. Curbside Recycling Guidelines/Education Discussion

Staff Liaison Akers: Passed out a copy of "City of Ypsilanti – Curbside Recycling Guidelines" to commissioners.

Commissioner Collins: Provided an update as to the YouTube recycling video being planned, which was previously discussed at the January meeting.

7. Resolution 2020-002 - Support for Native Plants Resolution

Commissioner Michalowski: Explained the intent behind the resolution.

[Discussion ensued regarding possible revisions/additions/clarification].
[Commissioner Greenwald agreed to spearhead editing/clarifying language]

8. Ypsilanti Road Diet Update

Council Liaison Wilcoxen: Provided an update of City Council's approval and what the Road Diet entails.
[Discussion followed]

X. COMMISSIONER REPORTS

Commissioners, who wished, shared updates of meetings, events and activities they have been involved with and/or are working on related to sustainability.

XI. PUBLIC COMMENT-none

XII. PROPOSED BUSINESS

Commissioner Michalowski notated items for addition to the March agenda.

XIII. NEXT MEETING DATE - *NOTE DATE CHANGE

*Monday, March 16, 2020

XIV. ADJOURNMENT: 9:27 p.m.

Bayha (Second: Collins) moved to adjourn the meeting of the Sustainability Commission.

Voice Vote: Unanimous **Motion: Carried**

Why is Ypsilanti Writing a Sustainability Plan?

"It's real. It's us. It's bad. Scientists agree. There's hope."
Anthony Leiserowitz, Director Yale Project on Climate Change Communication

While Ypsilanti has done its fair share of sustainability planning, and in many ways is a state leader in this area, these efforts had yet to be folded into the Master Plan until now. Inventories and strategies could be found in one or more of the City's Climate Action Plan, Energy Plan, or Alternative Fuel Policy. While these plans hold tremendous value, they carry little enforceable weight if not included in the City's primary policy document. As the most comprehensive planning document, the Master Plan is the basis for the Zoning Ordinance, one of the City's most powerful tools in regulating land use including protecting natural resources, prioritizing infill development, and improving infrastructure that boosts nonmotorized travel. The previous efforts were influential and integral to the City's "green" practices, and this next step officially codifies sustainability as a City priority through the compilation and advancement of sustainable strategies into one go-to document. Sustainability plans are successful when they respond to a community's needs, incorporate robust community engagement, connect to and are integrated with existing goals and organization plans, and include metrics and benchmarks for improving sustainability, all of which are addressed in this plan.

The Impetus

The Great Lakes Integrated Sciences and Assessments (GLISA) Center is one of 11 regional centers funded by the National Oceanic Atmospheric Administration. It is a partnership between the University of Michigan and Michigan State University that seeks to manage risk from climate change in the Great Lakes region. GLISA hosts dozens of stations that track changes in temperatures and precipitation in specific locations to monitor climate trends. The closest station to Ypsilanti is located in Ann Arbor, and records show that between 1951 and 2017, there has been an uptick in the instances of storms that are greater than two inches. The recorded changes in precipitation are significant. In that 66-year period, annual precipitation has increased by nearly 43% and the larger storms indicate that it is falling in more concentrated bursts. Another trend identified at the climate stations is the average annual temperature has risen by 1.1 degrees Fahrenheit (F), and the gap between average high and low temperatures is closing and swinging upward towards warmer temperatures. This trend is also represented by fewer days per year falling below 32 degrees F. It is the documentation of these trends that allows climate scientists to extrapolate what we can expect to see in the next 50 years.[1]

Risk analysts, including the US Department of Defense, rank climate change as one of the most serious threats to ecosystems and people around the world.[2] [3] Climate change refers to a broad range of global phenomena created predominantly by burning fossil fuels, which add heat-trapping gases to Earth's atmosphere. The result is increased temperature trends but also a variety of challenges including extreme heat and increased cooling days, more severe winter storms,

[1] GLISA. Ann Arbor U of Mich Climate Station. http://glisa.umich.edu/station/C00200230#block-glisa-climatologies-station-monthly-prcp
[2] Intergovernmental Panel on Climate Change (IPCC), 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 (IPCC, Geneva, Switzerland, 2014) Retrieved from http://www.ipcc.ch/report/ar5/syr
[3] U.S. Department of Defense, Quadrennial Defense Review (Washington, DC, 2014)

changing coastal dynamics and rising water levels, disruptions to growing seasons, temperature volatility, increasing extreme weather events and associated stress on natural ecosystems, and risk of drought that will disturb of the characteristics and functions of natural processes. [4]

Americans and local residents are concerned about climate change, and more are becoming convinced of the science. A majority of Americans believe global warming is happening (71%) and that it will harm future generations (73%).[5] Public opinion estimates generated by the Yale Program on Climate Change Communication and the George Mason Center for Climate Change Communication suggest that 78% of Washtenaw County residents believe climate change is happening; 76% believe climate change will harm future generations; and 83% support policies that bolster renewable energy or limit CO2 emissions. [6]

Definition of Sustainability

Sustainability is a tricky term to define. When the residents were asked in the community-wide survey, "What does sustainability mean to you?" the answers were unsurprisingly varied. Most of them touched on at least one aspect of the definition using phrases like "repairing our natural environment," "having a …diverse community without pricing people out," and "clean water, healthy citizens, easier access to public transportation." The open responses were telling; Ypsilanti residents were able to identify that becoming a more sustainable city is a multi-faceted endeavor

A commonly accepted definition of sustainability is "meeting the needs of the present without compromising the ability of future generations to meet their own needs." This definition comes from *Our Common Future*, a report published in 1987 by the United Nations that suggested concrete and realistic proposals for dealing with issues of environment and development. In 2017, the Ypsilanti City Council passed Resolution No. 2017 - 238 approving a recommendation from the Sustainability Commission that defined sustainability as, "Achieving a balance of ecological, social, and economic considerations to provide for an equitable path for the growth and improvement of our community in the uses of our resources, remaining conscious of the historical context, while ensuring the availability and vitality of those resources for future generations." As such, social equity, environmental health, and the economy become the three interrelated pillars of sustainable action. This Sustainability Plan will focus primarily on the environment because the social and economic sides of planning are discussed in greater detail in the Master Plan, although suggested sustainability measures are designed to positively impact all three pillars.

Three Pillars of Sustainability

- Equity is the degree to which all citizens of Ypsilanti benefit from the outcomes of this plan. For example, reducing disparities among residents, especially those from traditionally disadvantaged groups, could be measured by increased participation in utility rebate programs or diverse attendance at educational community events.

[4] Planning for Community Resilience in Michigan. 2017. http://mirisingtide.org/wp-content/uploads/Resiliency-HandbookAPRIL-242017.pdf

[5] Matthew T. Ballew, Anthony Leiserowitz, Connie Roser-Renouf, Seth A. Rosenthal, John E. Kotcher, Jennifer R. Marlon, Erik Lyon, Matthew H. Goldberg & Edward W. Maibach (2019) Climate Change in the American Mind: Data, Tools, and Trends, Environment: Science and Policy for Sustainable Development, 61:3, 4-18,DOI: 10.1080/00139157.2019.1589300. https://www.tandfonline.com/doi/full/10.1080/00139157.2019.1589300

[6] Marlon, J. (2018, August). WASHTENAW COUNTY, MICHIGAN Public Opinion on Climate Change, 2019. https://factsheets.ypccc.tools/Michigan:Washtenaw_County

- Environmental health is the degree to which these actions restore natural systems and human health and positively impact energy use and climate trends. Some examples include habitat restoration, carbon sequestration, and a reduction in miles traveled by vehicle.

- Economics is the degree to which this plan can positively impact economic development and the plight of the workforce. Through this lens, economics can be measured by investments in clean energy technologies and green jobs, benefits to local commerce and tourism, support for a local food system, green job training, and employment and workforce wages.

Adaptation/Mitigation Model

In practice, the actions that address the three pillars of sustainability fall into a common policy framework that categorize strategies as either primarily "adaptation" or "mitigation." Adaptation refers to actions that address the effect of the problem but not the root of the problem. Adapting to climate change necessitates changing behaviors, systems, and our way of life *in response* to the results of climate change. One example would be relocating electricity and communication lines from overhead to underground locations to prevent power outages during extreme weather. Mitigating, or reducing the risk of future changes to the climate, necessitates dramatically reducing future GHG emissions and increasing the sequestration or storage of existing GHG in natural sinks such as forests or soil. While mitigation strategies will take decades to positively impact rising temperatures, reducing GHG emissions now will reduce future risk and make it easier to adapt to the future impacts of climate change. An example of a mitigation strategy would be increasing the deployment and utilization of renewable energy.

Greenhouse Gas Study

In November 2019, the Sustainability Commission committed to carbon neutrality by 2035 in partnership with the City of Ann Arbor as a response to a "climate emergency." The resolution calls for City Council to budget staff and resources to achieve this goal. Prior to that, the City had already acted toward improving its sustainability practices pushing for an updated Greenhouse Gas (GHG) Study to determine if their actions were achieving their goals. As a result, the 2020 City of Ypsilanti Community and Government Greenhouse Gas Inventories were initiated. These updated GHG inventories present 2018 emissions from the City of Ypsilanti community as a whole and emissions from the City of Ypsilanti government operations. The City of Ypsilanti community inventory follows the approach and methods provided by the ICLEI U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions (U.S. Community Emissions Protocol). ICLEI is a global network of local and regional government committed to sustainable urban development. The City of Ypsilanti government operations inventory follows the approach and methods provided by the Local Government Operations Protocol version 1.1 (Government Emissions Protocol).

The City previously evaluated 2005/2008 community and government greenhouse gas emissions in coordination with the 2012 Climate Action Plan. Because the 2020 community inventory uses ICLEI's U.S. Community Emissions Protocol, which differs from the 2012 methodology, the results

are not directly comparable, but show trends and movement in emissions. Both the 2012 and 2020 City GHG inventories for government emissions followed methods outlined in the Government Emissions Protocol.

All of the results shared in this section are from the 2020 GHG inventories and more details can be found in study.
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 jurisdictional 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."

The government emissions protocol contributes to greenhouse gas emissions through the categorization of scope accounting terms including scope 1 (direct GHG emissions), scope 2 (indirect GHG emissions), and scope 3 (all other indirect emissions not covered in Scope 2). The two inventories are not to be summed together. The categorization methods differ between the two emission protocols and the government operations inventory functions as a subset of the community inventory. The community inventory reports on most greenhouse gas emissions within the City including sources and activities associated with government operations.

Community Inventory: Community-Wide Activities Frame

The City chose to look at community emissions through multiple frames including the community-wide activities frame and government significant influence frame. Both frames include the required five Basic Emissions Generating Activities, and also includes upstream electricity transmission and distribution losses. Ypsilanti focused on a community-wide activities frame to see the extent to which all members of the community's use of energy, materials, and services, contribute to GHG emissions within or outside of the City boundary, regardless of whether the City has significant influence over those emissions. The community-wide activities frame shows that the City of Ypsilanti total 2018 community emissions are 269,177 metric tons of CO2e and that commercial energy, residential energy, and transportation sectors are important ways in which the City of Ypsilanti community contributes to emissions, as illustrated in table 1.

Table 1: City of Ypsilanti Community-Wide Activities CO2e Emissions by Sector
Source: EcoWorks

Community – Wide Sector	Emissions (metric tons CO2e)	Percent of Total Emissions
Commercial Energy	82,084	30%

Residential Energy	67,531	25%
Transportation & Mobile Sources (Highway)	59,197	22%
Transportation & Mobile Sources (Non-Highway)	45,160	17%
Water & Wastewater	7,244	3%
Industrial Energy	6,202	2%
Solid Waste	1,759	1%
Total	**269,177**	**100%**

Major Findings for Top Emitters – Community-Wide Activities

Commercial In 2017, EMU replaced an aging cogeneration unit with a new high efficiency unit projected to reduce annual emissions of CO2 by 21,305 tons/year and reduce NOx emissions by 112 tons annually. Emissions from Eastern Michigan University represent 46% of total commercial emissions in the City of Ypsilanti.[7]

Residential Within the residential sector, electricity use accounted for 60% of emissions while natural gas use in stationary combustion accounted for 40%.

Transportation I-94 passes through the southern boundary of the City of Ypsilanti and represents a significant source of transportation related emissions which are not directly attributable to the community. The Southeast Michigan Council of Governments (SEMCOG) estimates that highway travel on I-94 represents 53% of all total on-road vehicle miles traveled within the City annually while non-highway vehicle miles represent 47%.

Community Inventory: Significant Influence Frame

Despite its lack of direct control over major GHG contributors, the City decided to include a government significant influence frame of the community inventory and focus on sources or activities in which it can exert significant influence, for example, consumption by other landholders. Households and businesses in the City of Ypsilanti can become starting points for new policy aimed at reducing emissions outside of municipal buildings. It was estimated that Ypsilanti can influence emissions by as much as 170,407.32 metric tons CO2e. The largest contributor in this set is residential energy use of electricity with 23.75% of emissions. The next largest contributor is commercial/industrial use of electricity with 23.38% of emissions. This will be the baseline for setting an emissions reduction target and measuring future emissions reductions against.

Government Operations GHG Emissions Inventory

The government operations inventory is an altogether separate greenhouse gas emissions inventory from the community inventory. It takes a deeper dive into emissions deriving from municipal operations. Table 2 shows a breakdown of the government operations inventory by sector. The largest contributor in this set is street lights and traffic signals energy with 29% of emissions. The

[7] Project summary provided by Eastern Michigan University.

next largest contributor is vehicle fleet with 23% of emissions. Actions to reduce emissions in both of these sectors will be a key part of a carbon neutrality strategy.

Table 2: City of Ypsilanti Government Operations CO2e Emissions by Sector
Source: EcoWorks

Sector	Scope	Emissions (metric tons CO2e)	Percent of Total Emissions
Street Lights & Traffic Signal	Scope 2	814.6	29%
Vehicle Fleet	Scope 1	631.44	23%
Building & Facilities Electricity Use	Scope 2	523	19%
Employee Commute Emissions	Scope 3	421.96	15%
Building & Facilities Stationary Combustion	Scope 1	199	7%
Solid Waste Facilities	Scope 3	181.6	7%
Total		**2,771.6**	**100%**

National Trends

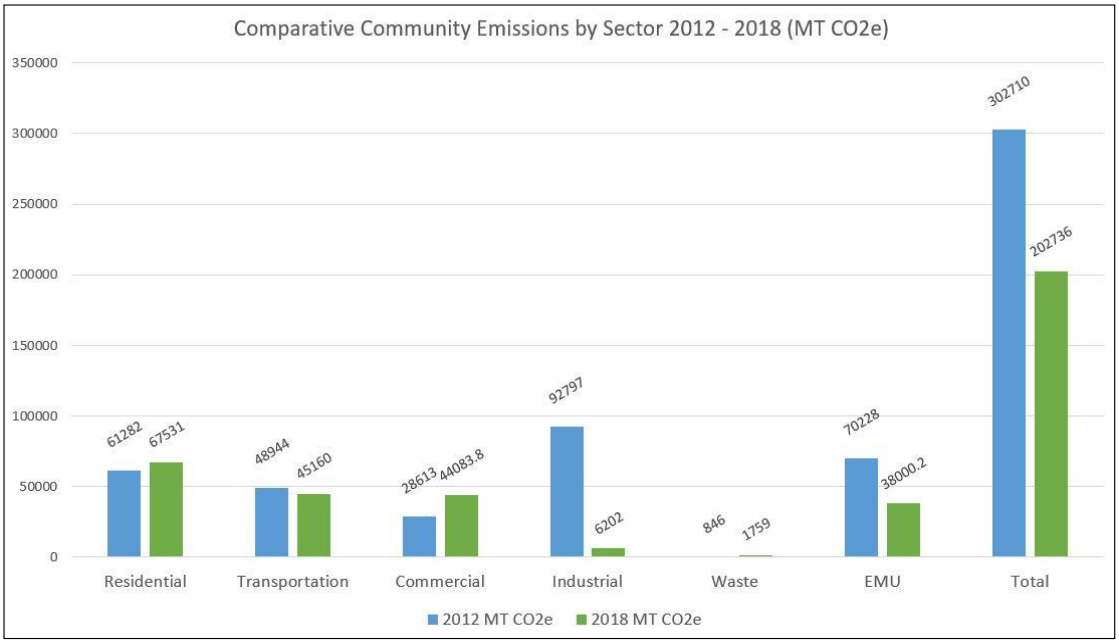
In the United States, the power sector and the transportation sector are also the two main contributors of greenhouse gas (GHG) emissions. Emissions from the electric power sector are primarily from coal-fired and natural gas-fired electric generators. Coal fuels the largest share of Michigan's electricity generation, and 4 of the 10 largest power plants in the state are coal-fired. In 2017, coal powered generation was about half of the generation that had occurred just three years earlier. In the same period, however, natural gas-fired power plants' share of Michigan's electricity generation nearly doubled.[8] As of 2017, the largest contributor to GHG emissions in the transportation sector is light-duty vehicles (cars, trucks, SUVs, and minivans), which contribute 59% of total transportation emissions. From 1990 to 2017, the total GHG emissions from light duty

[8] EIA. (2019, May 16). U.S. Energy Information Administration - EIA - Independent Statistics and Analysis. https://www.eia.gov/state/analysis.php?sid=MI

vehicles increased by 20.2% despite vehicles becoming more efficient; more vehicles on the road equals greater emissions.[9]

Ypsilanti Trends

Ypsilanti has made progress toward increasing its renewable energy portfolio but has fallen short of some of its ambitious goals. Resolution 2013-175 sought to place solar roofs on 1,000 properties and generate 5 megawatts of electricity from distributed solar by 2020.[10] Ypsi Solar has calculated that 55 sites have solar panels totaling about 1.24 megawatts of capacity. Based on the calculations from Ypsi Solar, the City has realized 5.5% of the solar roof target and 24.8% of the megawatt target. On a community scale, the comparison between 2012 and 2018 emission estimates show noticeable reductions. The estimated change is about 100,000 MT of CO2e, with most of the reductions coming from fewer industrial uses and EMU's installation of a modern cogeneration unit. Reductions attributable to City policies could be from increased financial contributions to expand bus service that helped take cars off the road. More closely tied to the City is the approximate 1,200 MT CO2e reduction from government operations, mainly due to the conversion to LED lighting.



[9] Fast Facts U.S. Transportation Sector Greenhouse Gas Emissions 1990-2017, Office of Transportation and Air Quality, United States Environmental Protection Agency, June 2019. https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100WUHR.pdf

[10] City of Ypsilanti," Resolution for 1,000 Solar Roofs Initiative", No. 2013-175, September 3, 2013. http://www.solarypsi.org/repository/documents/cityhall/Resolution_2013-175_1000_Roofs_by_2020.pdf

Environmental Challenges and Sustainability Policies

An inventory of the City's and region's sustainability policies were reviewed to determine where there are gaps in policy coverage. To start, environmental challenges were examined to describe existing conditions and City or regional policies and determine which actions, if any, specifically address those challenges. Where there is no alignment between challenge and policy, there are opportunities to tailor policy. The Sustainability Commission, formed in 2017, was established to address primarily environmental issues and has been actively stewarding the City's natural resources and prioritizing sustainability policies. As such, many of the newer policies put forth in recent years have originated with the Sustainability Commission.

Contamination

Underground Storage Tanks

Ypsilanti's industrial history has left behind environmental contamination that the City still contends with. Michigan's Department of the Environment, Great Lakes, and Energy (EGLE) maintains a database of sites that have been affected by former development. The table "Contamination by Census Tract" shows the most up-to-date data available for underground storage tanks. These are tanks that have been buried underground to mitigate their risk of explosion, usually because they contain petroleum. Many times, businesses do not remove them before leaving the site, and after years of deterioration their contents leak into the soil and could reach groundwater or other sources of drinking water. There are 47 recorded LUSTs in the City, the majority of which are closed, meaning that corrective action has been taken to stop the spread of petroleum or other hazardous substances.[11]

Table X: Contamination and LUSTs by Census Tract

Census Tract	Sites of Environmental Contamination	Leaking Underground Storage Tanks (Open)	Leaking Underground Storage Tanks (Closed)	Total
Tract 4108	8	2	13	23
Tract 4106	4	3	3	10
Tract 4107	1	1	4	6
Tract 4103	3	1	7	11
Tract 4110	2	2	4	8
Tract 4112	1	1	1	3
Tract 4109	1	1	2	4
Tract 4102	0	0	1	1
Tract 4111	0	0	1	1
Total	20	11	36	67

Source: Michigan Department of Environment, Great Lakes, and Energy, EnviroMapper

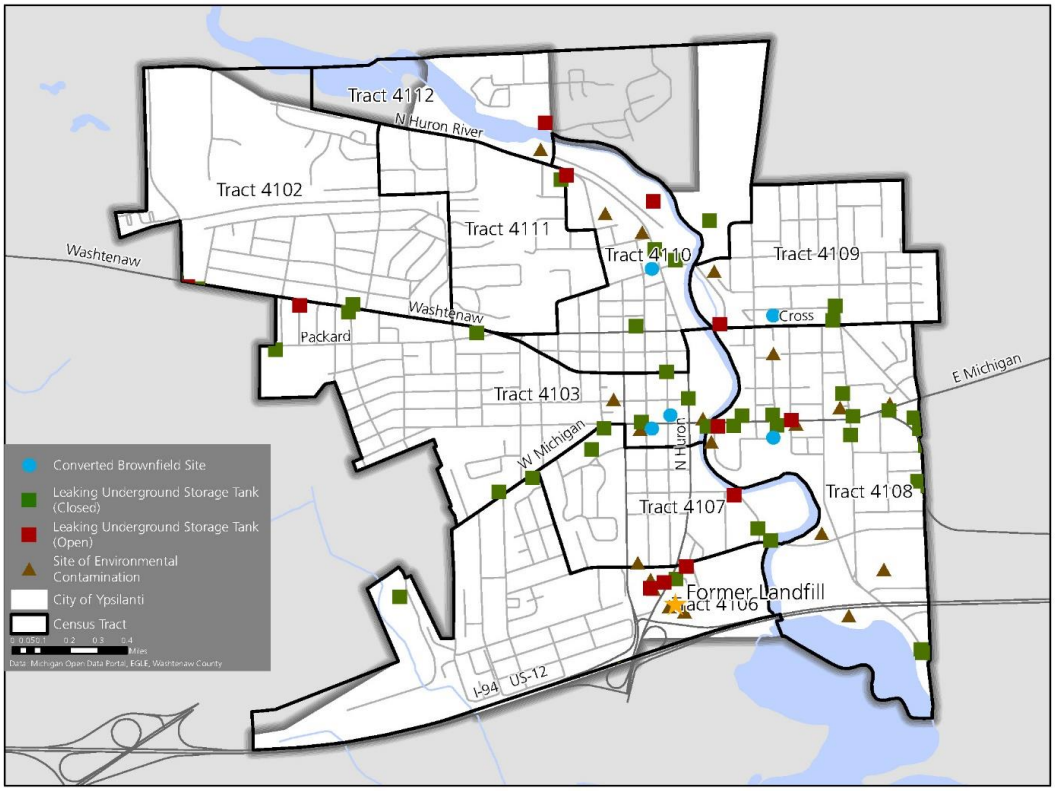
Environmental Contamination

EGLE also tracks environmental contamination because of the significant impacts it can have on the drinking water supply and on residents living in proximity to these sites. This is a distinct database

[11] Underground Storage Tanks, United States Environmental Protection Agency. https://www.epa.gov/ust/learn-about-underground-storage-tanks-usts

from LUSTs so that records are not duplicated. The main differences between the two systems are the source of the contamination, and which governmental division manages the sites. All other contamination releases, besides LUSTs, are covered under the Environmental Remediation Program (part 201). Twenty sites of environmental contamination are identified in the City. The "Contamination Map" illustrates the location of all known environmental contamination, LUSTs, and brownfields that were converted to usable sites in the City. The map shows that these sites are primarily clustered along commercial corridors, the rail line, the river, and less frequently in neighborhoods. Brownfields are also sites that experience the threat of environmental contamination but have a broader definition of sites that are blighted or functionally obsolete.

Map X: Contamination Map



Bell Kramer

The Bell Kramer neighborhood is an example of how environmental contamination, or even the threat of it, complicates land use planning. Home to about a dozen households, this neighborhood is wedged north of I-94 and the intersection of S Huron Street where Harriet Street turns into Spring Street. Immediately adjacent to this neighborhood is a former city landfill that has not been used since 1967. Some of the content dumped there is unknown. The first phase of an environmental assessment was conducted in 2012 and 2013 with intention of placing a solar farm on the site. The results prompted further investigation because volatile organic compounds (VOCs),

polynuclear aromatic hydrocarbons (PNAs), metals, benzo(a)pyrene, and methane gas were detected at higher levels than the state permits. These substances create negative effects such as increased ozone levels and soil toxicity, therefore posing substantial health and environmental risks.[12] [13] Property owners were notified of these results in 2013 because evidence suggested that contaminations could be migrating through the neighborhood. In 2017 and 2018, indoor air was tested in some of the Bell Kramer homes, and concentrations of contaminants were within acceptable ranges for the residents to stay.

The City's involvement extended to zoning changes to Bell Kramer during this time. In 2014, as a result of the findings that contamination could be affecting households, Ypsilanti rezoned the neighborhood to an industrial-commercial use so that future homes could not be built there and to phase out residential development in a potentially hazardous area. The rezoning turned homes into non-conforming structures, making it more difficult to sell or upgrade the homes. The residents' discontent, coupled with the positive vapor testing results in the homes, provided support for the City to rezone the neighborhood back to residential uses. The history of this neighborhood points to the complexity of changing land uses and monitoring the effects of environmental contamination. While the City will have to continue to deal with past instances of environmental negligence, it can tighten its land use standards to help prevent further conflicts.

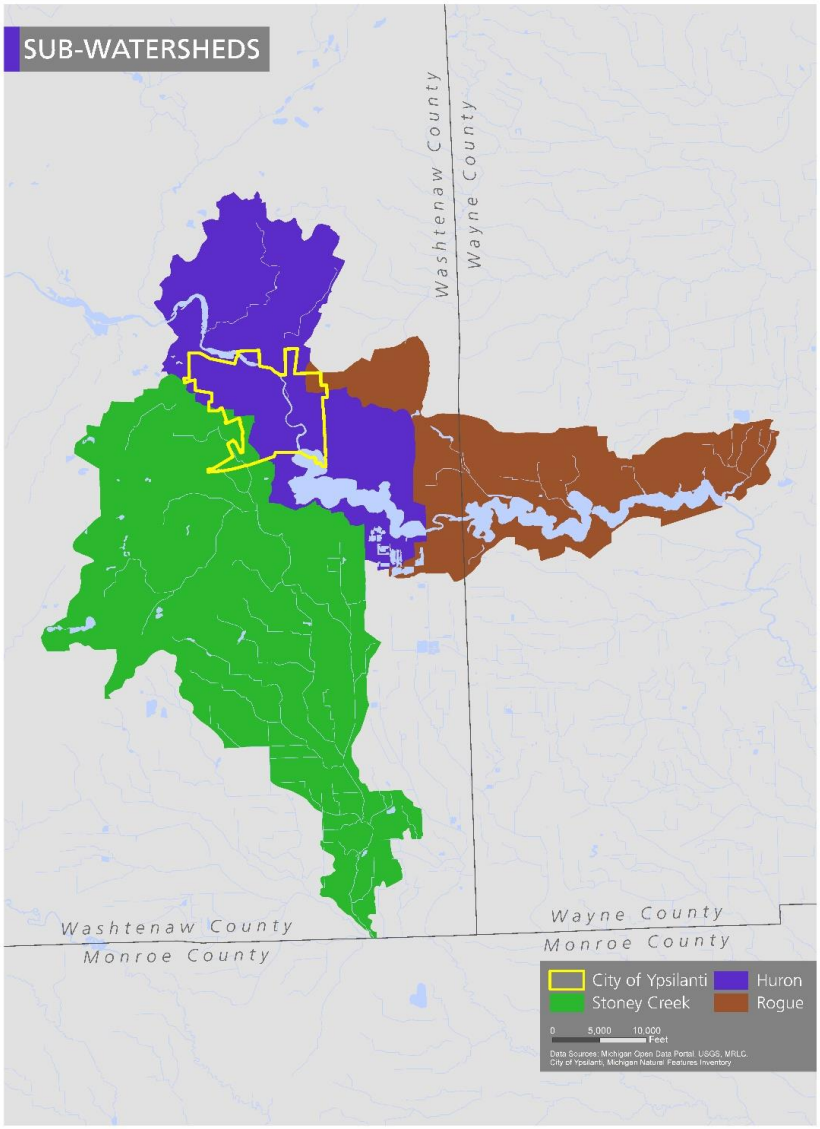
Sustainability Policy: Contamination

Contamination clean-up is often funded at the federal or state level and administered by a local Brownfield Authority. The US has long focused on post-contamination efforts on a case-by-case basis as opposed to holistic preventive measures, though providing incentives to remediate and redevelop brownfield sites to reduce sprawling and contamination on fresh "green" sites is a precautionary strategy. On a local level, Ypsilanti has used its Zoning Ordinance to prevent automotive uses in certain zones because their practices and commonly-used materials have a higher likelihood of contaminating soil.

Washtenaw County has had a Brownfield Redevelopment Authority (WCBRA) since 1999. Ypsilanti is one of the 23 municipalities that partners with the WCBRA to identify, assess, remediate, and redevelop brownfield properties that have a threat of contamination, are blighted, or are functionally obsolete. As such, the WCBRA uses Tax Increment Financing, Community Revitalization Program, and grants and loans to advance projects through the various phases of redevelopment. Five sites in Ypsilanti have received assistance from WCBRA, all of which have been successfully converted into usable space except for the Water Street property.

[12] EPA. Technical Overview of Volatile Organic Compounds. https://www.epa.gov/indoor-air-quality-iaq/technical-overview-volatile-organic-compounds#definition

[13] Helmenstine, Anne Marie, Ph.D. "What Is a Polynuclear Aromatic Hydrocarbon?" ThoughtCo, Feb. 11, 2020, thoughtco.com/definition-of-polynuclear-aromatic-hydrocarbon-605543



Watersheds

Surface Water

Ypsilanti is a part of the Huron River Watershed that follows the Huron River 125 miles from Big Lake near Pontiac, Michigan to Lake Erie. The enormity of the watershed calls for dividing into smaller branches to take a closer look at its features and conditions. The area of the watershed that encompasses the city of Ypsilanti covers 27.7 miles of the river from North Maple Road (Barton Pond) downstream to Belleville lake and includes the city and township of Ann Arbor, Superior Township, Ypsilanti Township, and Van Buren Township. Each watershed is subdivided into sub watersheds, and three sub watersheds intersect the City: Huron, Stoney Creek, and Rouge. Because a watershed crosses several jurisdictional boundaries, it is incumbent on these municipalities to cooperatively maintain high-quality drinking water while permitting access to the river. The health of the river depends on the quality of all its tributaries, which is often linked, at least in part, to land use policy. One way to coordinate across municipal jurisdictions is through a watershed council. The Huron River Watershed Council (HRWC) is the active nonprofit group that works to protect and restore the Huron River. In addition to writing a management plan for the entire watershed, the HRWC writes management plans for sections of the watershed. The HRWC is updating the section of the watershed that includes Ypsilanti in 2020-2021.

The HRWC identifies that the section of the Huron River that runs through Ypsilanti and Ann Arbor is heavily impounded: 77% of it is impounded by the seven dams that stretch across this area, making it more similar to a lake ecosystem than a river. Two of the major challenges afflicting the health of the watershed are runoff from impervious surfaces, and new development along the riverbank that clears vegetation vital to the absorbing runoff based on land use codes from 2000. In particular, phosphorous and E.coli are entering the river from Mill, Honey, and Boyden creeks.

Table X: Watershed Report Card

Subject[14]	Grade	Explanation
Watershed land use	D	High impervious surfaces along tributaries
Natural areas	D	12% of watershed has intact natural areas
River flow	F	Flashes following storms, erratic dam gate
River habitat	B	Where undammed, favorable features for river life
Aquatic Insect Community	C	Where undammed, good habitat for insects
Fish Community	B	Anglers enjoy good smallmouth bass
Phosphorous	C-	Concentrated of phosphorous exceed target; declining
E.Coli	C	After heavy rain, E.coli exceeds state standards
Total Suspended Solids	A	Low levels of TSS
Water Temperature	B	High maximum summer temperatures
Conductivity	B	Mostly measured at normal levels
Dams	F	High presence of dams and poorly controlled

Source: HRWC

Well Water

There are 14 water wells within the City: four type 1 wells, one type 2 well, four household wells, and four irrigation wells.[15] All of the type 1 municipal wells in Ypsilanti have been closed. The remaining wells are personal wells that residents are responsible for testing. Because the City is served by a municipal water system, the installation of personal wells is no longer necessary. The City of Ypsilanti sources water from the Great Lakes Water Authority which serves Southeast Michigan.

Sustainability Policy: Water

The City created two well exclusion areas which are written into local ordinances and documented through property deeds. Well exclusion areas were instituted to protect property from contamination; for example, in the downtown, a well was prohibited on a parcel where there was a leak from the former gas station. As wells become a less ubiquitous source of water in urban areas, this tool will be used even less frequently.

According to the City of Ypsilanti's code of ordinances, all development along any river frontage must include a planned 50 to 100 feet conservation and/or access easement.[16] This planned conservation easement allows river access for potential restoration or cleanup efforts. Without an easement, the City would have to receive permission from private property owners to pursue any river restoration projects. To further ensure protections for the Huron River, a river overlay district

[14] Huron River Watershed Council. Barton Pond to Belleville Lake Dam. https://hrwc.maps.arcgis.com/apps/MapJournal/index.html?appid=67e1fd1bbc9a44cf853cd78dd6d8219f

[15] Michigan Open Data Portal, "Water Wells – South Central & Southeastern Michigan" http://gis-michigan.opendata.arcgis.com/datasets/water-wells-south-central-southeastern-michigan?geometry=29.491%2C-17.893%2C-105.860%2C71.775

[16] City of Ypsilanti Code of Ordinances, Article VI: Site Regulations, Section 122-607 (c). https://cityofypsilanti.com/DocumentCenter/View/1396/ZOUpdate--02--ZO_BW20170215_anno?bidId=

could be implemented that would limit new development, ban toxic fertilizers, and incorporate low impact design standards that allow the site to retain water so that less contamination enters the river.

It takes the work of many groups to see positive change in our water systems. The Middle Huron Partners, a group that works with the HRWC, has invested over $10 million over 11 years on projects that reduce and capture stormwater runoff. At a larger scale, the Middle Huron Partners successfully lobbied to restrict phosphorous fertilizers, and the state followed suit in 2012 with new legislation to reduce algae blooms. At the county level, Washtenaw County modified its focus from flood control to quality control. This change in philosophy is backed by a hierarchy of preferred management practices that prioritizes natural vegetation first, then minimizing impervious surfaces, and finally detention and conveyance of excess stormwater.

Soil

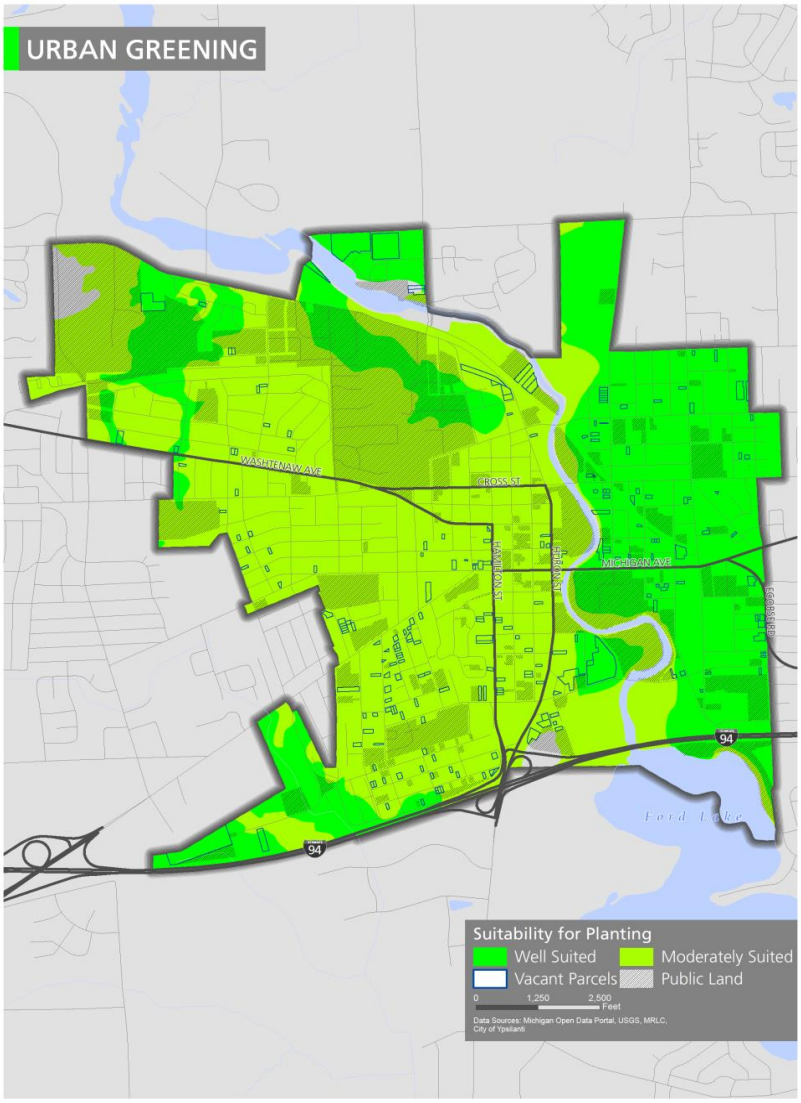
There are five types of soil in the City. Soil characteristics dictate the suitability for potential uses, such as dwelling units with basements and surface composting facilities. The table below shows the type and percentage of area within the City for each soil.[17]

Table X: Soil Types

Soil Type	Basic Characteristics	Percentage of Area in Ypsilanti
Fine	Soil particles not visible to the eye, poor load bearing capacity, fairly impermeable, susceptible to frost action	56.4%
Coarse Loamy	Larger grain loam soil, visible to the eye	18.8%
Sandy	Light soil, quick water drainage, poor water retaining qualities	12.8%
Fine Loamy	Smaller grain loam soil, not visible to the naked eye	11.8%
Loamy	Not predominantly sand, silt, or clay, suitable for growing plants due to the nutrient and water capacity	0.2%

Source: United States Department of Agriculture Soil Survey, current

[17] Web Soil Survey, United States Department of Agriculture, https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm



Soil plays an important part in flood dynamics. The composition of the soil determines how much water infiltrates into the ground. Only 7% of the soils in Ypsilanti experience "frequent flooding," and the rest experience no flooding aside from extreme circumstances.[18] Soils also impact development; the "Soils – Dwellings with Basements" map shows that the majority of the western side of the City is not conducive to basement construction based on the capacity of the soil to support a building without the soil shifting. Building basements is a matter of building code, not zoning code, and the state building code cannot be changed at the local level. In the face of greater flooding frequency, the City of Ypsilanti can encourage that new construction be built upward and not downward through the Zoning Ordinance.

Additionally, soil is an important factor when planning for green infrastructure, urban gardens, and tree planting. The "Urban Greening" map shows soils that are best suited for vegetated plantings superimposed over the vacant and public land within the City to determine appropriate areas for green infrastructure. Areas that are vacant, are held in the public trust, and have soils suitable for

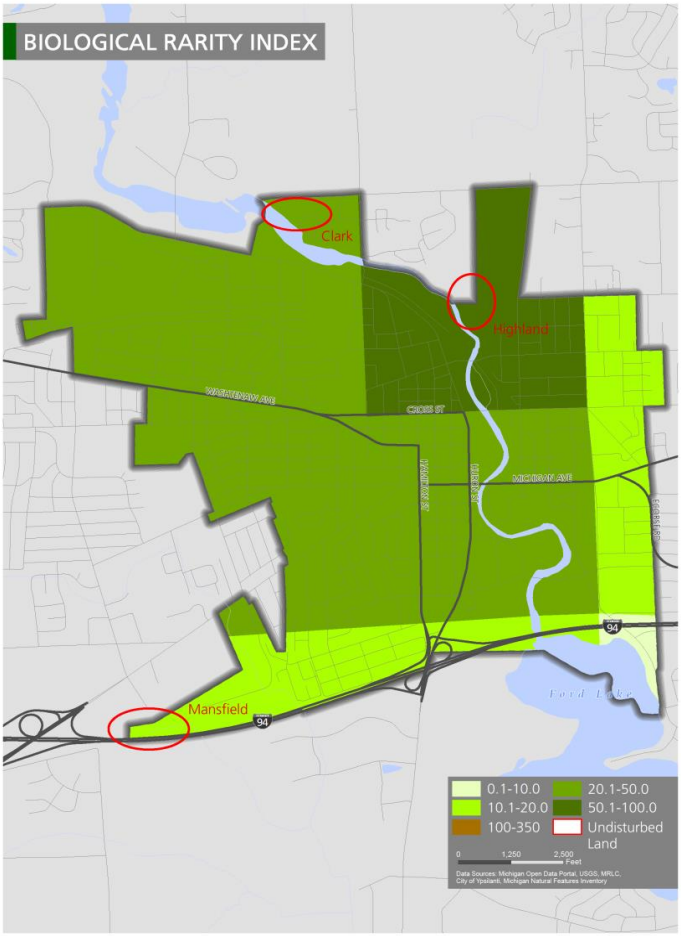
[18] Web Soil Survey, United States Department of Agriculture, https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm

planting should be prioritized for urban greening as they signify the conditions for the best outcomes.

Sustainability Policy: Soil

The City of Ypsilanti does not have any city regulations regarding soil or soil health. Some communities have adopted protections for the natural environment such as sensitive features overlays. For instance, the City of Grand Haven adopted a sensitive feature overlay which protects natural features including slopes. Development in the sensitive feature zone is subject to more intensive site plan restrictions and review, including preventing soil erosion and disturbance.[19] Although the City does not have any specific regulations regarding soil, Ypsilanti participates in Washtenaw County's Soil Erosion and Sedimentation Control Program. This program "works to protect surface water and the environment from the negative impacts of soil erosion pollution that are the result of earth changes."[20] Any projects that require substantial earth moving are required to obtain a Soil Erosion and Sediment Control (SESC) permit. Projects that require a permit include earth changes within 500 feet of a surface water's edge, earth changes more than 1 acre, earth changes related to gravel pits and landfills, installation or alterations to ponds, transportation facilities, and directional drilling or boring for utilities and infrastructure.[21]

[19] City of Grand Haven, Article IV Zoning Districts, Section 40-422 Sensitive Features Overlay district, https://library.municode.com/mi/grand_haven/codes/code_of_ordinances?nodeId=PTIICOOR_CH40ZO_ARTIVZODI_S40-422SASEAROVDI.
[20] Washtenaw County Water Resources Commissioner, Soil Erosion Control https://www.washtenaw.org/232/Soil-Erosion-Sedimentation-Control.
[21] Washtenaw County Soil Erosion and Sedimentation Control Ordinance 2016, https://www.washtenaw.org/DocumentCenter/View/758/Soil-Erosion---Sedimentation-Control-Ordinance---April-1-2016-PDF.



Biodiversity

The term biodiversity refers variety of living organisms within an ecosystem. The biodiversity and ecosystems of Ypsilanti and the broader region have been significantly impacted by urbanization and development but are not completely devoid of plant and animal life. The Michigan Natural Features Inventory (MNFI) maintains a database of state and federally listed endangered and threated species. This observational data is converted into the Biological Rarity Index. The Biological Rarity (Biorarity) Index model is based on the MNFI database of known sightings of threatened, endangered, or special concern species and high-quality natural communities. Each record is spatially joined to its habitat using land cover data, streamlines, and rail corridors. The records are then assigned three values based one the species' global status, state status, and occurrence quality rank. These values are multiplied by a likelihood of future sightings based on the age of the database record. Finally, the scores of all the records in a geographic unit are summed to determine the Biorarity Index for that geography.[22] The map "Biological Rarity Index" illustrates the areas in the City that have a higher Biorarity index. The higher the index, the more likely that area has threatened and endangered species. The areas with a higher index (darker colors) should be prioritized for conservation because of the importance of the habitat to threatened and endangered species. Overlaid on this map are three sites that have remained relatively untouched sites since the 1940s. Each of these areas fall into zoning districts with little protection from development and correspond to priority conservation areas on the map.

[22] Biological Rarity Index, Michigan Natural Features Inventory – MSU Extension, https://mnfi.anr.msu.edu/resources/biological-rarity-index

Table X: Potential Conservation Areas Current Zoning Districts

Area	Zone	Description of Zone
Mansfield & Highland (adjacent to cold water trout stream)	Production, Manufacturing, Distribution	Buildings can be on large plots of contiguous land, serviced by railroad lines or major thoroughfares; uses are expected to generate waste, noise, odor, and truck traffic; however, uses should produce minimal external impacts that are detrimental to other uses in the district or to properties in adjoining districts
Clark	Multi-family dwelling	Adjacent to high traffic generators and major thoroughfares and corridors; insure sound development policies for concentrations of multifamily units; recreation, service, and retail uses are permissible as special land uses to allow residents to access everyday needs by foot, if they are not already within a quarter-mile walking distance

Due to the sensitive nature of threatened and endangered the MNFI does not release site specific data on threatened and endangered species, but in Washtenaw County there are 83 observed species that are listed as threatened or endangered, including the peregrine falcon, smallmouth salamander, and orange frilled orchid.[23]

Sustainability Policy: Biodiversity

The best thing a community can do to preserve biodiversity is to concentrate development so that it does not sprawl onto natural habitat. However, as these sites are on the periphery of the City's core, they are susceptible to pressure from larger footprints like industrial and commercial uses. Equally important is to ensure that untouched land is contiguous and large enough so that animal species can minimize their contact with the developed world. This would require coordinating with surrounding municipalities on preservation efforts as animal species do not adhere to political boundaries. One example could a wildlife corridor strategy that cross jurisdictions to prohibit development in environmentally sensitive areas. Currently, there is no additional protections for these areas.

Another aspect of biodiversity is plant-based. "Rewilding" lawns, or planting native grasses that are more wildlife friendly (as opposed to sod) without the use of chemicals, are often perceived as unkempt, even a "threat to public health, safety, and welfare"[24] for attracting vermin, trash, and criminal activity. To an untrained eye, "weeds" are associated with blight, in fact, the Property Maintenance Code penalizes property owners for "weeds" over 10 inches in height. However, native grasses and shrubs on private property help to create microhabitats that can help insect population and the species that rely on them thrive. A loosening of property maintenance codes and a training for inspectors could help to normalize life-giving "messy "gardens a chance to boost biodiversity in the City. A "lawn alternative" education program that encourages property owners to participate in could also help reduce emissions from lawn mowers. Microhabitats can also be constructed as part as planned development. For instance, green roofs provide an opportunity to

[23] Michigan State University. MSU Extension. Michigan Natural Features Inventory. Accessed March 3, 2020; https://mnfi.anr.msu.edu/resources/county-element-data
[24] Ypsilanti Property Maintenance Code. Section 110-81

plant native species that provide food sources or refuge for insects and birds. Over an entire city these microhabitats can become effective in supporting the urban wildlife.[25]

Dam Removal

The Peninsular Paper Dam, in its current state, is a cause of many troubling ecological indicators regarding the Huron River's health, namely creating impoundments where algae forms and changing water temperatures that increase and lower dissolved oxygen levels harm fish habitats.[26] Ypsilanti and the HRWC conducted a feasibility report on removing the dam. The dam was classified as a high potential hazard, due to the severity of impending damage it could cause if it failed, and also classified as obsolete because it does not generate hydroelectric power or economic benefit. Based on sediment quality and quantity, potential infrastructure and utility impacts, and riverfront land ownership, it was determined that removing the dam is feasible.[27] In 2016, estimates for repairing the dam would exceed $800,000 and removing it would cost closer to $2.7 million.

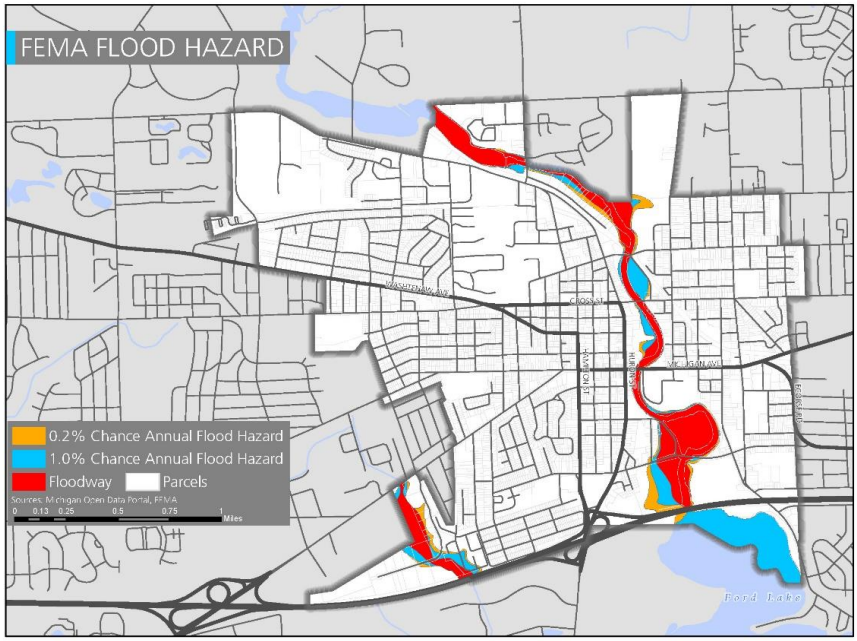
Sustainability Policy: Dam Removal

In May 2019, City Council voted to approve $500,000 towards deconstructing the dam as opposed to continuing to pay for repairs so long as the City applies to grants to complete the project.[28] [29] Dismantling the dam will protect the environmental health of native species that rely on the Huron River, and protect the City's budget in the long run.

[25] URBANhabitats "Green Roofs and Biodiversity" December 2006 http://www.urbanhabitats.org/v04n01/introduction.html
[26] Huron River Watershed Council. The Huron River Data Report: Ann Arbor and Ypsilanti Vicinity. https://www.hrwc.org/wp-content/uploads/LowerMiddleHuron-11x8.pdf
[27] Princeton Hydro. Peninsular Paper Dam: Dam Removal Assessment and Feasibility Report. September 2018. https://cityofypsilanti.com/DocumentCenter/View/1789/2018-11-21-Peninsular-Dam-Removal-Study-Report
[28] WXYZ Detroit. Ypsilanti City Council Votes to Tear Down Peninsular Dam. May 2019. https://www.wxyz.com/homepage-showcase/ypsilanti-city-council-votes-to-tear-down-peninsular-dam
[29] Ypsilanti City Council. Resolution 2019-101. May 7 2019.

Green Stormwater Infrastructure

Flooding is a cause for concern in that it has the potential to harm the water supply, human life, property, and infrastructure. The Federal Emergency Management Agency (FEMA) has identified zones based on the anticipated frequency an area will flood in a 100-year interval. These predictions are based on historical data, which means that they do not incorporate climate change considerations. Already, the FEMA-delineated floodplains are proven in many cases to be outdated, as areas vulnerable to flooding have expanded outside of its boundaries. Part of the increase in instances of flooding is linked to increased precipitation falling in concentrated storm patterns. To gain more accurate depictions of how City floods, Ypsilanti can invest in an updated study that incorporates recent data and includes forecasts of more intense and frequent storms.



Green infrastructure is one way to reduce the impacts of excess stormwater. Green infrastructure is a broad term that includes several practices of water management that protect or mimic the natural water cycle. As opposed to conventional "gray" infrastructure that uses hard surfaces and systems to channel excess water elsewhere, this approach protects and expands the natural environment so that water can be absorbed naturally at several scales: a home, a downtown, an entire city, a watershed. Common examples are rain gardens, green roofs, trees, planter boxes, rainwater harvesting systems, and bioswales, in additional to better protection of wetlands and floodplains.

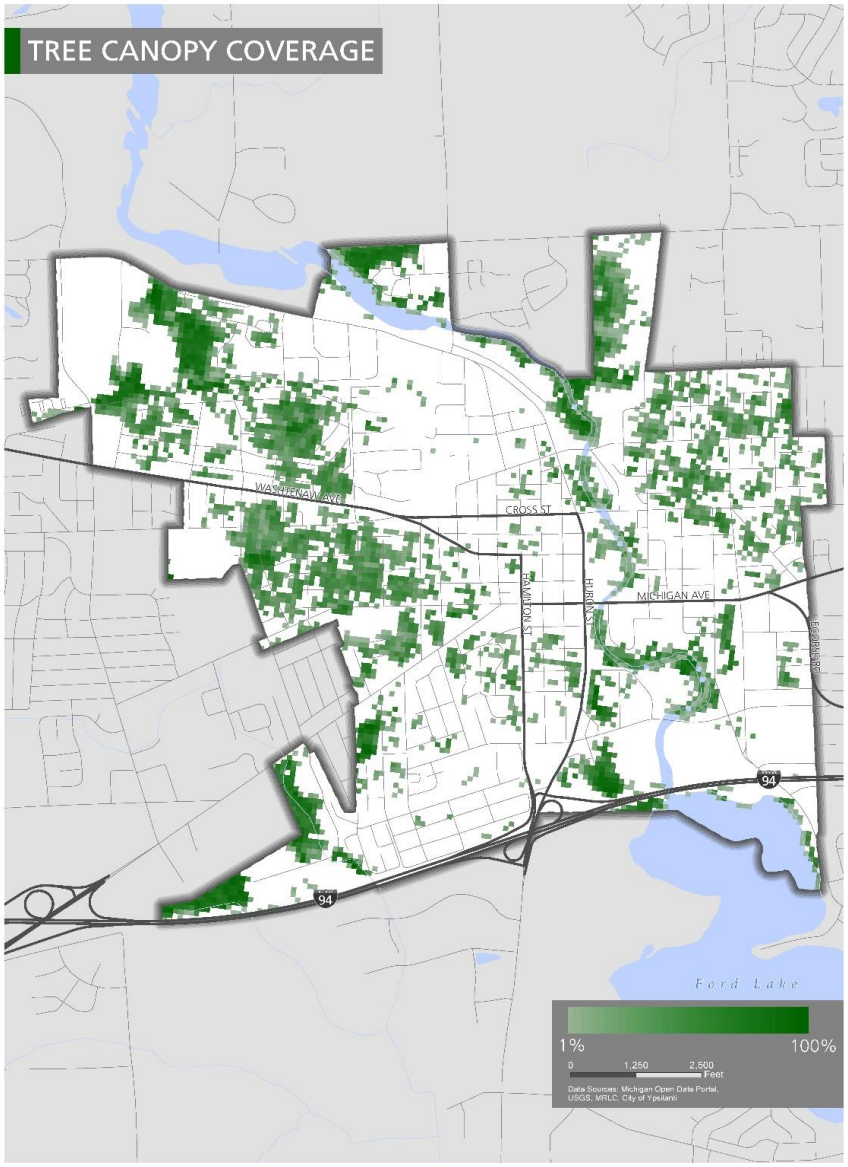
Native Plants

Native plants play an essential role in ecosystems. They are the primary producers, converting the sun's energy into biological material. Secondary producers, such as insects and herbivores, rely on plants to survive. These secondary producers are consumed by tertiary species such as carnivores and humans. When this chain is interrupted, it impacts every organism involved in the ecosystem. Plants also provide structural support, stabilizing the soil through their root networks which reduces

erosion. They also increase the infiltration of water moving across the landscape, as described in the green infrastructure section above. Some of the largest threats to plants are human development and invasive species.

Invasive species also negatively impact native plants. Invasive species are species from another ecosystem, usually from another area of the globe, that outcompete the native species for essential resources. Invasive species can outcompete the native species because there are no natural predators or processes in the native ecosystem to curb their growth. When native species disappear from the landscape, other organisms that require the native species to survive also disappear. For example, monarch butterfly caterpillars only eat milkweed plants. If urban development removes all the milkweed or an invasive species outcompetes the milkweed, the monarch butterfly would also disappear. Finally, as climate change continues to elevate global temperature averages, the composition of native species is subject to change. Species that were originally held south by a temperature barrier are now able to expand farther north because of rising overall temperatures, and native species that are not adaptive to warmer temperatures may disappear from the landscape. Native species that can survive in warmer temperatures should be prioritized for planting in the City because of their ability to adapt to Ypsilanti's predicted climate.[30]

[30] "Climate Change Tree Atlas and Bird Atlas." USDA, US Forest Service https://www.fs.usda.gov/ccrc/index.php?q=tools/tree-and-bird-atlas.



Trees

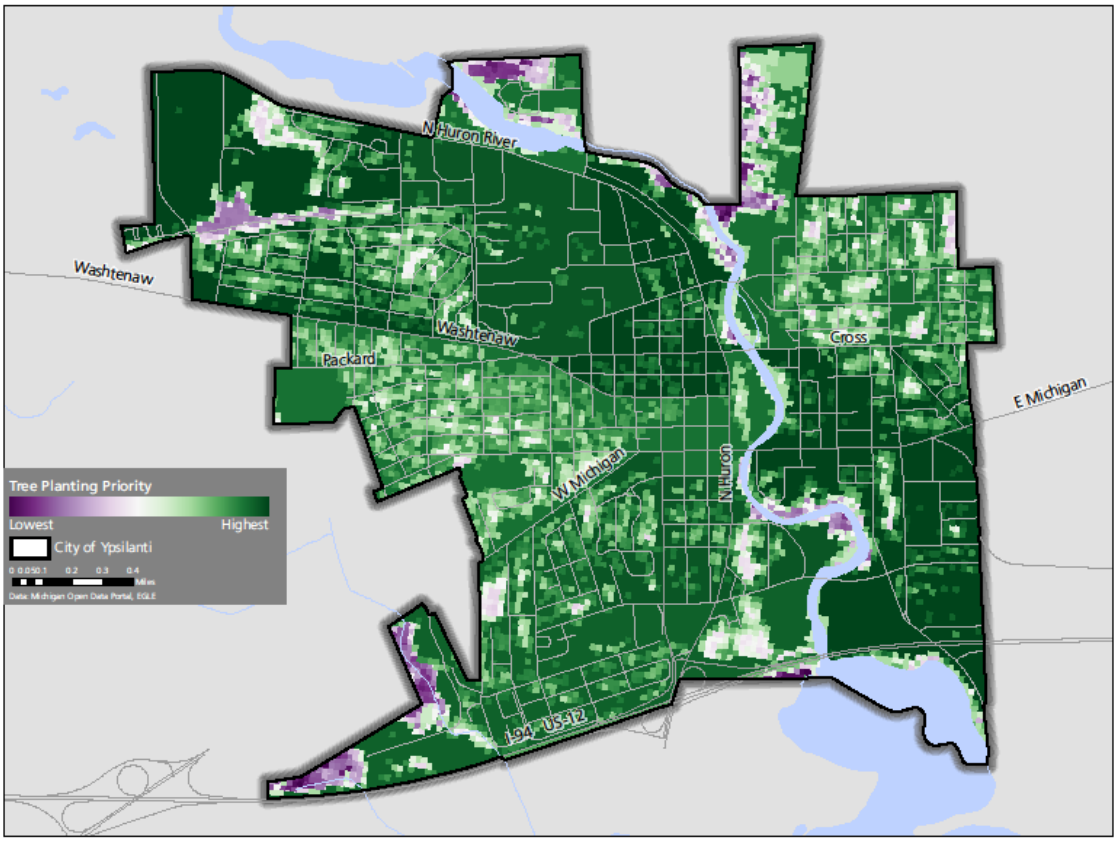
One of the most common types of green infrastructure is trees. Investment in trees pays back with dividends due to the ecosystem services they provide. In addition to capturing stormwater, trees beautify cityscapes, improve property values, sequester carbon, and provide cool refuges in the heat. The "Tree Canopy Coverage" map shows that trees are limited within central neighborhoods and along corridors where large swaths of the map are "white," representing zero coverage. In 2012, an Urban Forestry Management Plan was completed on public trees and found that Ypsilanti had 8,835 trees, stumps, and planting sites for a total appraised value of about $10.7 million. There are 105 distinct species, but maples account for 55.2% of the tree population. That lack of diversity leaves the City vulnerable to a disease that could wipe out half of tree population. Public trees skew older and the majority are in fair condition, and would ideally be replaced with younger trees at a higher replacement rate.[31]

[31] City of Ypsilanti Urban Forestry Management Plan. February 2012.

A tree placement model was run for the entire City to determine what areas are most in need of trees based on four factors. The four factors were weighted accordingly: existing tree canopy (55%), land use (25%), and low-income population and heat vulnerability index were both weighted at 10%. The results of the tree placement model are shown in the "Tree Placement Priority Map." The darker green areas represent highest-need areas and the purple areas have adequate tree canopy coverage. The challenge in tree planting is the initial funding and ongoing maintenance; the environmental challenges that result from a lacking tree canopy coverage come with high opportunity costs to human health, water quality, and aesthetics. When the City of Ann Arbor quantified the benefits that trees provide, each tree was found to contribute $97 in ecosystem services annually. Each tree provides annual energy savings of $48 by shading buildings and slowing winds, which reduce the heating and cooling requirements in buildings. The aesthetic value and quality of life benefits each tree provides is estimated at $29. Reducing runoff and other water quality benefits is valued at $11 per tree and the air benefits that tree provide is quantified at $9 per tree.[32] Communities that manage and expand their urban tress can achieve status as a "Tree City" awarded by the Arbor Day Foundation. As of June 2019, Ypsilanti lost its Tree City designation. To be awarded this status, a community must achieve four standards: a tree board or department, a tree care ordinance, a community forestry program with a budget of at least $2 per capita, and observance of the Arbor Day holiday.

[32] City of Ann Arbor Urban & Community Forest Management Plan, City of Ann Arbor, June 2, 2014.

Map X: Tree Planting Priority Map



Sustainability Policy: Stormwater Infrastructure

The Sustainability Commission adopted a resolution (No. 2020-002) in December 2020 that acknowledges the value of native plants and resolves to update the City ordinance to support the planting of native species (disregarding native plant blight violations in the meantime), to make reasonable efforts to use them on City property, and to educate residents about native species to plant on private property.

Already embedded in the landscaping requirements in the Zoning Ordinance is a tree protection plan for site plan review. The applicant is also awarded credit for preserving or incorporating existing trees and shrubs into the development, and if trees or shrubs were used to meet the minimum landscaping requirements and are cut down or damaged, the applicant must replace them according to ordinance specifications. Moreover, trees proposed for credit cannot be invasive (122-632). The frontage of all public and private streets for a new or altered use that requires site plan review must be landscaped with street trees (122-636). Currently, there is no tree preservation ordinance that precludes new development from removing certain tree species from the site based

on criteria such as growth rate, presence of insects or disease, crown development, life expectancy, structure, and soundness of the trunk.[33]

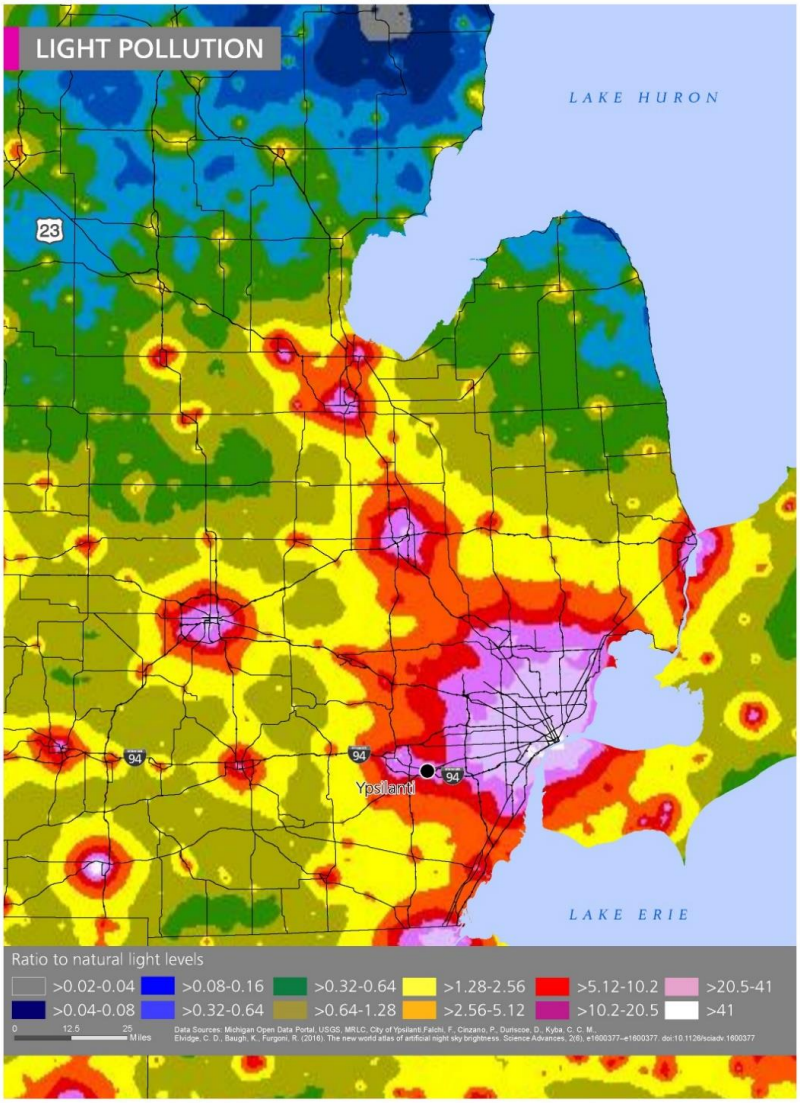
The Zoning Ordinance in its 2019 version allotted more space for urban agriculture in the form of community gardens in the park, single-family, multiple-family, core neighborhoods, and health and human services zones. The Zoning Ordinance also permits accessory stormwater control features such as swales, pervious paving, rain garden, rain cisterns, vegetated roofs, and other methods. Ypsilanti has two rain gardens, one in Depot Town and one at the Freight House but has struggled to maintain them.

In partnership with Washtenaw County Conservation District (WCCD), the Sustainability Commission has offered support to promote WCCD workshops to residents and encourage tree planting on residential lots and identify a site for Earth day tree planting and volunteers for the event. Washtenaw County has staff dedicated to teaching master rain gardener certification courses and provides technical advice for planting one on private property. The City of Ypsilanti also won bronze at the Michigan Sustainability Conference in 2019 for its work with the Washtenaw County Water Resources Commissioner to provide free consultations to household interested in development or enhancing rain gardens.[34]

Light Pollution

The inappropriate or excessive use of artificial light is referred to as light pollution. Light pollution includes excessive brightness, the brightening of the night sky, light where it is not needed, and the clustering of light sources. [35] Light pollution has negative effects on wildlife, energy consumption, and human health. Light pollution alters the perception of many nocturnal animals turning the night into day, inhibiting their ability to forage, hunt, and breed. Additionally, migratory birds that

[33] City of Ann Arbor. Landmark Tree List. https://www.a2gov.org/departments/forestry/Documents/LandmarkTreeList_Web.pdf
[34] Michigan Green Communities (MGC). 2019 MGC Challenge Participants and Awards. https://migreencommunities.com/blog/
[35] Light Pollution, International Dark Sky Association, https://www.darksky.org/about/



use the moon and stars to navigate can be pulled towards urban areas and collide with improperly lit buildings.[36] The type of outdoor lighting also has an impact on insects that are attracted to the cooler white lights and less attracted to the warmer yellow lights.[37] The City of Ypsilanti has an artificial to natural light ratio of 10.2 to 20.5, indicating that the amount of night light is 10 – 20 times above natural levels.[38] On top of the effect on birds, the United States Department of Energy estimated that 35% of lighting is wasted, roughly $3 billion dollars annually, indicating that buildings can reduce or reconfigure lighting to solve problems of waste and disrupting migratory bird patterns.

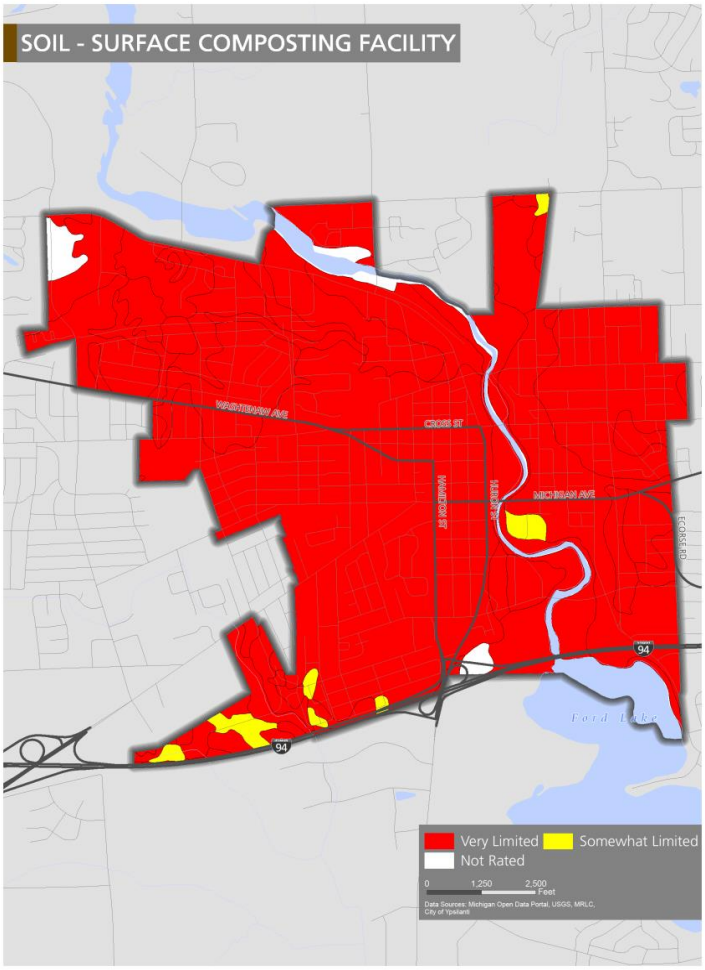
Policy: Light Pollution

Article VI Section 122-609 of Ypsilanti's Zoning Ordinance states that "parking and loading facilities, building entrances, and building exits used during night-time shall be artificially illuminated." The parameters around lighting standards are based on the effect they have on

[36] Wildlife and Ecosystems, International Dark Sky Association, https://www.darksky.org/light-pollution/wildlife/
[37] Servick, Kelly "Which Light bulk attracts the fewest bugs? Study revels surprises", Science, Feb. 14, 2016. https://www.sciencemag.org/news/2016/02/which-light-bulb-attracts-fewest-bugs-study-reveals-surprises
[38] Cooperative Institute for Research in Environmental Sciences at the University of Colorado Boulder, https://cires.colorado.edu/artificial-sky

adjacent property owners, the overall height of a lighting fixture, and the intensity of the light. For ornamental lighting, uplighting is permitted, subject to Building Code. However, to reduce light pollution, the Model Lighting Ordinance recommends creating lighting zones where different intensities are permitted, apply curfews to turn off lighting after a given time, minimize uplighting, and institute performance methods for how many lumens are permitted based on site conditions.[39] One device that can help achieve many of these suggestions are motion detectors, which has the add bonus of reducing energy waste.

Waste Management



The City of Ypsilanti's waste disposal is contracted to Stevens Disposal, which serves Southeast Michigan. Stevens Disposal provides waste services to 5,337 households, roughly 70% of households in the City.[40] [41] The solid waste generated in the City is transported to two landfills: Carleton Farms located in New Boston, MI and the City of Riverview's municipal landfill Riverview Land Preserve.[42] Carleton Farms accepts 2.25 million tons of waste annually, the third highest volume in Michigan, and has a total capacity of 101 million tons, the largest in the state. The landfill is estimated to produce 15.8 million cubic feet of gas per day, 40.1% of which is captured. Methane that cannot be captured is flared. Flaring gas is the process of lighting gas wells on fire to convert the more harmful methane to carbon dioxide as it enters the atmosphere. Carleton Farms flares 0.65 million cubic feet of

[39] International Dark-Sky Association. "Model Lighting Ordinance." June 2011. https://www.darksky.org/wp-content/uploads/bsk-pdf-manager/16_MLO_FINAL_JUNE2011.PDF
[40] Stevens Disposal Services Contract. Retrieved from email with Bonnie Wessler. February 27, 2020.
[41] United States Census "Quick Facts: Ypsilanti city, Michigan"
[42] Stevens Disposal Customer Service. Phone call on January 20, 2020.

landfill gas daily, roughly two-thirds the size of an Olympic size swimming pool. In 2018, Carleton Farms emitted 195,105 metric tons of carbon dioxide equivalents to the atmosphere.[43] Based on current capacity, Carleton Farms is anticipated to close in 2052.

River Land Preserve accepts 780,00 tons annually and has a capacity of 39 million tons. Riverview Land Preserve is expected to close in 2031.[44] In 2018, Riverview Land Preserve emitted 288,394 metric tons of carbon dioxide equivalents into the atmosphere. While the waste generated by Ypsilanti is only a fraction of the waste sent to these two facilities, it nevertheless makes a contribution that impacts global warming. The City of Ypsilanti provides recycling hauling services and as of 2020 serves 5,186 properties.[45] To reduce the amount of solid waste generated, the City of Ypsilanti could improve its curbside recycling or composting. With the two landfills that Ypsilanti relies on closing in the next 30 years, the City should pursue all opportunities to reduce the solid waste generated. Due to the soil composition of the City, a composing facility would most likely have to be located outside city boundaries as the "Soil – Surface Compositing Facility" shows that the majority of the City's soil is not conducive to a surface composting facility. These ratings are based on factors that might lead to the contamination of groundwater from composting byproducts.[46]

Sustainability Policy: Waste Management

The City of Ypsilanti provides a curbside recycling and composting service. The curbside recycling program is not a complete recycling program because glass and Styrofoam are not collected since they disrupt the recycling stream. Additionally, the curbside recycling service is only available to properties with fewer than four units, which excludes roughly 88 residential properties. The curbside composting operates from April through December, but this service is only for yard waste and not for household waste.[47] Many survey-takers expressed a desire for improved access to services, likely in reference to the remaining properties without curbside recycling and few options for composting food. Residents are also eligible to use Ann Arbor's drop-off recycling station for safe disposal of items that Ypsilanti does not collect.

In 2018, the Sustainability Commission resolved (No. 2018-08-002) to increase recycling rates based on the Climate Action Plan findings. The resolution aims for increased education about the City's recycling program, and the placement of artistic recycling bins throughout the City. The expansion of the recycling program would have to be accompanied by an extensive outreach and education program to ensure that best recycling practices are followed. The following summer, the Sustainability Commission defined 2019-2020 goals, one of which was to facilitate a Zero Waste event (No. 219-07-002).

[43] FLIGHT, United States Environmental Protection Agency. https://ghgdata.epa.gov/ghgp/main.do
[44] Landfill Methane Outreach Program (LMOP) United States Environmental Protection Agency. https://www.epa.gov/lmop/project-and-landfill-data-state
[45] City of Ypsilanti
[46] Web Soil Survey, United States Department of Agriculture https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm
[47] The City of Ypsilanti, Meeting with Bonnie Wessler, March 4, 2020.

Public Input

In 2019, high priority themes from The City of Ypsilanti Energy Plan (2018), The City of Ypsilanti Climate Action Plan (2012), and the Shape Ypsilanti Master Plan (2013) were identified, and coupled with a round of community input.

Community Engagement Summary of Details
Survey respondents: 144
Board entries: 876 unique responses
Attendees at in person session: 25

Residents were invited to attend an in-person meeting held on July 11, 2019 to participate in group exercises that prioritized sustainability actions. There was also an online survey (physical copies were provided), and in an attempt to "go to the people," boards were placed on easels at five different locations throughout the City (City Hall, two student centers at EMU, Parkridge Community Center, and Cream & Crumb) in the spring and summer of 2019 that allowed residents to select their environmental priorities. The findings from each engagement were compiled, analyzed, and used as a basis for outlining the City's ongoing path towards sustainability.

Results suggest that the community most passionately wants to see action taken in the following areas:

- Waste management, waste reduction, increased access to recycling and composting
- Communication, education, and outreach about sustainability goals and practices
- Complete streets and neighborhoods
- Increased energy efficiency and renewable energy
- Disaster preparedness and response to climate change

Action Plan

Waste Management

The public expressed the need for recycling and composting options in all three forms of engagement. Residents prioritized expanded recycling and composting services in the "infrastructure" category of the survey, and 61% believe that improved curbside access would realistically help their households divert waste from landfills.

US and global consumption of materials increased rapidly during the last century. Global waste production has multiplied by a factor of ten over the last century and will likely double again by 2025. Circular business models and mindsets can transform the manufacturing and consumption approach of "take, make, sell (or purchase), and waste." By looking at a product's entire lifecycle—from materials extraction to end-of-life management—new opportunities can be found to reduce environmental impacts, conserve resources, and reduce costs. Choosing products that are manufactured using different, fewer, less toxic, and more durable materials reduces the amount of materials that must be recovered or be landfilled. The Zero Waste Hierarchy describes a series of steps and considerations that will help communities, organizations, and individuals make smarter choices about materials purchases in order to reduce environmental impact.

A comprehensive waste strategy starts with source reduction or diversion of waste from landfills. Responsible waste management practices and purchasing choices make a difference. Every ton of mixed paper recycled can save the energy equivalent of 166 gallons of gasoline. Not purchasing that paper to begin with makes an even bigger impact because no raw materials or energy are used to produce it, no fuel is used to transport it, and no energy or fuel is used to haul or recycle it at the end of its life. Cities can adopt procurement policies centered on reduction through initiatives such as paperless offices. Cities can also reduce waste by encouraging residents and agencies to judiciously use, reuse, and recycle materials, and motivating businesses to manufacture products that are longer lasting, easier to fix, and as recyclable as possible.[48]

When materials have reached the end of their useful life, they should be diverted from landfills. Diverting organic waste from landfills includes separate collection requirements, education campaigns, financial incentives for food redistribution, and disincentives for generating food waste.[49] Nearly half of the solid waste produced globally is organic or biodegradable. Much of it ends up in landfills, where it decomposes in the absence of oxygen and produces the greenhouse gas methane, which is up to 34 times more powerful than carbon dioxide over a century. While many landfills have some form of methane management, it is far more effective to divert organic waste to composting.[50]

Recycling can reduce emissions because producing new products from recovered materials often saves energy. Forging recycled aluminum products, for example, uses 95 percent less energy than creating them from virgin materials. Despite the emissions generated through the collection, transport, and processing of recycled goods, increasing recycling rates remains an effective approach to managing waste while addressing emissions. It also reduces resource extraction, minimizes other pollutants, and creates jobs. Recycling programs for appliances and refrigerants are impactful components of a comprehensive recycling strategy. While chlorofluorocarbons (CFC) and hydro chlorofluorocarbons (HCFC) have been phased out because of the damaged done to the ozone layer, their primary replacement, hydrofluorocarbons (HFC), have 1,000 to 9,000 times greater capacity to warm the atmosphere than carbon dioxide.[51]

[48] EPA. Managing and Transforming Waste Streams – A Tool for Communities. Retrieved from https://www.epa.gov/transforming-waste-tool
[49] Corvidae, J. et al. The Carbon-Free Region Handbook. RMI. (2018) Retrieved from https://rmi.org/category/global-energy-transitions/cities-and-communities/carbon-free-regions-handbook/?post_type=insight
[50] Project Drawdown. Composting. https://www.drawdown.org/solutions/food/composting
[51] Project Drawdown. Refrigerant Management. https://www.drawdown.org/solutions/materials/refrigerant-management

Table X: Waste Management Action Plan

Sustainability Alignment	Action	Source	Adaptation/ Mitigation	Key Accountable Agency	Funding/ Financing Source
Environment, Economy	Conduct a waste audit to understand the changing composition of the waste stream at the municipal operations level and at the community level.	New	Mitigation		
Equity, Environment, Economy	Implement an educational campaign on recycling and composting	New	Mitigation		
Environment, Economy	Increase opportunities for end-of-life collection and recycling programs for difficult-to-recycle materials including electronics and refrigerant management.	New	Mitigation		
Environment, Economy	Set a goal for City operations to be zero waste by a specific date with annual benchmarks.	New	Mitigation		
Environment, Economy	Require any events with a City permit provide for recycling, compost, or are zero waste.	New	Mitigation		
Environment, Economy	Promote and increase opportunities for municipal composting. • Implement a pilot program for a municipal kitchen compost system with high food-waste generators. • Support the development of commercial-scale compost operations. • Pilot curbside community composting services for leftover food. • Explore small-scale composting of pet waste, lawn debris, and organic non-food waste in neighborhoods.	CAP	Mitigation		
Environment, Economy	Implement zero waste policies that require public events or government operations to use durable or compostable materials and send no waste to landfills.	CAP	Mitigation		

Equity, Environment, Economy	Implement municipal procurement policies, focused on source reduction, that require government operations to reduce waste. • Become a "paperless" office	CAP	Mitigation		
Equity, Environment,	Increase access to curbside recycling services to multi-family units.	CAP, PE	Mitigation		
Equity, Environment	Expand recycling to public spaces and all City facilities by placing artful, educational and engaging waste sorting stations throughout the community.	CAP	Mitigation		

Communication, Education, and Outreach about Sustainability Goals and Practices

Based on the collective prioritization results, residents see a need for education and outreach related to sustainability-related services and programs such as waste management, alternative forms of transportation, nutrition and health services, housing assistance programs, and home water and energy efficiency improvements. Survey-takers gave the City a decent grade on following the guiding principle "communication is key," with most respondents assigning a B or C. It was also noted that sustainability education should be added to the school curriculum and taught by local experts. This has yet to be done at a national level but some local efforts have incorporated sustainability into youth's curriculum. A federal grant was awarded to the Southeast Michigan Stewardship Coalition to educate students across nine schools, including one school in Ypsilanti, about climate resiliency. Discussion on this topic included identifying potential solutions to make communities more resilient through a community-based project. Ypsilanti Community High School students worked with City Council and the Sustainability Commission; all hope to forge a lasting partnership to complete more projects.[52]

Most survey participants were unaware of the City of Ypsilanti Climate Action Plan (69%), let alone the strategies that the City is using to adapt to and mitigate the impacts of climate change. Residents will be impacted by the effects of climate change and need easy access to resources that will help them respond to and mitigate the negative impacts on their families and their health. To increase the climate resiliency of residents, the City must make information easier to access, provide emergency training for extreme events response, and help residents take proactive measures to reduce GHG emissions. Community education is an important step in promoting adaptation and mitigation strategies on an individual and community level, and the City is in a position to provide easily accessible and well-publicized information for residents.

[52] Michigan Radio. "Centering the Classroom on Climate Resilience." December 2019. https://www.michiganradio.org/post/centering-classroom-climate-resilience

Table X: Action Plan: Communication, Education, and Outreach

Sustainability Alignment	Action	Source	Adaptation/ Mitigation	Key Accountable Agency	Funding/ Financing Source
Equity, Environment, Economy	Promote the city's energy, climate, and sustainability vision. • Include information on municipal marketing materials. • Publish the adopted plans, goals, and progress dashboards on the City's website. • Promote the City's commitment to energy, climate, and sustainability through regional conferences, and/or other appropriate communication mechanisms. • Focus on identifying actions that have multiple community benefits such as green infrastructure, increasing the tree canopy, and reducing vehicle miles traveled.	CAP, EP, New	Mitigation and Adaptation		
Equity, Environment, Economy	Organize competitions between municipal employees, business owners, and neighborhoods that promote sustainability-focused activities such as, "Bring Your Green to Work," energy treasure hunts, adopting catch basins or green infrastructure, zero waste days, smart commute weeks, and challenges to bike, walk or take public transit to work.	New	Mitigation		
Equity, Environment, Economy	Implement an educational series about energy efficiency and renewable energy through energy saving workshops in different venues. • Focus on the most vulnerable populations. • Educate on the availability of low and no cost business energy audit services through multiple partners. • Promotes home water and energy efficiency improvements, utility assistance programs, home repair, and other programs that help	CAP, New	Mitigation and Adaptation		

	residents reduce their monthly expenses. • Publicize existing finance and funding opportunities for integrating solar development into private projects				
Equity, Environment, Economy	Distribute easy to follow tips and reminders about the City's energy vision on a regular basis (monthly or quarterly).	CAP	Mitigation and Adaptation		
Equity, Environment, Economy	Utilize the community's experts to gather support for adding sustainability education to the curriculum in local K-12 schools.	CAP	Mitigation and Adaptation		
Equity, Economy	Publicize affordable housing options.	New	Adaptation		

Green, Connected, and Complete Neighborhoods

Ypsilanti residents want to live in neighborhoods that are green, connected, and complete. The features of a "complete neighborhood" was left to survey-takers to decide, and 68% of respondents said that "completeness" is deciding factor in choosing where to live. Most important in "completing" their neighborhood was the presence of "parks, recreation, and/or open space (96%)," and the fourth highest priority is trees and/or community gardens (77%).
They understand that stewardship of natural resources will improve the health of the Huron River and preserve existing trees which is what beautifies their neighborhoods.

Residents also see complete neighborhoods as physically connected so that streets safely accommodate bicyclists, pedestrians, public transportation passengers, and users of all ages and abilities. This was expressed in high response rates for wanting "sidewalks" (87%) and "public transportation options" (84%). City Ordinance No. 1156 provides for the planning, design, and construction of streets that offer appropriate access to all legal users and provide safe, accessible, comfortable, and efficient transportation options for people and goods in order to support the City's quality of life, economic vitality, and environmental sustainability. This is an important step in cutting vehicle miles traveled, as is coupling transportation routes with building density. Permitting neighborhood-friendly stores that provide goods serving daily needs (convenience store, market) and personal services (hair salon, dry cleaner) in proximity to households makes destinations convenient by foot or bicycle. Urban Land Institute reviewed studies that show that compact suburban development reduces VMT by 20% compared to low-density suburban development, and by 60% compared to urban development.[53]

[53] Urban Land Institute. "Land Use and Driving: The Role Compact Development Can Play in Reducing Greenhouse Gas Emissions." https://uli.org/wp-content/uploads/ULI-Documents/Land-Use-and-Driving-Low-Res.pdf

Even though 64% of Ypsilanti residents commute to work alone in a personal vehicle,[54] improved nonmotorized transportation infrastructure can make a difference in how people choose to arrive to other destinations. Residents generally support alternative modes of transit, even if they prefer to drive. Residents are proponents of expanded bicycle and pedestrian networks and public transit service including the Amtrak stop. What prevents residents from walking or riding a bicycle to destinations is incomplete sidewalks or bicycle lanes, the condition of the nonmotorized infrastructure, and the difficulty in crossing some streets safely.

While the idea of green, connected, and complete neighborhoods arose from the public engagement process, similar ideas are reflected in the US Green Building Council's LEED for Neighborhood Development standard. Similar conceptions of complete neighborhoods are expressed in in Detroit's vision for 20 Minute neighborhoods and Kalamazoo's Imagine 2025 Master Plan as an emerging trend in Michigan. The US Green Building Council's LEED for Neighborhood Development standard recognizes that neighborhoods can be designed to respond to the local impacts of global climate change and make significant advances toward a sustainable planet. The standards focus on achieving sustainability goals at a neighborhood scale that align with Ypsilanti's broader sustainability goals:

- Lower operating costs and increased asset value
- Reduce waste sent to landfills
- Increase energy and water conservation
- Provide more healthful and productive environments for occupants
- Reduce greenhouse gas emissions; and
- Promote rebates, zoning allowances, and other incentives.

Table X: Action Plan: Green, Connected, and Complete Neighborhoods

Sustainability Alignment	Action	Source	Adaptation/ Mitigation	Key Accountable Agency	Funding/ Financing Source
Transportation					
Equity, Environment, Economy	Champion the development of the County-wide Transit Master Plan.	CAP	Mitigation		
Equity, Environment, Economy	Maintain and expand transportation options including the development of bicycle, pedestrian, and sharing networks. • Coordinate with Townships, WCRC, and Border to Border (B2B) trail development.	CAP, MP, New	Mitigation		

[54] American Community Survey. 2017 5-Year Estimates. Table DP03.

	• Partner with Eastern Michigan University to create a bike-sharing program and car-sharing network. • Partner with the DDA and AATA to provide a discounted transit pass via the City Treasurer as an alternative to downtown parking permits. • Implement a parking cash-out alternative benefit option for employees currently eligible for parking permits at City Hall. • Expand protected bike lanes. • Encourage police enforcement and legislative support for bike and pedestrian safety.				
Equity, Environment, Economy	Make it easier for pedestrians and bicyclists to cross the street safely • Restore two-function to Cross, Huron, and Hamilton Streets. • Separate Cross and Washtenaw. • Restore Harriet Street as the Main Street of adjacent neighborhoods. • Retain the mix of uses within each corridor but allow them throughout the area.	MP, PE	Mitigation		
Equity, Environment, Economy	Prioritize the improvement of nonmotorized connections that link neighborhoods and job centers	New	Mitigation		
Equity, Environment, Economy	Encourage population density and transit-oriented development in appropriate locations	New	Mitigation		
Equity, Environment, Economy	Incorporate complete street principles in all new roadway and rehabilitation projects.	New	Mitigation		
Equity, Environment, Economy	Encourage corporate sponsorship of transit passes and infrastructure to encourage employee bus and bikeshare ridership.	New	Mitigation		
Equity, Environment,	Improve neighborhood walkability by improving sidewalk connectivity and	New	Mitigation		

Economy	conditions.				
Greenery					
Equity, Environment, Economy	Provide nutrition and environmental education at recreation centers and parks.	New	Mitigation		
Equity, Environment, Economy	Increase tree plantings according to the Community Forestry Management Plan	New	Mitigation and Adaptation		
Equity, Environment	Implement a tree preservation ordinance	New	Mitigation and Adaptation		
Environment	Renew the City's Arbor Day designation	New	Mitigation and Adaptation		
Equity, Environment, Economy	Establish a River Overlay Zoning District	New	Mitigation and Adaptation		
Equity, Environment, Economy	Establish a Sensitive Features Overlay Zoning District to preserve and protect the natural resources in the City and threatened and endangered species.	New	Mitigation and Adaptation		
Environment, Economy	Increase vegetation requirements on multifamily, commercial, and industrial parcels to absorb stormwater and cool the area.	New	Mitigation and Adaptation		
Equity, Environment, Economy	Connect homeowners to Washtenaw County rain garden services.	New	Mitigation and Adaptation		
Environment, Economy	Update property maintenance code to permit native gardens and microhabitats previously deemed unsightly.	New	Mitigation and Adaptation		
Environment, Equity	Invest in an updated floodplain map that includes climate predictions.	New	Adaptation		

Equity, Environment, Economy	Incentivize rain barrels on residential and commercial property.	New	Adaptation		
Equity, Environment, Economy	Develop permanent year-round homes for the Depot Town Farmer's Market and Downtown Farmer's Market.	CAP	Mitigation and Adaptation		
Environment, Economy	Concentrate development to preserve existing open space and the connectivity of natural areas to preserve biodiversity.	New	Mitigation and Adaptation		
Environment	Use the Rainwater Rewards tool calculate the value of green infrastructure practices.	New	Mitigation and Adaptation		
The Commercial Side of a Complete Neighborhood					
Equity, Environment, Economy	Develop an Environmental Justice program that identifies vulnerable populations that are disproportionately impacted by climate change, and act to help those communities adapt to or eliminate burdens.	New	Adaptation		
Equity, Environment, Economy	Expand green jobs training and workforce development program.	New	Mitigation		
Equity, Economy	Expand workforce development opportunities, with an emphasis on students and low-income residents, through a City-University-Corporate partnership for education and training.	New	Mitigation and Adaptation		
Equity, Environment, Economy	Develop a Green Business/Neighborhood Certification program.	New	Mitigation		

Increased Energy Efficiency and Renewable Energy

Increasing energy efficiency for residents means reducing the percentage of income spent on housing utility costs and reducing the amount of energy consumed. This is accomplished through education programs for residents and developing higher standards for new housing developments.

More efficient housing could be encouraged by site plan review and guidance for developers, applications for tax abatements, and promoting existing financial tools to help developers meet these standards.

Energy efficiency measures for municipally operated facilities could result in significant savings. The City needs to address major projects at the most energy-intensive facilities and while implementing no- or low-cost efficiency opportunities at all facilities. These best-practice measures include LED lighting, low-flow water fixtures, programmable thermostats, air sealing, staff behavior changes, and increased awareness about conservation and efficiency. Larger projects should be integrated into capital improvement plans. Solar photovoltaic energy (PV) is cost competitive with conventional power generation.

Ypsilanti should set targets to increase the adoption and penetration of solar PV, develop a streamlined solar permitting process, and facilitate the integration of solar PV by property owners and developers. Ypsilanti also continues to lead by example by installing solar PV on more municipal facilities. Residents support increased building energy efficiency and the use of renewable energy and future developments that will prioritize sustainability and the incorporation of renewables.

Table X: Action Plan: Increasing Energy Efficiency and Renewable Energy

Sustainability Alignment	Action	Source	Adaptation/ Mitigation	Key Accountable Agency	Funding/ Financing Source
Equity, Environment, Economy	Improve municipal building performance following suggested actions from City of Ypsilanti Energy Plan and following energy management best practices. • Improve municipal building performance. • Sustain the City's revolving loan fund. • Establish an energy manager position. • Improve knowledge of energy management among city staff and appointed officials among staff. • Improve the data-drive approach to manage energy use. • Establish a process to analyze data to determine energy use trends and billing errors. • Improve communications with facility managers utility providers and relevant contractors to resolve issues quickly.	EP, New	Mitigation		

Equity, Environment, Economy	Prioritize the Energy Plan's Project Action Plan Summary. ● Prioritize a list of potential energy assessments and audits to be completed in the next five years. ● Utilize the most efficient equipment available and incorporate renewable energy into the energy portfolio of each building including back-up generation. ● Select a suite of projects to undertake in the short-term. Couple projects with a short return on investment with projects with a long return on investment to improve the terms of longer ROI projects and facilitate their completion.	EP	Mitigation		
Equity, Environment, Economy	In pursuit of the City's 100% Renewable Energy goal, set annual goals to reduce energy consumption and increase the percent of energy demand from renewables. Publicly report on progress made toward those goals.	New	Mitigation		
Equity, Environment, Economy	Increase outreach to and participation of industrial customers in renewable energy and energy efficiency projects.	New	Mitigation		
Environment, Economy	Expand programs to increase energy efficiency and solar energy generation for the private market such as Solarize or PACE financing.	New	Mitigation		
Equity, Environment, Economy	Purchase renewable energy credits (RECs) for City operations.	New	Mitigation		
Environment, Economy	Set incremental goals for 100% LED streetlights, municipal, and outdoor lighting. Follow Dark Sky guidance to ensure that lighting does not interfere with the health of residents or the greater biotic community.	New	Mitigation		

Equity, Environment, Economy	Promote state policies, incentives, grants and Community Energy Management programs that encourage energy efficiency and renewable energy.	New	Mitigation		
Equity, Environment, Economy	Implement a coordinated site plan review process with attention to sustainability-related strategies such as energy use and efficiency, generation and offsetting of emissions, on-site water management and infiltration, etc.	New	Mitigation and Adaptation		
Equity, Environment, Economy	Establish an energy sub-committee within the Sustainability Commission and include implementation of the City of Ypsilanti Energy Action Plan in the Sustainability Commission's scope of work.	EP	Mitigation		
Equity, Environment, Economy	Focus on increasing the energy efficiency and safety of rental properties. ● Continue and increase rental inspections and enforcement. ● Create a green rental certification program to encourage energy-efficient improvements. ● Incentivize landlords to make energy upgrades. ● Require utility cost disclosure for rental properties. ● Promote Washtenaw County's weatherization program.	MP, CAP	Mitigation and Adaptation		
Equity, Environment, Economy	Adopt a certification requirement for any development project receiving at least $10,000 in municipal incentives or tax abatements in a single year. Certification could be ENERGY STAR, Green Globes, LEED, WELL, or other building standards.	CAP	Mitigation		
Equity, Environment,	Participate in or sign-on to regional, national or international commitments energy, climate, and sustainability including: ● The Michigan Green Communities Challenge ● The Paris Climate Agreement	EP, New	Mitigation and Adaptation		

	• The Sierra Club's "Ready for 100" pledge • The Global Covenant of Mayors for Climate and Energy.				
Equity, Environment,	Work with community stakeholders to initiate an energy competition. The university and City can partner together to challenge another city and university to an energy reduction competition.	EP, CAP	Mitigation		
Equity, Environment,	Create a Sustainability District with performance goals	New	Mitigation		
Equity, Environment, Economy	Develop home and business water efficiency financing program.	CAP	Mitigation		
Equity, Environment, Economy	Reduce emissions from City vehicles. Improve fleet fuel efficiency with clean diesel, alternative fuels, and electrification.	New	Mitigation		
Environment, Economy	Develop an electric vehicle infrastructure strategy.	New	Mitigation		
Equity, Environment, Economy	Install a solar farm.	New	Mitigation		
Equity, Environment, Economy	Development an alternative energy microgrid.	New	Adaptation		

Disaster Preparedness and Adaptive Responses to Climate Change

Extreme heat and cold events, heavy rainfall, flooding, and other extreme weather events are expected to increase over time as a result of climate change. While sustainability-related actions will help mitigate these risks in the future, the City must help residents adapt to these increasing risks by expanding emergency preparedness and communication tools.

As GHG emission rates continue to rise, Michigan is expected to see up to a 5°F increase in average air temperature between 2041 and 2070. An additional 30 to 70 days per year, depending on the region, are expected to exceed 90°F. The amount of energy needed to cool buildings will also rise. There were 474 cooling "degree days" in 1990, 679 cooling degree days in 2000, and 1205 cooling degree days in 2019. Degree days can be a confusing and counterintuitive measurement.

There can be more than 365 heating or cooling degree days in one year because degree days are measured relative to a base of 65°F(18°C) and reflect the *amount* of heating or cooling necessary at a facility. Above 65°F (18°C), it is assumed that a facility will need to be cooled, and below 65°F (18°C), it is assumed that a facility will need to be heated. Heating Degree Days (HDD) are the equivalent number of days a facility would need to be heated by 1 degree to accommodate the heating requirement. For example, one day where the temperature measures 80°F would be 15 Cooling Degree Days because it is 15 degrees above 65°F.

As temperatures increase, the frost-free season (the period interval between the last and first occurrences of 32°F) will extend to include an additional 40 to 50 days each year by 2100. Precipitation is projected to increase on average but concentrate in more intense precipitation events, likely resulting in greater periods of both extreme flooding and extreme drought. An additional 2 to 3 inches of annual precipitation is expected for Michigan, and the number of days each year experiencing heavy rain falls is expected to increase by at least one day per year. These extreme weather events will impact the economy, disrupt the environment, and disproportionately impact vulnerable population

Extreme heat events will:

- Exacerbate asthma symptoms and other pulmonary illnesses.
- Amplify ground-level ozone levels, which are associated with higher hospitalization rates for asthma, more severe allergic reactions, and premature deaths for people with heart and lung disease.
- Increase healthcare costs as a result of negative health impacts.
- Raise temperatures in urban areas and put pressure on electrical distribution as people rely more on air conditioning.
- Reduce grid reliability as a result of increased demand.
- Decrease energy efficiency and increase costs for rate payers because of increased energy use.
- Negatively impact seasonal businesses from wineries to ski resorts.

Heavy rain and flooding will:

- Put residents and emergency response personnel in direct physical danger.
- Increase runoff which can pollute bodies of water and spread water-borne illnesses and infections.
- Create financial and health problems when flooded homes are not properly and quickly addressed.
- Create damp conditions that spur the development of mold and reduce indoor air quality.
- Expand 100-year floodplains resulting in more homes and infrastructure being prone to damage in the future.
- Stress the capacity of aging sewer infrastructure and increase the risk it may be overwhelmed by an increased volume of stormwater.
- Force cities to release untreated water into nearby water sources, possibly contaminating drinking water.
- Increase runoff that will eat away at banks and shorelines.
- Increase sediments that can smother aquatic habitats, such as the gravel beds where many fish spawn.
- Impair commercial and recreational navigation in ports and marinas.
- Degrade vast freshwater resources and have an enormous impact on the State's economy.

Severe winter storms will:

- Disproportionally affect homeless people who are vulnerable to cold temperatures.
- Increase the risk for low-income individuals, the elderly, and the sick who may be vulnerable to colder temperatures.
- Damage power lines, infrastructure and vegetation such as crops and trees with "mixed" precipitation, including heavy wet snow, sleet, ice and hail.
- Cause power outages and disrupted transportation resulting in reduced productivity and profitability.

Table X: Action Plan: Disaster Preparedness and Adaptive Responses to Climate Change

Sustainability Alignment	Action	Source	Adaptation/ Mitigation	Key Accountable Agency	Funding/ Financing Source
Equity, Environment, Economy	Develop an emergency preparedness or natural hazard mitigation plan and expand the emergency preparedness resources by integrating climate change impacts into future hazard mitigation planning.	PE, New	Adaptation		
Equity, Environment,	Expand emergency preparedness and communication tools including a multilingual and universally accessible communication network for disseminating risks and recommendations in the event of emergency.	New	Adaptation.		
Equity, Environment, Economy	Conduct neighborhood vulnerability assessments.	New	Adaptation		
Equity, Environment,	Conduct an urban heat island assessment.	New	Adaptation		
Equity, Environment, Economy	Expand local air quality monitoring system.	New	Adaptation		
Equity, Environment, Economy	Utilize the most efficient equipment available and incorporate renewable energy into the energy portfolio of each building including back-up generation, renewables, microgrids and storage.	EP, PE	Adaptation and Mitigation		

Equity, Environment, Economy	Improve response to severe weather and temperature events. • Invest in infrastructure materials that can weather extreme weather. • Improve snow and ice response. • Identify warming and cooling shelters and invest in back-up generation. • Require occupied residential rental units to have one air-conditioned room. • Implement renewable backup power systems for areas of refuge and emergency facilities. • Address the urban heat island effect with cool roofs, green roofs, increased tree canopy, and use energy-efficient appliances and equipment.	PE, New, CAP	Adaptation		
	Expand the City's capacity to deal specifically with heavy rainfall. • Invest in upgrading the stormwater management system • Develop tighter stormwater management ordinances on multifamily, commercial, and industrial parcels. • Encourage onsite stormwater retention and infiltration and discourage runoff by restructuring sewer and/or stormwater fee.	.			

The City of Ypsilanti
2020 Inventories of Community and Government Greenhouse Gas Emissions

Photo Credit: Solar Ypsi. http://www.solarypsi.org/installations/FireStation

Produced by EcoWorks
With Assistance from ICLEI - Local Governments for Sustainability USA
[Reference to Further Information]

Credits and Acknowledgements

City of Ypsilanti
Bonnie Wessler – Project Manager

Sustainability Commission
Chair – Keith Michalowski
Vice Chair - Nancy Heine
Commission Member – Julia Bayha
Commission Member – Emily Drenen
Commission Member – Christian Cannon
Commission Member – Bryan Foley
Commission Member – Katy Greenwald
Commission Member – Takunia Collins
Commission Member – Beth Gibbons

City Council
Mayor Beth Bashert
Mayor Pro Tem Lois Richardson
Council Member – Ward 1, Nicole Brown
Council Member Ward 2, Steve Wilcoxen
Council Member – Ward 2, Jennifer Symanns
Council Member – Ward 3, Anthony Morgan
Council Member – Ward 3, Annie Somerville

This report was prepared by Henrik Mader, Energy Analyst, and Brittany Turner, Energy Analyst at EcoWorks. The authors would like to thank the City of Ypsilanti staff for providing much of the insight and local information necessary for the completion of this report.

This GHG inventory report was developed using a template provided by ICLEI – Local Governments for Sustainability, USA. This template and its appendices were published in January 2019.

Table of Contents

Tables and Figures

List of Figures

List of Tables

Executive Summary

The City of Ypsilanti (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. On November 19th the City of Ypsilanti City Council passed resolution No. 2019-260 declaring a "climate emergency" and a commitment to achieve carbon neutrality by year 2035.[1] Furthermore, the City has multiple opportunities to benefit by acting quickly to reduce community GHG emissions.

The City of Ypsilanti, released a Capital Action Plan and associated greenhouse gas inventory (including both the community and government inventories) in July of 2012. There are various nuanced differences between the 2012 inventories and the 2020 inventories; most significantly being that the ICLEI U.S. Community Protocol for Accounting and Reporting of GHG Emissions Version 1.1, did not exist when the 2012 community inventory was compiled.

This report provides estimates of greenhouse gas emissions resulting from activities in City of Ypsilanti as a whole and according with municipal operations in 2018. It was executed in parallel with the draft sustainability plan.

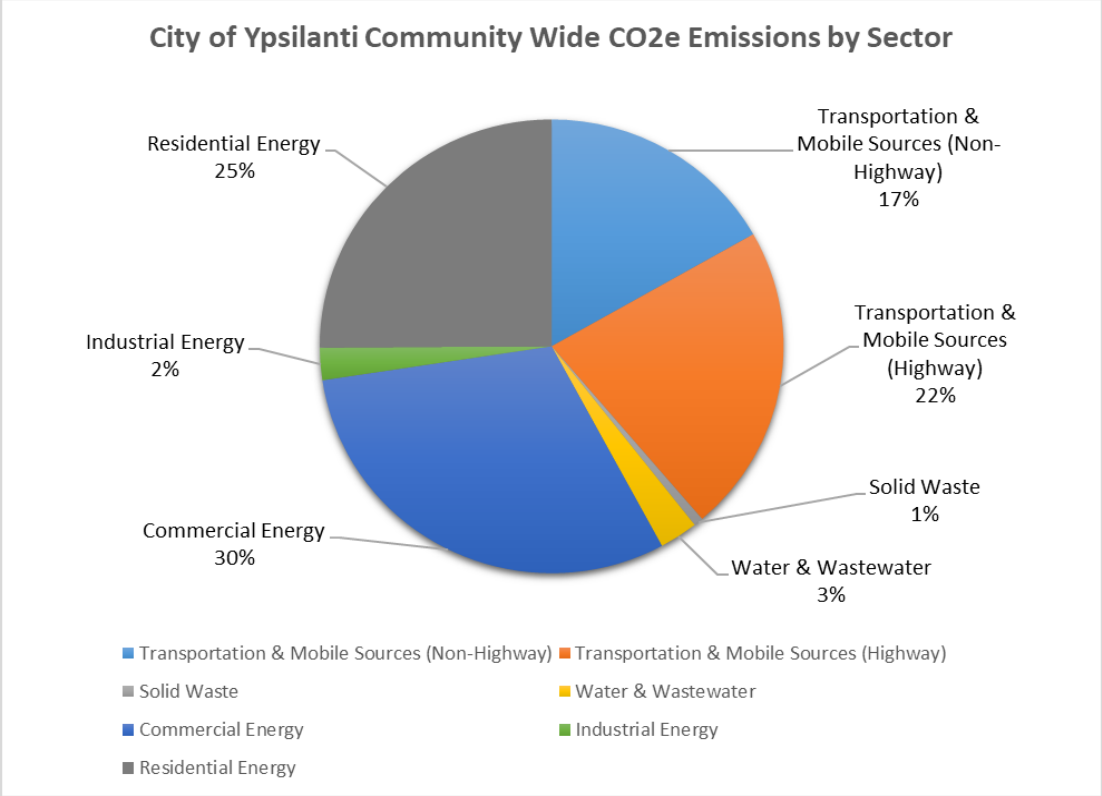
Key Findings

Community-Wide Emissions Subject to Community Activities

The largest contributor in this set is transportation with 39% of emissions. The next largest contributor is commercial energy with 30% of emissions followed by residential energy with 25% of emissions, illustrated in figure 8 These sectors are important ways in which the City of Ypsilanti community as a whole contributes to emissions. Waste and water waste, industrial energy, and solid waste were responsible for the remainder of community emissions.

[1] City of Ypsilanti. Regular Council Meeting November 19, 2019. Resolution No. 2019-260. p.5-6. Retrieved from February 18, 2020 https://cityofypsilanti.com/AgendaCenter/ViewFile/Item/1987?fileID=3730

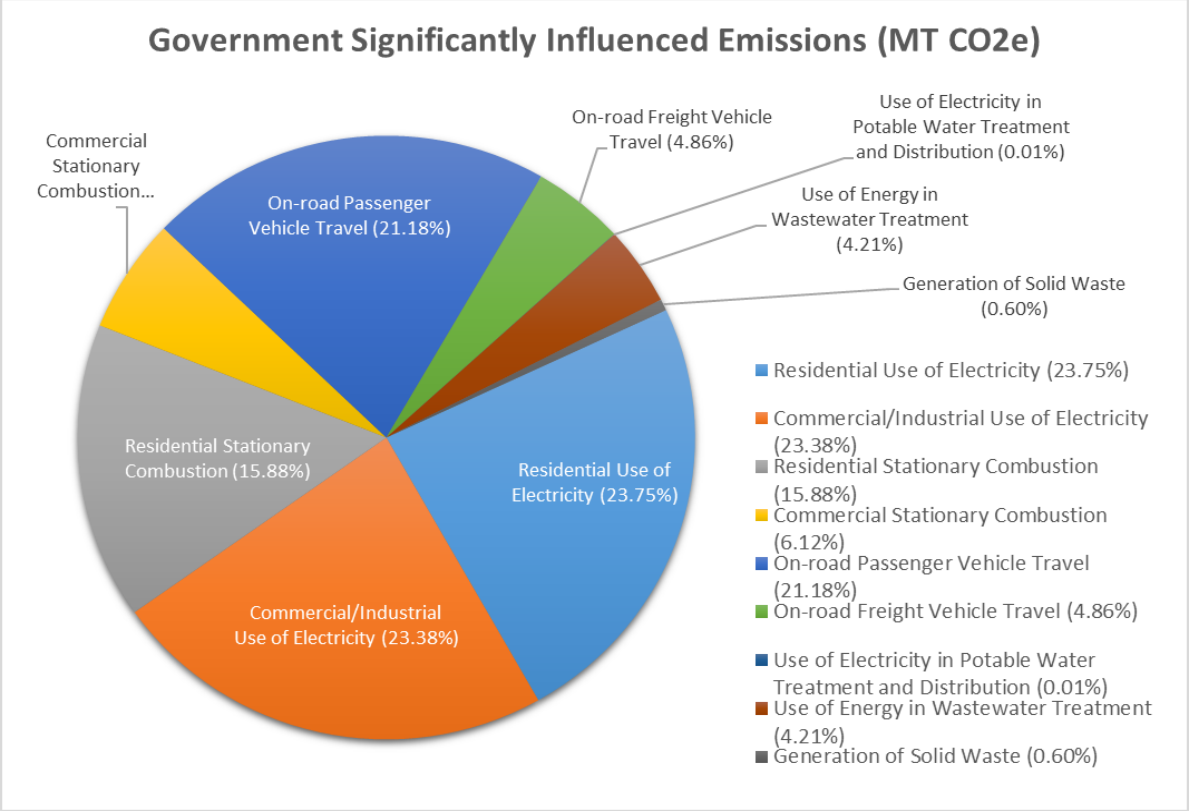
Figure 1 - Community-Wide CO2e Emissions by Sector



Community-Wide Emissions Subject to Local Government Significant Influence

A subset of community emissions, identified as local government significantly influenced emissions, are most policy relevant. Figure 2 shows the significantly influenced activity emissions. The largest contributor in this set is residential energy use of electricity with 23.75% of emissions. The next largest contributor is commercial/industrial use of electricity with 23.38% of emissions. Actions to reduce emissions in both of these activities will be a key part of a carbon neutrality strategy. On road passenger vehicle travel, residential stationary combustion, commercial stationary combustion, on-road freight vehicle travel, use of energy in wastewater treatment, generation of solid waste, and use of electricity in potable water treatment and distribution were responsible for the remainder of significantly influenced emissions.

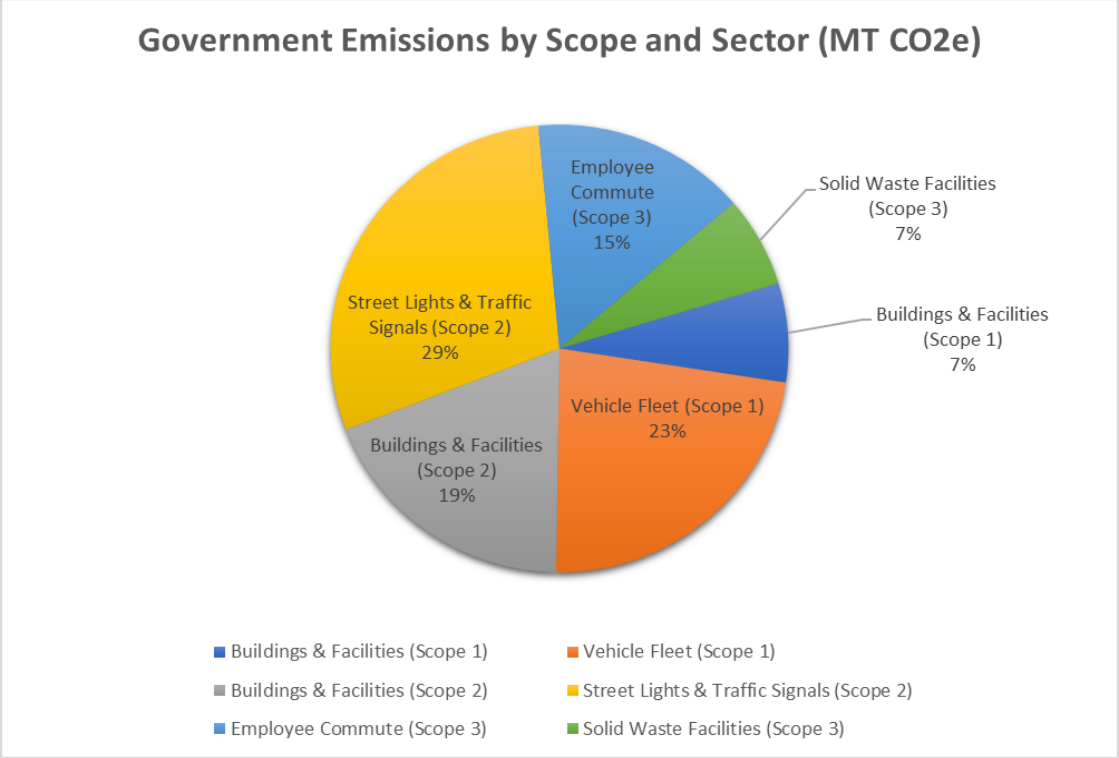
Figure 2 - Community-Wide Emissions Subject to Local Government Significant Influence



Government Operations Inventory

The government operations inventory is an altogether separate greenhouse gas emissions inventory from the community inventory. It takes a deeper dive into emissions deriving from municipal operations. Figure 3 shows a breakdown of the government operations inventory by scope and sector. The largest contributor in this set is street lights and traffic signals energy with 29% of emissions. The next largest contributor is vehicle fleet with 23% of emissions. Actions to reduce emissions in both of these sectors will be a key part of a carbon neutrality strategy. Buildings and facilities scope 1 and scope 2, employee commute, and solid waste are responsible for the remainder of government operations inventory emissions.

Figure 3 - Government Operations Inventory Emissions by Scope and Sector



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.

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 at local businesses and add 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

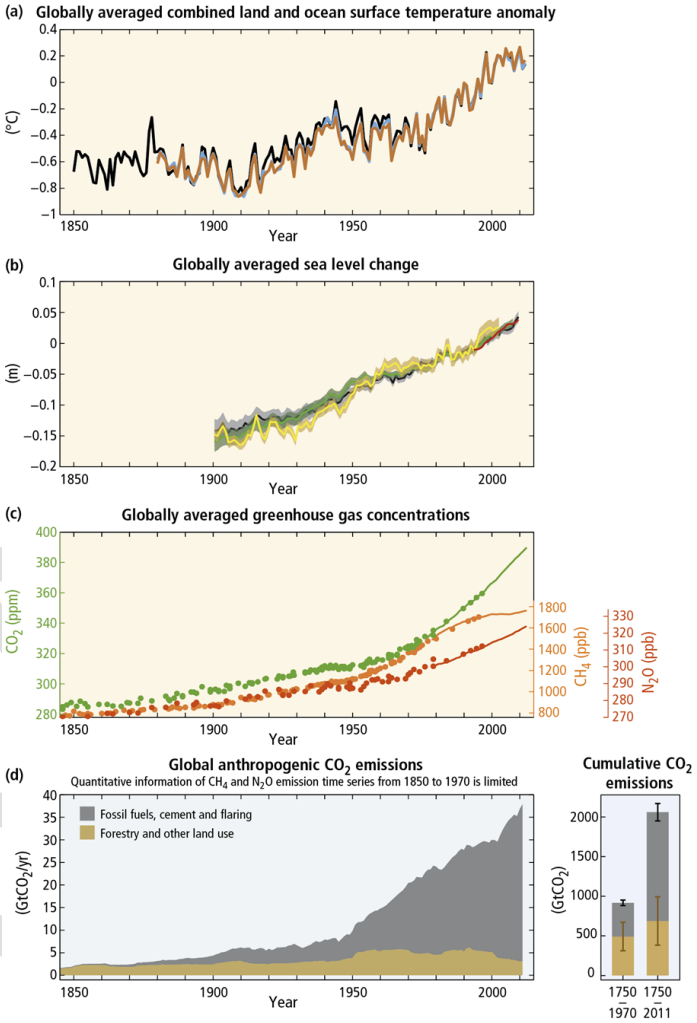
The Intergovernmental Panel on Climate Change (IPCC)'s Fifth Assessment Report affirms that "warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice and rising global average sea level."[2] 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.[3] These refinements expand upon the findings of previous IPCC Assessments – today, observational evidence from all continents and most oceans shows that "regional changes in temperature have had discernible impacts on physical and biological systems."

[2] 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

[3] 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.

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 4, 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 4 - Observations and Other Indicators of a changing Global Climate System



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

City of Ypsilanti Climate Policy Context

On November 19th the City of Ypsilanti City Council passed resolution No. 2019-260 declaring a "climate emergency" and a commitment to take action starting first with a public engagement process to helps outline how the entire Ypsilanti Community could achieve carbon neutrality by the year 2035, set a target date that is both ambitious and achievable; and develop a draft strategy for how the Ypsilanti community

could achieve carbon neutrality.[4] The initial draft is to be presented to City Council no later than March 31, 2020.

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.

Figure 5 - ICLEI Climate Mitigation Milestones

ICLEI provides a framework and methodology for local governments to identify and reduce greenhouse gas emissions, organized along Five Milestones, also shown in Figure 5:

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 City of Ypsilanti.

[4] City of Ypsilanti. Regular Council Meeting November 19, 2019. Resolution No. 2019-260. p.5-6. Retrieved from February 18, 2020 https://cityofypsilanti.com/AgendaCenter/ViewFile/Item/1987?fileID=3730

Sustainability & Climate Change Mitigation Activities in City of Ypsilanti

The City of Ypsilanti has already implemented programs that have or will lead to ancillary benefits in the form of energy conservation and greenhouse gas mitigation through:

- Ongoing collaborative effort with Solar Ypsi; the city has invested resources in installing solar PV arrays throughout the city.
- Commitment to establish a Sustainability Plan - anticipated to be released in 2020.
- Commitment to Carbon Neutrality by 2035 - Resolution No. 2019-260 passed November 19th, 2019.
- Adoption of the 2018 Energy Plan.
- Gold SolSmart designation - recognized in 2016; Various variables of the program included: Determining path to designation; reviewing the zoning code, developing a checklist to make the solar permitting process more transparent; and cross-training inspection and permitting staff on solar PV.
- Michigan Green Communities bronze certification, received in 2018.
- Sustainability Commission – establishment effective February 2017 under Ordinance No. 1280.
- According to the City of Ypsilanti Resolution #2013-175, on April 2nd, 2013, “the City of Ypsilanti officially set its own goal of the City of Ypsilanti and its residents generate 5 MW of electricity from distributed solar, to reach 1,000 solar roofs by 2020.”
- Adoption of Climate Action Plan 2012.
- Completion of 2012 Greenhouse Gas Inventory – includes both a Community and Government Operations inventory.

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 City of Ypsilanti community as a whole and emissions from the City of Ypsilanti government operations. Please do not sum total greenhouse gas emission results from the community and government inventories. 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, whereas the government operations inventory evaluates energy consumed by municipal buildings only in terms of all buildings and facilities operated by the City.

As local governments have continued to join the climate protection movement, the need for a standardized approach to quantify GHG emissions has proven essential. The City of Ypsilanti community inventory uses the approach and methods provided by the ICLEI U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions (Community Emissions Protocol)[5]. The City of Ypsilanti government operations inventory uses the approach and methods provided by the Local Government Operations Protocol version 1.1 (Government Emissions Protocol).[6]

2018 Base Year

The inventory process requires the selection of a base year with which to compare current emissions. The base year for the City of Ypsilanti community inventory and government operations inventory is 2018. The reason for selecting 2018 as the base year is that it is the most recent full calendar year of data available at the time of data collection beginning in 2019 and meets the required reporting standards of the Community Emissions Protocol.

2012 City of Ypsilanti Community and Government GHG Inventories

Please note that the City previously evaluated 2005/2008 community and government greenhouse gas emissions in coordination with the 2012 Climate Action Plan released in July of 2012. For consistency purposes, this report does not acknowledge the 2005/2008 emissions as an official base year for this inventory. The reason for not officially including the 2005/2008 emissions as a base year is that the report does not follow the Community Emissions Protocol because the Community Emissions Protocol did not exist during the 2012 inventory report process. Instead the 2012 community-wide inventory report followed methods outlined in the International Local Government Greenhouse Gas (GHG) Emissions Analysis. Both the 2012 and 2020 inventories for government emissions followed methods outlined in the Government Emissions Protocol. It is important to know that the 2012 and 2020 inventories are not easily

[5] ICLEI. (2013, July). U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions Version 1.1. Retrieved July 1, 2019, from https://icleiusa.org/publications/us-community-protocol/

[6] ICLEI. (2010, May) Local Government Operations Protocol For the quantification and reporting of greenhouse gas emissions inventories Version 1.1. Retrieved July 1, 2019 from https://icleiusa.org/ghg-protocols/.

comparable due to variations in the data collected and the sectors evaluated. A simple side by side review of these emissions by sector is provided under the inventory results section.

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.
- **Calculation-based methodologies** calculate emissions using activity data and emission factors.[7] To calculate emissions accordingly, the basic equation below is used: *Activity Data x Emission Factor = Emissions*

The majority of emissions sources in this inventory are quantified using calculation-based methodologies using the basic equation: *Activity Data x Emission Factor = Emissions*. Activity data refers 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. 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). Please see appendices for a detailed listing of the activity data and emissions factors used in composing these inventories.

Only one emission source in the community inventory is quantified using measurement-based methodology. That source is the Eastern Michigan University combined heat and power plant.

Factor Sets

The 2020 inventories use the waste, grid electricity and transportation factor sets to calculate greenhouse gas emissions in the ICLEI ClearPath software calculation tools. Factor set details are saved on the City of Ypsilanti profile on ClearPath.

Factor Set Category Type	Factor Set
Waste	2016 Michigan MSW Waste Characterization
Grid Electricity	2018 DTE Emissions
Transportation	2018 AATA
	2018 US National Defaults

In the absence of a City of Ypsilanti waste characterization, both inventories utilize the 2016 Michigan Municipal Solid Waste (MSW) Characterization report to define percentage of greenhouse gas generating waste types: Percentage Newspaper (1%), Percentage Office Paper (6%)[8], Percentage Corrugated Cardboard (8%), Percentage Magazines / Third Class Mail (6%), Percentage Food Scraps

[7] This inventory utilized calculators provided by the ICLEI USA ClearPath online software tool: https://icleiusa.org/clearpath/.

[8] Evenly divided the 12% Michigan MSW category of mixed paper across the two following categories: percentage office paper and percentage magazines/third class mail.

(13.6), Percentage Grass (1.6%)[9], Percentage Leaves (1.6%), Percentage Branches (1.6%), (Percentage Dimensional Lumber (5.2%).[10]

The emission factors for grid electricity include: 2150.5 lbs/MWh CO2 based on the DTE reported 2018 regional fuel mix emissions[11], 129 lbs/GWh CH4 and 18 lbs/GWh N2O based on U.S. EPA eGRID summary emissions.[12]

Transportation factor sets specify fuel economy and per-mile CH4 and N2O rates for a variety of vehicle classes and are utilized when vehicle miles travelled (VMT) is the input. In the absence of a known transportation factor set specific to the City of Ypsilanti, both inventories utilized the 2018 EIA National Vehicle Fuel Efficiency and Emission Factors (also referred as National US default values). Average MPG for diesel transit buses was determined using Ann Arbor Transit Authority (AATA) fleet mix of diesel and hybrid electric buses and fuel efficiency performance reported in budget documents.

DTE provided the average heat content of natural gas delivered to their consumers in 2018: 1063 Btu/cf.

Global Warming Potential

The global warming potential refers to multipliers applied to all non-CO2 greenhouse gases in order to present them in the common term of carbon dioxide (CO2) equivalent or CO2e. The IPCC 5th Assessment 100 Year Values for global warming potential were utilized for the community-wide emissions inventory.

The Community Emissions Protocol and Government Emissions Protocol addresses the six internationally recognized greenhouse gases regulated under the Kyoto Protocol:

1. Carbon dioxide (CO2);
2. Methane (CH4);
3. Nitrous oxide (N2O);
4. Hydrofluorocarbons (HFCs);
5. Perfluorocarbons (PFCs); and
6. Sulfur hexafluoride (SF6).

Community Emissions Protocol

The Community Emissions 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

---

[9] Evenly divided the 5% mean percentage by weight of Michigan MSW yard waste across the three following categories: percentage grass, percentage leaves, and percentage branches.

[10]West Michigan Sustainable Business Forum. Economic Impact Potential and Characterization of Municipal Solid Waste in Michigan. 2016. Retrieved July 1, 2019 from https://wmsbf.files.wordpress.com/2016/04/michigan-msw-characterization-and-valuation-20161.pdf

[11] DTE. Fuel Mix – Regional Emissions Comparison. Retrieved 2/20/2020 from https://newlook.dteenergy.com/wps/wcm/connect/dte-web/home/community-and-news/common/environment/fuel-mix

[12] U.S. EPA. eGRID Summary Tables. Retrieved 2/20/2020 from https://www.epa.gov/energy/egrid-summary-tables

range of emission sources and community activities, and provides a number of optional reporting frameworks to help local governments customize their community GHG emissions inventory reports based on their local goals and capacities.

Quantifying Greenhouse Gas Emissions - Community Emissions Protocol

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 jurisdictional 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 greenhouse gas (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 community's jurisdictional 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 jurisdictional boundary. However, often emissions can be categorized as both source and activity.

Figure 6 - Source and Activity Examples

The City of Ypsilanti community inventory is organized by the following categories[13]:

- activity and source,
- activity, and
- source emissions.

Community Inventory Methodology by Sectors

Considering that the framing of "sectors" is recommended by the Community Emissions Protocol and is generally a more commonly utilized framing by governments as compared to activities and sources, the 2020 community inventory includes the following sectors:

1. Transportation & Mobile Sources

[13] Find a summary of the emissions sources and activities that are included in the community inventory, as well as those potential sources that are excluded in Appendix A, Table A-1.

    a. (Highway)
    b. (Non-Highway)
2. Solid Waste
3. Water & Wastewater
4. Commercial Energy
5. Industrial Energy
6. Residential Energy

Below are summaries of the methodology used to gather data for the community inventory. Please refer to appendix A table A-2 for a more detailed list of calculation methods and data sources for the 2020 community inventory.

Transportation & Mobile Sources

(Highway)

(Non-Highway)

Solid Waste

Solid waste generation data was collected for both the community of Ypsilanti and Eastern Michigan University (EMU). The City waste service provider was changed since the 2012 Community Inventory; Woodland Meadows Recycling and Disposal Facility is no longer utilized. The 2018 waste disposal service provider is Republic and waste is disposed at Saulk Trail Hills landfill in Canton, MI. The Saulk Trail Hills landfill operates a landfill methane capture system.

EMU waste data was provided by the waste service provider Waste Management. Solid waste generation and annual composting data for the City of Ypsilanti community was provided by the City of Ypsilanti.

Emissions resulting from the collection and transportation of waste by contracted service providers within city boundaries are accounted for in the transportation sector.

Compost

Annual community composting data was provided by the City of Ypsilanti. Two compost facilities are utilized for the City of Ypsilanti including: 1. An in-boundary facility operated by the City, and 2. An outside of boundary facility operated by and located within Ypsilanti Township. The City owned facility only accepts green waste. Data on composting was provided from the City of Ypsilanti.

Water & Wastewater

The City of Ypsilanti wastewater and potable water are treated by the Ypsilanti Community Utility Authority (YCUA), quasigovernmental regional authority managed by a board with representatives from member communities including the City of Ypsilanti and Ypsilanti Township. Treatment of water and wastewater is performed outside the geographical boundaries of the City. According to YCUA, “On January 1, 2016, the State of Michigan, the City of Detroit, and Macomb, Oakland, and Wayne counties officially united to form the Great Lakes Water Authority (GLWA). YCUA is now one of the suburban

water customers of the GLWA.…Today, YCUA provides drinking water to approximately 110,000 people and wastewater services to approximately 250,000 people and the average daily flow of wastewater to the YCUA WWTP is approximately 22.3 MGD."[14] It is assumed that a population of 21,706 people in the City of Ypsilanti were served by YCUA in 2018.

YCUA wastewater treatment emissions data was provided by Sree Mullapudi, Director Wastewater Operations/Compliance, Ypsilanti Community Utilities Authority. It is noted that this provided utility data covers the fiscal years September 2018 - August 2019. YCUA fugitive emissions from the supply of potable water to the city for 2018 was provided by Michael Shaffer, Director of Service Operations. Nitrification/Denitrification emissions were provided by YCUA.

Energy use data and process specifications were provided by the Ypsilanti Community Utilities Authority (YCUA) and emissions were determined using the potable water and wastewater ClearPath calculators.

Energy

Residential, commercial, and industrial energy consumption data was provided by DTE for the 2020 community inventory. The energy data was determined based on DTE accounts located within the jurisdictional spatial boundary of the City of Ypsilanti. This spatial boundary approach more accurately accounts for electricity and gas energy consumption by the City as compared to the 2012 GHG inventory method where data was "pro-rated based on the Census number of occupied households in the City of Ypsilanti and divided by the total number of occupied households in the City and the two surrounding townships". Gregory L Ryan of DTE provided the 2018 commercial energy consumption data for: electricity consumption, natural gas usage, outdoor lighting, and electric streetlights and automatic traffic signals. Please refer to appendix B for a discussion on the differences between the 2012 and 2020 inventory methods.

Residential Energy

Commercial and Industrial Energy

Eastern Michigan University (EMU) provided detailed energy generation and consumption data regarding their combined heat and power plant (CHP). The 55-ton cogeneration system supplies, "approximately 98 percent of the heat and 93 percent of the electricity to EMU's 800-acre campus"[15]. "Cogeneration is a combined heat and power system that uses one fuel source, in this case natural gas, to simultaneously produce electricity and steam heat."[16] The remaining 2% of heat is generated from the stationary combustion of natural gas at EMU is supplied from the third-party supplier, Constellation; it is assumed to be a negligible amount thus is not included in this report. The remaining 7% of electricity is supplied from DTE. It is assumed that the commercial energy consumption data reported by DTE includes this small percentage of electricity consumption at EMU.

The Michigan Air Emissions Reporting System (MAERS) database, compiled by the Michigan Department of Environmental Quality, collects emissions estimates for commercial, industrial, and

[14] Ypsilanti Community Utilities Authority. Retrieved March 12, 2020 from http://www.ycua.org/history.htm.
[15] EMU Today. Eastern Michigan University, ENGIE Services U.S. launch new cogeneration system that will provide more than 90 percent of the University's electricity and heat. Source: https://today.emich.edu/story/news/10567
[16] Ibid.

governmental sources of air pollution in Michigan. EMU provided a copy of their 2018 MAERS emissions report. According to the 2012 community emissions inventory, Automotive Components Holdings (ACH) reported emissions in 2012 to the MAERS database. By 2018 the facility had drastically reduced operations. It is assumed that this facility makes up most of the industrial energy consumption data provided by DTE, however this was not confirmed by DTE The EMU provided emissions is considered commercial energy.

Local Governments Operation Protocol

The Local Governments Operations Protocol (Government Emissions Protocol) was released by ICLEI in May 2010, and "is designed to provide a standardized set of guidelines to assist local governments in quantifying and reporting GHG emissions associated with their government operations."[17] "Although elements of the ICLEI Reporting Standard are called "Required", there is currently no verification process for certifying that an inventory meets the standard."[18] It can be thought of as a drill-down from the community-wide inventory.

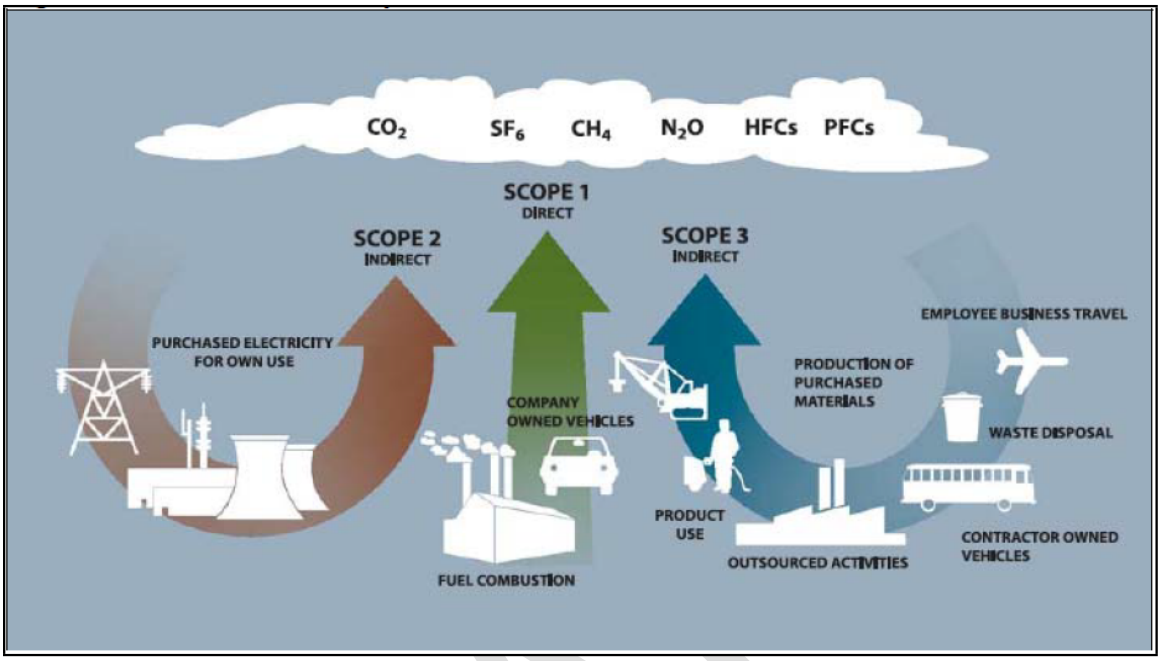
Quantifying Greenhouse Gas Emissions – Government Emissions Protocol

The government emissions protocol contributes to greenhouse gas emissions through the categorization of scope accounting terms including scope 1, scope 2, and scope 3 emissions as shown in figure 7. Together the three scopes provide a comprehensive accounting framework for managing and reducing direct and indirect emissions.

Scopes
Scope 1: All direct GHG emissions (with the exception of direct CO2 emissions from biogenic sources).
Scope 2: Indirect GHG emissions associated with the consumption of purchased or acquired electricity, steam, heating, or cooling.
Scope 3: All other indirect emissions not covered in Scope 2, such as emissions resulting from the extraction and production of purchased materials and fuels, transport-related activities in vehicles not owned or controlled by the reporting entity (e.g., employee commuting and business travel), outsourced activities, waste disposal, etc.

Figure 7 - Overview of Scopes and Emission Sources

[17] ICLEI. (2010, May) Local Government Operations Protocol For the quantification and reporting of greenhouse gas emissions inventories Version 1.1. Retrieved July 1, 2019 from https://icleiusa.org/ghg-protocols/.
[18] Ibid.



Source: WRI/WBCSD GHG Protocol Corporate Standard, Chapter 4 (2004).

"The local government sectors are meant to create a framework that is based on internationally recognized GHG accounting terms (i.e., Scope 1, Scope 2, stationary combustion, mobile combustion, etc.) but that is more policy relevant to local governments. By categorizing your GHG inventory according to these sectors, you may be able to more easily communicate your inventory results to the public and identify opportunities for reductions.[19] A scope-based emissions inventory could be summed to estimate total emissions released.

Government Operations Inventory Methodology by Sectors

Emissions sources for the government operations inventory was determined based on if the government had operational and/or financial control over the source. The Government Emission Protocol sectors included in this 2020 Government Operations Inventory are:

1. Buildings and other facilities
2. Streetlights and traffic signals
3. Vehicle fleet
4. Transit fleet
5. Solid waste facilities

Buildings and Other Facilities and Streetlights and Traffic Signals
2018 electricity and natural gas usage for buildings and facilities and streetlights and traffic signals were provided by account number from the local utility, DTE and coordinated by Gregory L Ryan of DTE.

[19] ICLEI. (2010, May) Local Government Operations Protocol For the quantification and reporting of greenhouse gas emissions inventories Version 1.1. p.23. Retrieved July 1, 2019 from https://icleiusa.org/ghg-protocols/.

Vehicle and Transit Fleet

Vehicles are defined as _____. Transit is defined as _____. Vehicle fleet and transit fleet emissions were calculated based on data provided by the City including: list of city-owned vehicles, estimated mileage, and fuel costs sourced from the city 2018 annual budget. Fuel efficiency was estimated based on vehicle make and model. As a result, the reported emissions are estimated and not based on actual vehicle miles traveled.

Solid Waste Facilities

Solid waste facility emissions for government operations were calculated based on three City owned dumpsters including two 3-yard dumpsters and one 6-yard dumpster collected on a weekly pick up schedule by the waste company Republic. As a result, the actual emissions may be less than what was estimated within this report.

Excluded Sectors

The City's government operations inventory does not include the following sectors because the sectors do not exist within the city boundaries and are not operated by the government: water delivery facilities, port facilities, airport facilities, power generation facilities, and wastewater facilities located within city boundaries. Industrial and other process and fugitive refrigerant emissions were excluded due to a lack of data.

Wastewater

Fugitive emissions from wastewater treatment by the Ypsilanti Community Utility Authority (YCUA) were not included in the government operations inventory because the facility is located outside of the City's jurisdictional boundary and the City of Ypsilanti does not have significant financial or operational control over the treatment center. According to the Government Emissions Protocol, "If you do not have financial or operational control over the treatment facility, you should not report the fugitive emissions from that facility as Scope 1 emissions. You are encouraged, however, to optionally report these emissions as Scope 3." (p. 105-106)

Community Inventory Results

Following the Community Emissions 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 greenhouse gas emissions (emissions). This report looks at the City of Ypsilanti community emissions through two frames:

- Community-Wide Activities
- Local Government Significant Influence

Community GHG Inventory Frame	Total CO2e MT
Community-Wide	269,177
Local Government Significant Influence	170,407.32

Community Profile

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

Table 1: City of Ypsilanti Community Indicators

2010 Population	19,435 people
2010 Households	7,865

Community-Wide Activities Frame

The City of Ypsilanti has chosen to look at emissions through multiple frames including 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 the City has significant influence over those emissions. These emissions may be occurring within or outside of the community boundary. This frame includes the Community Emissions Protocol required five Basic Emissions Generating Activities, and also includes upstream electricity transmission and distribution losses. When used for comparison across communities, this framework is helpful in illustrating relative urban efficiencies.

The City of Ypsilanti's total community-wide greenhouse gas emissions for the year of 2018 is 269,177 metric tons (MT) of carbon dioxide equivalents. (CO2e).

Results show that the largest contributor in community-wide frame is transportation with 39% of emissions. The next largest contributor is commercial energy with 30% of emissions; followed by residential energy with 25% of emissions, illustrated in figure 8 These sectors are important ways in which the City of Ypsilanti community as a whole contributes to emissions. Actions to reduce these

emissions are key to the development of a carbon neutrality strategy. Please refer to table 2 for a detailed breakdown of the community-wide and source CO2e emissions by sector including activity data quantity and unit, such as kWh of electricity or therms of natural gas, and emissions factor utilized to calculate the CO2e emissions.

A sub-total of community-wide emissions that excludes highway transportation is (209,980 MT of CO2e). This sub-total is provided to compare to the 2012 community inventory reported emissions of which does not include highway transportation.

Figure 8 – Community-Wide CO2e Emissions by Sector

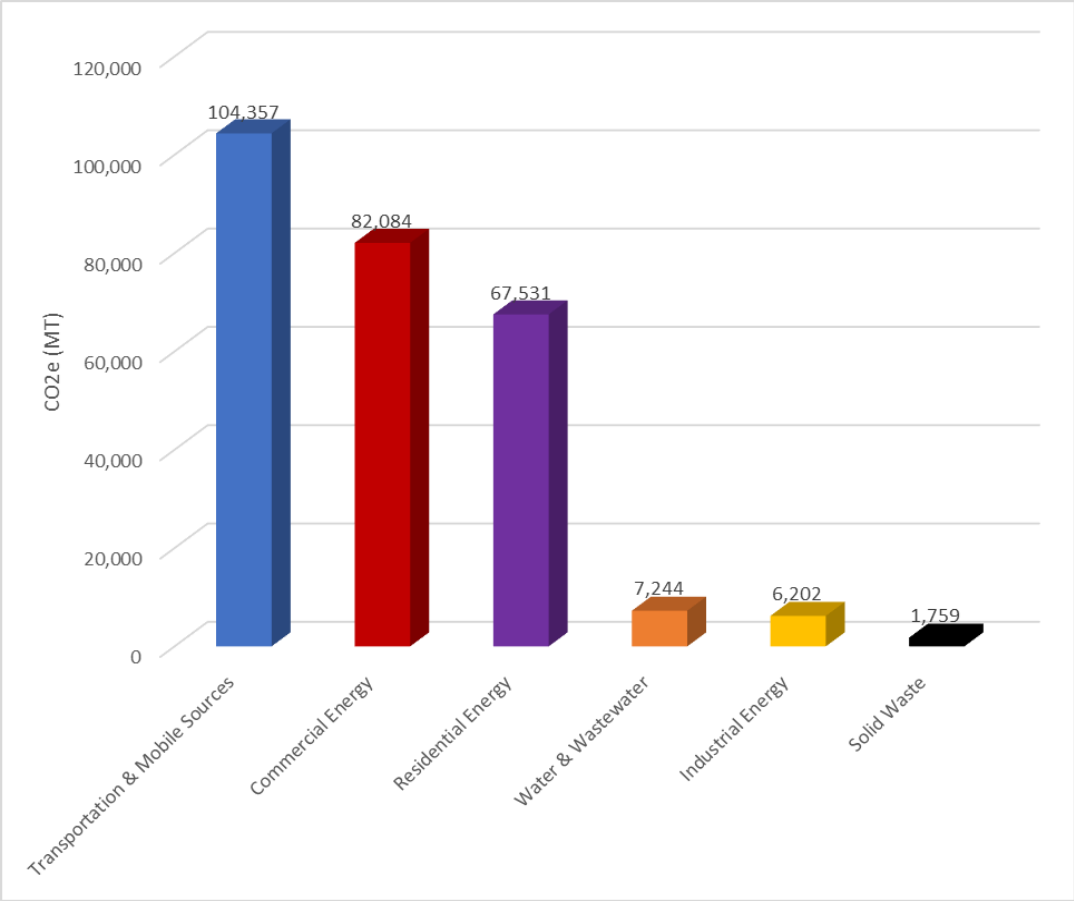


Table 2: Detailed Community-Wide Activity and Source GHG Emissions by Sector

Sector	Source or Activity	Activity Data Usage and Unit	Emissions Factor	Emissions (metric tons CO2e)
Commercial Energy Use				
Commercial Use of Electricity	Activity	34,361,158 kWh	ClearPath, 2018 DTE, and 2018 eGRID	33,648.3
Commercial Stationary Combustion	Source and Activity	1,962,209.7 therms	ClearPath, 2018 DTE, and 2018 eGRID	10,436.31
Commercial Stationary Combustion – EMU	Source and Activity	7,404,239.9 therms	Emissions reported by EMU	38,000.2
Commercial Energy Total				**82,084**
Residential Energy				
Residential Use of Electricity	Activity	41,328,187 kWh	ClearPath, 2018 DTE, and 2018 eGRID	40,470.77
Residential Stationary Combustion	Source and Activity	5,087,949.6 therms	ClearPath, 2018 DTE, and 2018 eGRID	27,061.02
Residential Energy Total				**67,531**
Transportation and Other Mobile Sources				
Highway				
On-road Passenger Vehicle Travel (Highway)	Source and Activity	94,877,242.7 vehicle miles	2018 US National Default	38,865.58
On-road Freight Vehicle Travel (Highway)	Source and Activity	12,002,607.13 vehicle miles	2018 US National Default	19,704.02
Highway Total				*59,197*
Non-Highway				
On-road Passenger Vehicle Travel (Non-Highway)	Source and Activity	89,611,810.17 vehicle miles	2018 US National Default	36,085.27
On-road Freight Vehicle Travel (Non-Highway)	Source and Activity	5,045,219.69 vehicle miles	2018 US National Default	8,282.46
Public Transit – AAATA Local Routes	Activity	411,870.4 vehicle miles	AAATA and 2018 US National Default	792.58
(Non-Highway) Total				*45,160*
Transportation and Other Mobile Sources Total				**104,357**
Water and Wastewater				
Use of Electricity in Potable Water Treatment and Distribution	Activity	25,545 kWh	ClearPath, 2018 DTE, and 2018 eGRID	25.02
Use of Energy in Wastewater Treatment	Activity	6,072,706.08 kWh and 233,819.5 therms	ClearPath, 2018 DTE, and 2018 eGRID	7,180.62
Wastewater Treatment Nitrification/Denitrification	Activity		Provided by YCUA	39.1
Water and Wastewater Total				**7,244**
Industrial Energy				

Industrial Use of Electricity	Activity	6,323,040 kWh	ClearPath, 2018 DTE, and 2018 eGRID	6,191.86
Industrial Stationary Combustion	Source	2,005.88 therms	ClearPath, 2018 DTE, and 2018 eGRID	10.65
Industrial Energy Total				**6,202**
Solid Waste				
Generation of Solid Waste (Ypsilanti)	Activity	3,475 Tons	2016 EPA Michigan Waste Characterization	1,026.46
Generation of Solid Waste (EMU)	Activity	2,396.3 Tons	2016 EPA Michigan Waste Characterization	672.85
Solid Waste Total				**1,759**
Total Community-Wide Emissions				**269,177**

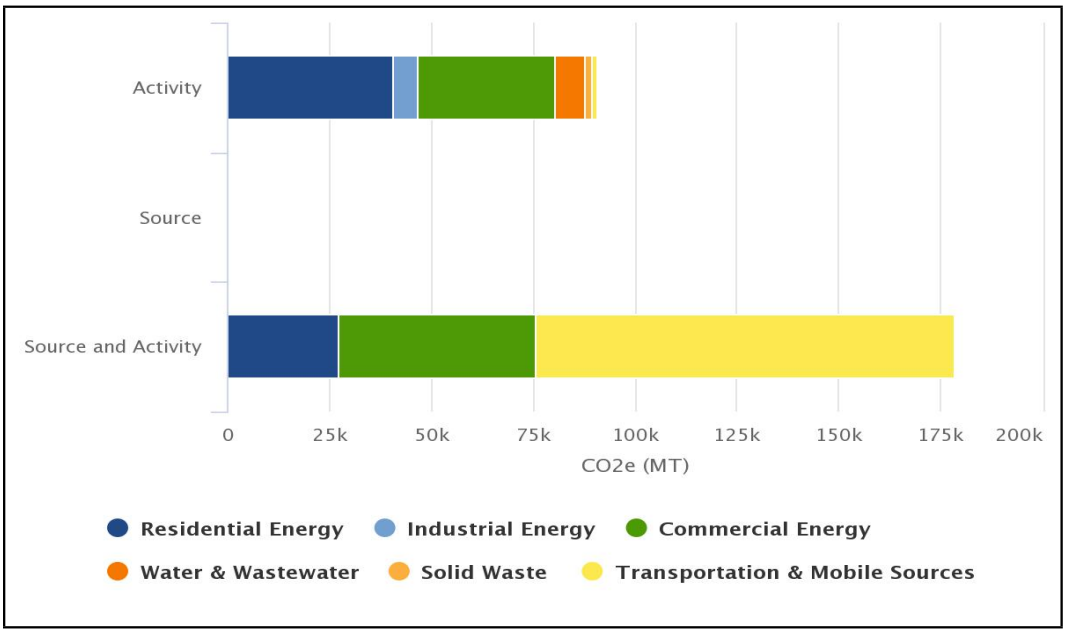
Results: Activity and Source Greenhouse Gas Emissions

Of the activity and source greenhouse gas emissions in the City of Ypsilanti, the categories that are identified as both an activity and a source make up the largest contribution of emissions with 178,434 MT CO2e, illustrated in figure 9. The next largest contributing scope is activity with 90,671 MT CO2e emissions (i.e. use of energy, materials, and/or services by members of the community that result in the creation of GHG emissions). Source is the lowest contributing scope with 70 MT CO2e of emissions. Source is any physical process inside the jurisdictional boundary that releases GHG emissions into the atmosphere). For more detail, please refer to the breakdown of scopes by sector in table 3.

Table 3: Community-Wide Scope Emissions by Sector

Scope	Sector	CO2e (MT)
Activity	Transportation & Mobile Sources	1,419
Activity	Solid Waste	1,699
Activity	Water & Wastewater	7,244
Activity	Commercial Energy	33,648
Activity	Industrial Energy	6,191
Activity	Residential Energy	40,470
Activity Total		*90,671*
Source	Solid Waste	59
Source	Industrial Energy	10
Source Total		*69*
Source and Activity	Transportation & Mobile Sources	102,937
Source and Activity	Commercial Energy	48,436
Source and Activity	Residential Energy	27,061
Source and Activity Total		*178,434*

Figure 9 - Community-Wide CO2e Metric Tons Emissions by Activity and Source

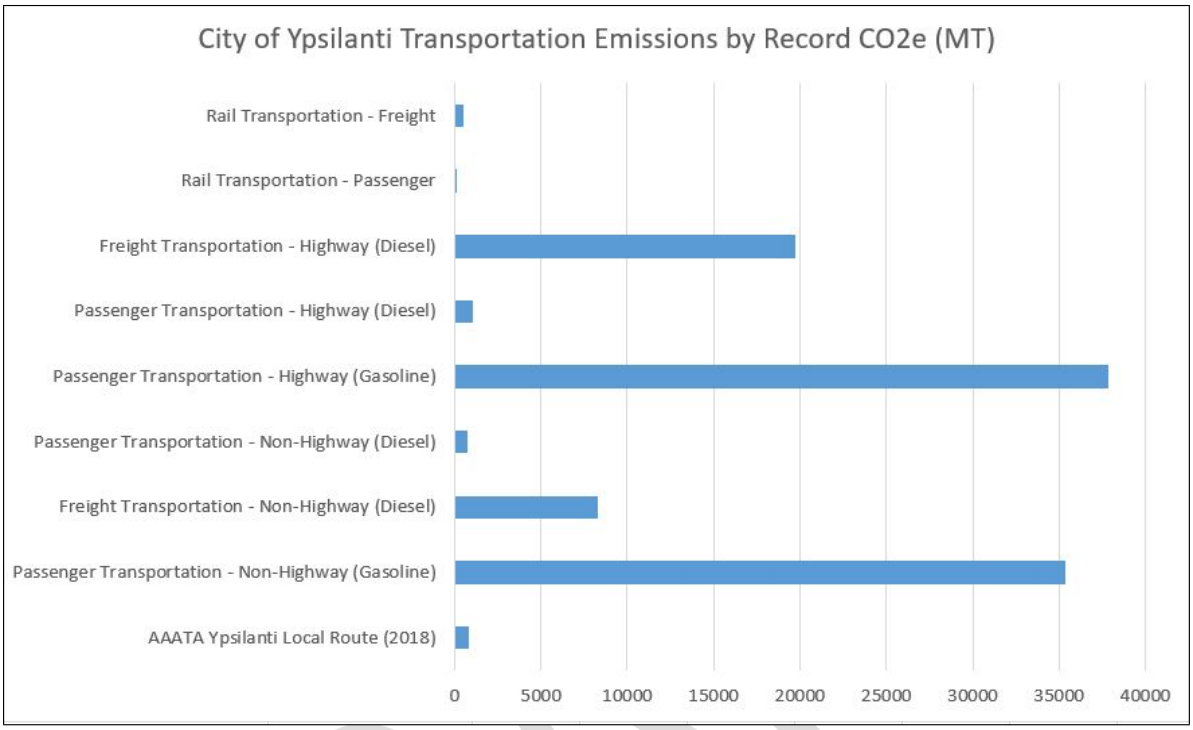


Note: Although emissions associated with source are not visible in figure 9, 69MT of CO2e source-only emissions occurred as a result of solid waste community composting and industrial energy natural gas consumption.

Transportation and Other Mobile Sources

Transportation within the geographical boundaries of the City of Ypsilanti resulted in a total of 104,357.1 MT CO2e representing 39% of total community emissions. A breakdown of transportation and mobile source sectors included in the community-wide inventory is provided below in figure 10. This section can be broken down between highway and non-highway emissions as illustrated in figure 11.

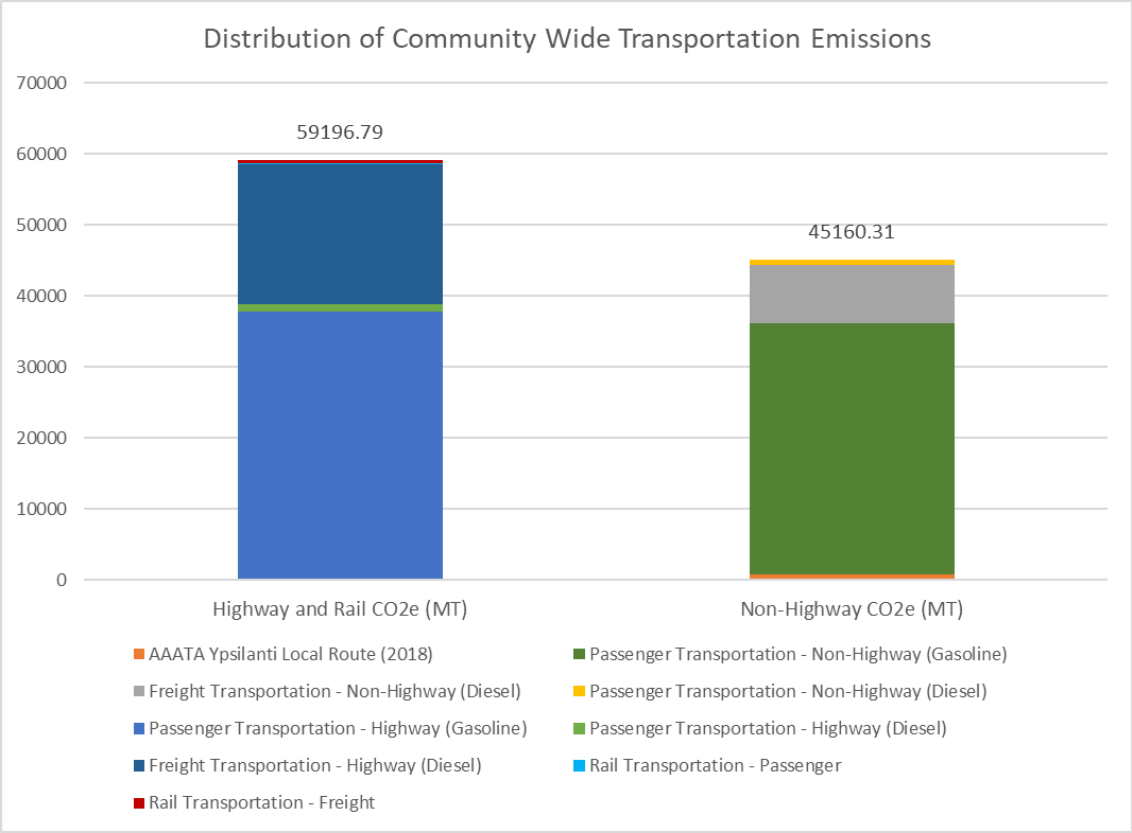
Figure 10 - Community-Wide Transportation and Other Mobile Sources by Record CO2e (MT)



I-94 passes through the southern boundary of the City of Ypsilanti and represents a significant source of transportation related emissions which are not directly attributable to the community. The Southeast Michigan Council of Governments (SEMCOG) estimates that highway travel on I-94 represents 53% of all total on-road vehicle miles traveled within the City annually while non-highway vehicle miles represent 47%. The City of Ypsilanti also contains approximately 2.15 miles of railway owned by MDOT. Norfolk Southern operates freight lines and Amtrak operates passenger rail lines that both utilize this railway. Emissions from highway transportation and railway transportation are considered outside the jurisdiction of local control but are included in total community emissions calculations due to emissions occurring within the boundaries of the city.

Figure 11 below shows the distribution of transportation emissions that can be considered influenced by the local community and government. Emissions grouped under 'Highway and Rail CO2e' are considered out of jurisdiction and include highway travel by passenger vehicles, freight vehicles, Amtrak passenger rail emissions and Norfolk Southern freight rail emissions. Emissions considered within jurisdiction are grouped under 'Non-Highway CO2e' and include on-road passenger and freight travel within the city boundaries as well as emissions associated with AAATA local bus routes.

Figure 11 - Distribution of Community-Wide Transportation Emissions



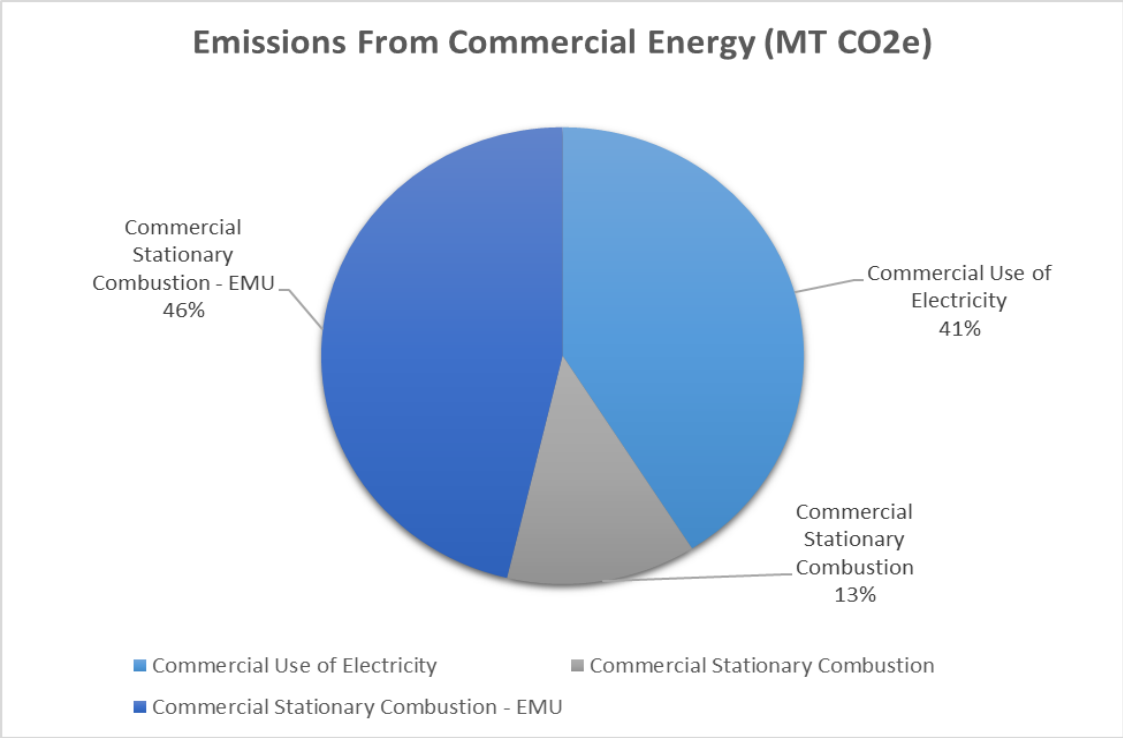
Commercial Energy

Commercial energy use within the City of Ypsilanti generated 82,084.81 MT CO2e representing 30% of total greenhouse gas emissions. Figure 1 below shows the distribution of emissions between commercial energy consumption.

The City of Ypsilanti is home to Eastern Michigan University (EMU) which operates a 7.8 MW cogeneration plant to generate 98% of the university's heat and 93% of the university's electricity needs. In 2017 EMU replaced an aging cogeneration unit with a new high efficiency unit projected to reduce annual emissions of CO2 by 21,305 tons/year and reduce NOx emissions by 112 tons annually. Emissions from Eastern Michigan University represent 46% of total commercial emissions in the City of Ypsilanti.[20]

Figure 12 - Commercial Energy CO2e Emissions

[20] Project summary provided by Eastern Michigan University.



Residential Energy

Residential consumption of electricity and natural gas generated 67,531 MT CO2e representing 25% of total community emissions. The table below shows the breakdown of emissions by energy usage for the residential sector.

Emissions from Residential Energy Use		
Residential electricity use	40,470.77 MT CO2e	60%
Residential natural gas use	27,061.02 MT CO2e	40%
Total	67,531.79 MT CO2e	100%

Note: Comparative residential emissions by energy type.

Within the residential sector electricity use accounted for 60% of emissions while natural gas use in stationary combustion accounted for 40%. As a significant source of community emissions this suggests that targeting reductions in residential electricity use is a priority for emissions reductions planning. Residential natural gas consumption for space conditioning or water heating is considered a source while residential electricity usage is considered an activity under the community emissions protocol.

Water & Wastewater

Wastewater treatment and the supply of potable water resulted in 7,244 MT CO2e and account for 3% of total community emissions. Within this sector the supply of potable water generated 25.02 MT CO2e, wastewater treatment generated 7,180.62 MT CO2e, and emissions from wastewater treatment nitrification and denitrification generated 39.1 MT CO2e.

Industrial Energy

Consumption of electricity and natural gas by industry generated 6,202.51 MT CO2e in 2018. This represents 2% of total community emissions and the second lowest emitting sector in the City of Ypsilanti. Industrial energy usage data was provided by DTE and emissions were determined using 2018 grid emissions data and the industrial energy ClearPath calculators.

Solid Waste

Total community solid waste generation resulted in 1,759 MT CO2e emissions for 2018 and represented 1% of total community emissions. Solid waste generation data was collected for both the community of Ypsilanti and Eastern Michigan University. Solid waste generated by the City of Ypsilanti community resulted in 1,026.46 MT CO2e emissions. City of Ypsilanti community composting resulted in 59.7 MT CO2e emissions. Solid waste generated by EMU resulted in 672.85 MT CO2e emissions. Emissions resulting from the collection and transportation of waste by contracted service providers within city boundaries are accounted for in the transportation sector.

Local Government Significantly Influenced Emissions Frame

The City of Ypsilanti chose to also 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 the City of Ypsilanti has the greatest opportunity to address. This frame includes all of the five Basic Emissions Generating Activities required by the community emissions protocol. Figure 13 summarize significantly influenced emissions by source and activity.

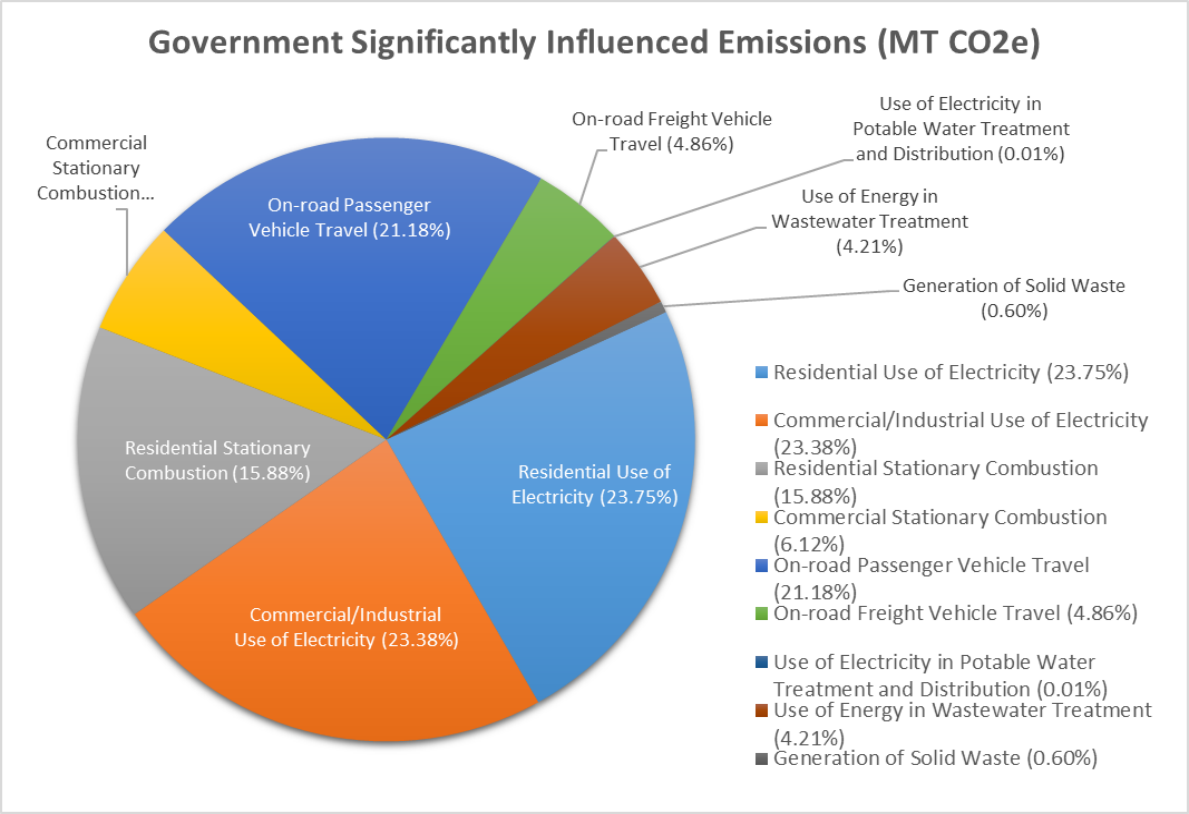
The most signficant differnce between this frame and the community-wide frame is the exclusion of _____ from the local government sigifncantly influenced frame.

City of Ypsilanti will focus on these emissions sources and activities in developing a climate action plan. The total significantly influenced emissions of 170,407.32 metric tons CO2e will be the baseline for setting an emissions reduction target and measuring future emissions reductions against.

Residential use of electricity is the largest contributor to emissions over which City of Ypsilanti has significant influence. This will be an important activity to focus efforts on in developing a climate action plan. Commercial and industrial electricity use as well as on-road passenger vehicle travel also account for a large part of significantly influence emissions, and will also be important to address.

INSERT

Figure 13: Community-Wide Emissions Subject to Local Government Significant Influence, Identical to Figure 2


Government Significantly Influenced Emissions (MT CO2e)
Commercial Stationary Combustion...
On-road Passenger Vehicle Travel (21.18%)
On-road Freight Vehicle Travel (4.86%)
Use of Electricity in Potable Water Treatment and Distribution (0.01%)
Use of Energy in Wastewater Treatment (4.21%)
Generation of Solid Waste (0.60%)
Residential Stationary Combustion (15.88%)
Residential Use of Electricity (23.75%)
Commercial/Industrial Use of Electricity (23.38%)
Residential Use of Electricity (23.75%)
Commercial/Industrial Use of Electricity (23.38%)
Residential Stationary Combustion (15.88%)
Commercial Stationary Combustion (6.12%)
On-road Passenger Vehicle Travel (21.18%)
On-road Freight Vehicle Travel (4.86%)
Use of Electricity in Potable Water Treatment and Distribution (0.01%)
Use of Energy in Wastewater Treatment (4.21%)
Generation of Solid Waste (0.60%)

Government Operations Inventory Results

City of Ypsilanti Government Operations Profile

To put emissions inventory data in context, it is helpful to have some basic information about the government. This information is provided in Table 6.

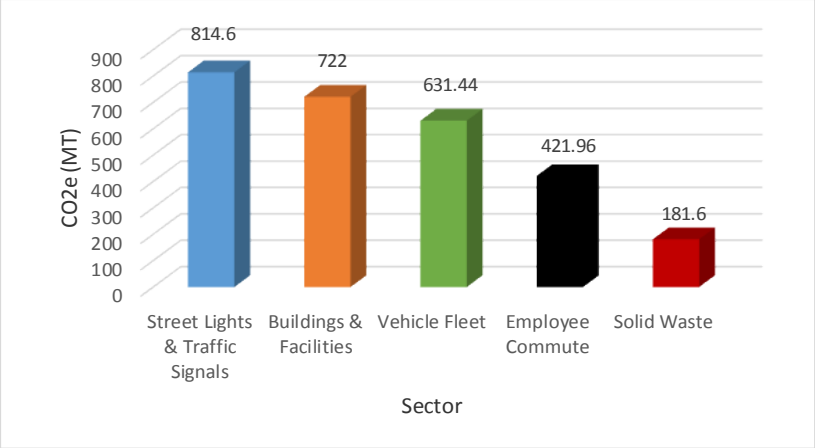
Table 4: City of Ypsilanti Government Indicators

2018 Size	4.51 square miles
2010 Population	19,435 people
Annual Budget	
Employees (FTE staff)[21]	136
Climate Zone	
Heating Degree Days	6615
Cooling Degree Days	853

Government Operation Emissions by Sectors

The City of Ypsilanti generated 2,771.6 MT CO2e through municipal operations in 2018. Following the Government Emissions Protocol, this inventory report organizes emissions by sectors as shown in figure 14. Details about each sector are provided in table 7.

Figure 14: Government Operations GHG Emissions by Sector



[21] Full time equivalent (FTE) staff employed by the City of Ypsilanti.

Table 5: Government Operations GHG Emissions Scopes by Sector

Sector	Scope	Data Quantity and Unit	Emissions Factor	Emissions (metric tons CO2e)
Buildings & Facilities				
Building Electricity Use	Scope 2	494722 kWh	DTE and eGRID emissions data	523
Building Stationary Combustion	Scope 1	37415.47 therms	DTE emissions and ClearPath calculator	199
Buildings & Facilities Total				**722**
Street Lights & Traffic Signals				
Street Lights & Traffic Signal Electricity Use	Scope 2	772880.44 kWh	DTE and eGRID emissions data	814.6
Street Lights & Traffic Signals Total				**814.6**
Vehicle Fleet				
Vehicle Fleet Emissions	Scope 1	555,353.1 vehicle miles	City fleet data, ClearPath calculator	631.44
Vehicle Fleet Total				**631.44**
Solid Waste				
Generation of Solid Waste	Scope 3	702 tons	Waste generation metrics and ClearPath calculator	181.6
Solid Waste Total				**181.6**
Employee Commute				
Employee Commute Emissions	Scope 3	1,129,427 vehicle miles	Employee commute survey and ClearPath calculator	421.96
Employee Commute Total				**421.96**
Total Government Emissions				**2,771.6**

Results: Scope Greenhouse Gas Emissions

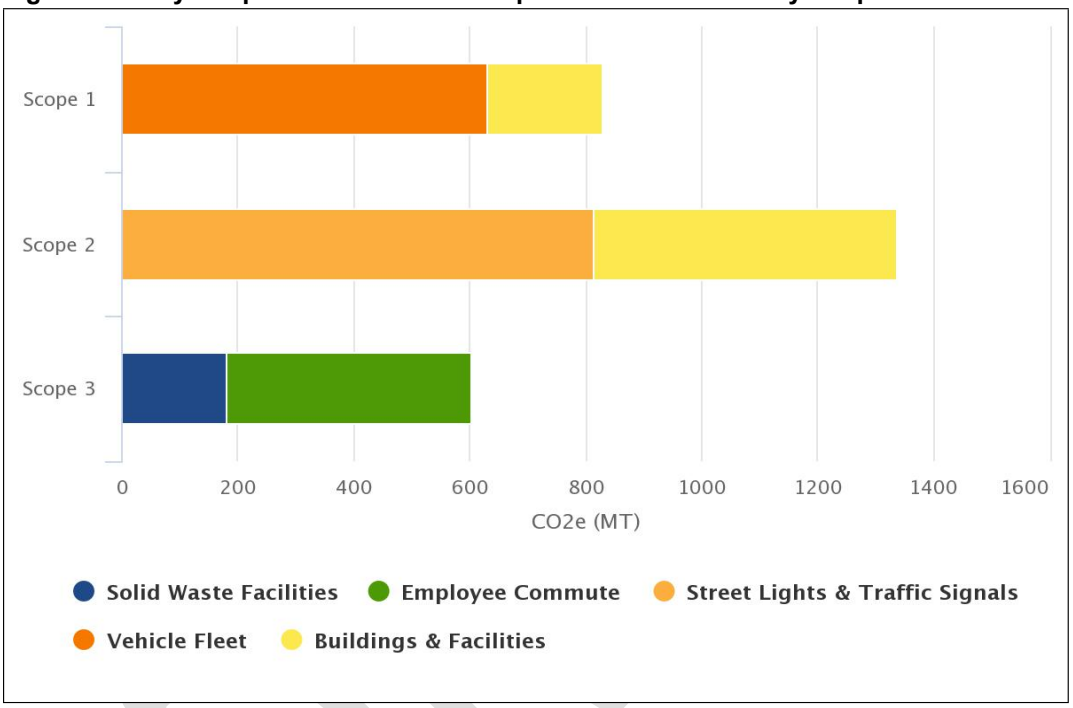
Emissions from government operations are classified as Scope 1, Scope 2, or Scope 3. More information on emissions scopes is available in the methodology section of this report. Table 6 and figure 15 below shows municipal emissions by scope and sector.

Table 6: Government Operations CO2e Emissions by Scope and Sector

Scope	Sector	CO2e (MT)
Scope 1	Buildings & Facilities	198

Scope 1	Vehicle Fleet	631
Scope 2	Buildings & Facilities	522
Scope 2	Street Lights & Traffic Signals	814
Scope 3	Employee Commute	421
Scope 3	Solid Waste Facilities	181

Figure 15 - City of Ypsilanti Government Operations Emissions by Scope and Sector



Buildings and Facilities

Energy consumption by municipally owned buildings and facilities resulted in 722 MT CO2e emissions in 2018 representing 26% of total municipal emissions. Table 7 below shows emissions associated with this sector by building and fuel use. Emissions resulting from natural gas combustion for space conditioning and water heating are classified as Scope 1 emissions while emissions resulting from electricity consumption are classified as Scope 2 as emissions occur outside city boundaries.

Table 7: Government Operations Buildings and Facilities CO2e Emissions

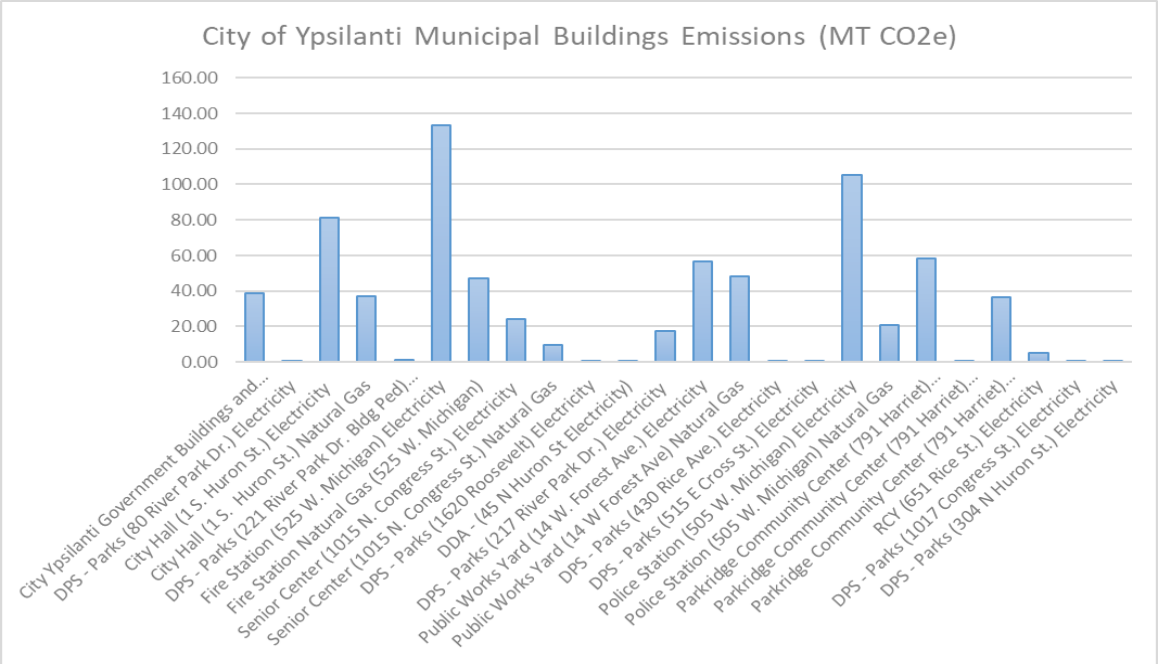
Category	Building	MT CO2e
DDA	DDA - (45 N Huron St Electricity)	0.02
DDA total		**0.02**
Facilities – City Hall	City Hall (1 S. Huron St.) Electricity *	81.24
Facilities – City Hall	City Hall (1 S. Huron St.) Natural Gas	36.9

Facilities – DPS	Public Works Yard (14 W. Forest Ave.) Electricity*	56.54
Facilities – DPS	Public Works Yard (14 W Forest Ave) Natural Gas	47.99
Facilities – Fire Station	Fire Station (525 W. Michigan) Electricity*	133.39
Facilities – Fire Station	Fire Station Natural Gas (525 W. Michigan)	47
Facilities – Police Station	Police Station (505 W. Michigan) Electricity	105.05
Facilities – Police Station	Police Station (505 W. Michigan) Natural Gas	20.87
Core facilities total		**528.98**
Facilities – Senior Center	Senior Center (1015 N. Congress St.) Electricity *	24.45
Facilities – Senior Center	Senior Center (1015 N. Congress St.) Natural Gas	9.72
Facilities – Parkridge Community Center	Parkridge Community Center (791 Harriet) Electricity *	58.06
Facilities – Parkridge Community Center	Parkridge Community Center (791 Harriet) Natural Gas	36.52
Community facilities total		**128.75**
Parks – Candy Cane	DPS - Parks (1620 Roosevelt) Electricity	0.11
Parks – Frog Island	DPS - Parks (430 Rice Ave.) Electricity	0.02
Parks – Frog Island	RCY (651 Rice St.) Electricity	4.91
Parks – Prospect	DPS - Parks (515 E Cross St.) Electricity	0.47
Parks – Recreation Park	DPS – Parks (1017 Congress St.) Electricity	0.49
Parks – Riverside	DPS – Parks (304 N Huron St.) Electricity	0.2
Parks – Riverside	DPS - Parks (80 River Park Dr.) Electricity	0.5
Parks – Riverside	DPS - Parks (221 River Park Dr. Bldg. Ped) Electricity	1.29
Parks – Riverside	DPS - Parks (217 River Park Dr.) Electricity	17.7
Parks total		**25.69**
City Ypsilanti Government Buildings and Facilities Electric Power Transmission and Distribution Losses		38.54
	TOTAL	**721.98**

Building	MT CO2e
DPS - Parks (80 River Park Dr.) Electricity	0.50
City Hall (1 S. Huron St.) Electricity	81.24
City Hall (1 S. Huron St.) Natural Gas	36.9
DPS - Parks (221 River Park Dr. Bldg. Ped) Electricity	1.29
Fire Station (525 W. Michigan) Electricity	133.39
Fire Station Natural Gas (525 W. Michigan)	47
Senior Center (1015 N. Congress St.) Electricity	24.45
Senior Center (1015 N. Congress St.) Natural Gas	9.72
DPS - Parks (1620 Roosevelt) Electricity	0.11
DDA - (45 N Huron St Electricity)	0.02
DPS - Parks (217 River Park Dr.) Electricity	17.7
Public Works Yard (14 W. Forest Ave.) Electricity	56.54
Public Works Yard (14 W Forest Ave) Natural Gas	47.99
DPS - Parks (430 Rice Ave.) Electricity	0.02
DPS - Parks (515 E Cross St.) Electricity	0.47
Police Station (505 W. Michigan) Electricity	105.05
Police Station (505 W. Michigan) Natural Gas	20.87
Parkridge Community Center (791 Harriet) Electricity	58.05
Parkridge Community Center (791 Harriet) Electricity	0.01
Parkridge Community Center (791 Harriet) Natural Gas	36.52
RCY (651 Rice St.) Electricity	4.91
DPS – Parks (1017 Congress St.) Electricity	0.49
DPS – Parks (304 N Huron St.) Electricity	0.20
City Ypsilanti Government Buildings and Facilities Electric Power Transmission and Distribution Losses	38.54
Total	722

The Fire Department represents the largest emitter in this sector at 25% of total building emissions. The second largest emission source is the Police Department (17.4%) followed by City Hall (16.4%). This can be expected of these facilities that operate 24 hours/day. Notably, Scope 2 emissions resulting solely from electric power transmission and distribution losses represent 5.34% of total building emissions. In future emissions reduction planning it is recommended that energy efficiency and renewable energy projects account for the benefits associated with reducing transmission losses in addition to reducing on-site energy consumption. Figure 16 below illustrates the proportional contribution to total building sector emissions by facility.

Figure 16 - Comparative Emissions from Municipal Buildings and Facilities



Streetlights and Traffic Signals

Electricity consumption by electric streetlights and traffic signals resulted in 814.59 MT CO2e representing 29.39% of total government emissions. Emissions resulting from electricity consumption are classified as Scope 2 and utility data was provided by DTE. The City of Ypsilanti has completed an LED retrofit of the municipal street lighting portfolio and an overview of emissions reductions in the lighting sector is available in the comparison section of this report. Table 8 below provides detail on streetlight sector emissions and emissions resulting from transmission and distribution losses.

Table 8: Government Operations Streetlights and Traffic Signals CO2e Emissions

Streetlights and Traffic Signals	MT CO2e
Electric Streetlights and Traffic Signals	736.23 MT
DPS – Streetlights (9 Washington)	8.22 MT
DPS – Streetlights (12 N Adams St.)	1.23 MT
DPS – Streetlights (30 S Huron)	9.75 MT
DPS – Streetlights (31 E Cross St.)	1.42 MT
Streetlight and Traffic Signal Electric Power Transmission and Distribution Losses	57.75 MT
Total Streetlight and Traffic Signal	814.59 MT

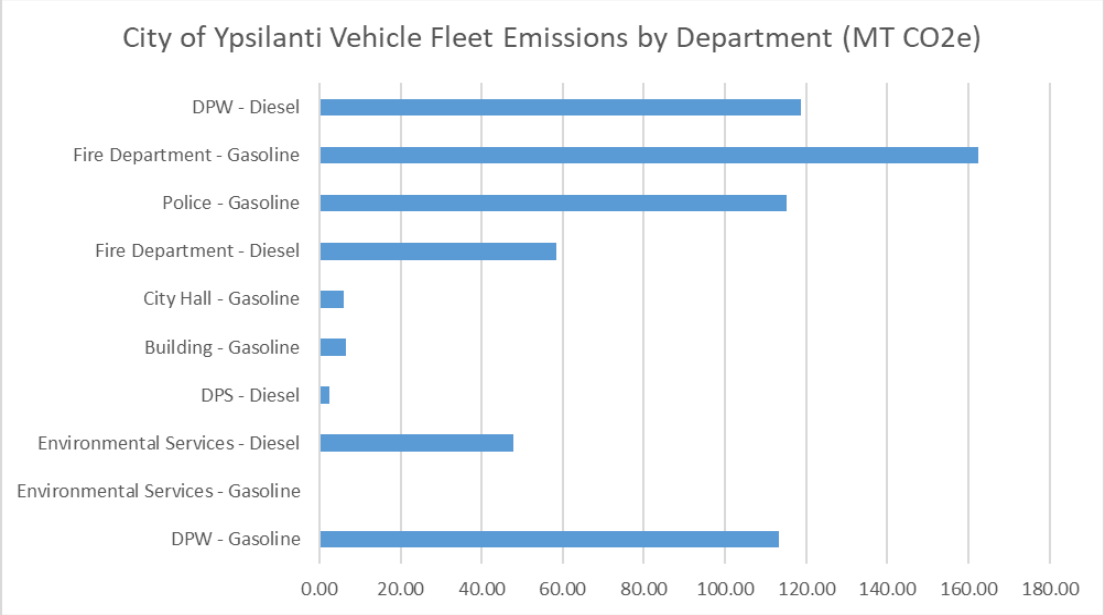
Vehicle Fleet

The City of Ypsilanti municipal vehicle fleet generated 631.44 MT CO2e representing 22.78% of total government emissions. Table 9 and Figure 16 below provide vehicle fleet emissions by department and fuel type.

Table 9: Government Operations Municipal Vehicle Fleet Emissions

Department and Fuel Type	MT CO2e
DPW – Gasoline	113.31 MT
DPW – Diesel	118.74 MT
Environmental Services – Gasoline	0.44 MT
Environmental Services – Diesel	47.83 MT
DPS – Diesel	2.37 MT
Building – Gasoline	6.5 MT
City Hall – Gasoline	6.14 MT
Fire Department – Diesel	58.37 MT
Fire Department – Gasoline	162.56 MT
Police – Gasoline	115.16 MT
Total Vehicle Fleet Emissions	631.44 MT

Figure 17 - Comparative Emissions from municipal Vehicle Fleet by Department



The DPW, Fire Department, and Police fleets represent the highest contribution to total emissions. Vehicle fleet emissions data is categorized as Scope 1 and emissions were calculated using data from the city budgeting process, fuel purchase records, and vehicle reports.

Solid Waste Facilities

The City of Ypsilanti does not have solid waste facilities within the City and contracts waste collection and disposal to a third-party provider. In 2018 solid waste generation from municipal activities generated 181.6 MT CO2e. Emissions resulting from solid waste generation by municipal operations is classified as scope 3 and represents 6.55% of total 2018 government CO2e emissions. Emissions resulting from the collection and transportation of waste by contracted service providers within city boundaries are accounted for in the transportation sector.

Employee Commute

Government employee commutes generated 421.96 MT CO2e in 2018 representing 15.22% of total government emissions. Commuting data was gathered through a survey of City of Ypsilanti employees and emissions calculated based on vehicle data and mileage provided through the survey. Table 10 below illustrates annual commuting emissions by travel method.

Table 10: Government Operations Employee Commute Emissions by Method

Commute Method	CO2e (MT)
Employee Commute – Air Travel	1.02 MT
Employee Commute – Gasoline	420.63 MT

Employee Commute – Bus	0.32 MT
Total Commute Emissions	421.96 MT

Commuting by gasoline fueled vehicle was the most prevalent commuting type among survey respondents. Among employees commuting by personal vehicle passenger vehicles represent 38% of vehicles and light trucks make up 62%. The employee commute survey indicated that 4.17% of city employees bike to work, 8.3% of city employees walk to work, and 6.25% of city employees commute by public transit sometimes or always. Survey results also indicate that the average roundtrip commute to work for city employees is 32.43 miles/day.

Appendix A: Community Inventory Details

Table A-1 provides a summary of the emissions sources and activities that are included in the community inventory, as well as those potential sources that are excluded.

Legend for Reporting Frameworks in Which Emissions Sources and Activities are Included

Required Activities:

- Five Basic Emissions Generating Activities

Strongly Encouraged:

- SI – Local Government Significant Influence
- CA – Community-Wide Activities

Notation Keys for Excluded Emission Sources and Activities

- IE – Included Elsewhere: Emissions for this activity are estimated and presented in another category of the inventory. The category where these emissions are included should be noted in explanation.
- NE – Not Estimated: Emissions occur but have not been estimated or reported (e.g., data unavailable, effort required not justifiable).
- NA – Not Applicable: The activity occurs but does not cause emissions; explanation should be provided.
- NO – Not Occurring: The source or activity does not occur or exist within the community.

Table A-1: Summary of Included and Excluded Community Emissions

Emissions Type	Source or Activity?	Required Activities	Included under reporting frameworks: SI	CA	IS (EMU)	Excluded (IE, NA, NO, or NE)	Explanatory Notes	Emission ($MTCO_2e$)
Built Environment								

Use of fuel in residential and commercial stationary combustion equipment		Source AND Activity	•	•	•	•			75497.53
Industrial stationary combustion sources		Source	•						10.56
Electricity	Power generation in the community	Source	•		•	•		EMU Combined Heat and Power, in commercial SFC	
	Use of electricity by the community	Activity	•	•					80,310.93
District Heating/ Cooling	District heating/cooling facilities in the community	Source					NO		
	Use of district heating/cooling by the community	Activity					NO		
Industrial process emissions in the community		Source					NO		
Refrigerant leakage in the community		Source					NE	Data unavailable	
Transportation and Other Mobile Sources									
On-road Passenger Vehicles	On-road passenger vehicles operating within the community boundary	Source	•	•				Includes highway and non-highway	74950.85
	On-road passenger vehicle travel associated with community land uses	Activity					IE	Included in community boundary VMT	
On-road Freight Vehicles	On-road freight and service vehicles operating within the community boundary	Source	•	•				Includes highway and non-highway	27986.48
	On-road freight and service vehicle travel associated with community land uses	Activity					IE	Included in community boundary VMT	
On-road transit vehicles operating within the community boundary		Source	•						792.58
Transit Rail	Transit rail vehicles operating within the community boundary	Source					NO		
	Use of transit rail travel by the community	Activity					NO		
Inter-city passenger rail vehicles operating within the community boundary		Source	•						106.12

Emissions Type		Source or Activity?	Required Activities	Included under reporting frameworks: SI	CA	IS (EMU)	Excluded	Notes	Emissions (MTCO2e)
Freight rail vehicles operating within the community boundary		Source	•						521.07
Marine	Marine vessels operating within the community boundary	Source					NO		
	Use of ferries by the community	Activity					NO		
Off-road surface vehicles and other mobile equipment operating within the community boundary		Source					NO		
Use of air travel by the community		Activity					NO		
Solid Waste									
Solid Waste	Operation of solid waste disposal facilities in the community	Source					NO		
	Generation and disposal of solid waste by the community	Activity	•	•	•	•			1699.31
Water and Wastewater									
Potable Water - Energy Use	Operation of water delivery facilities in the community	Source					NO		
	Use of energy associated with use of potable water by the community	Activity	•	•	•				25.02
Use of energy associated with generation of wastewater by the community		Activity	•	•	•				7180.62
Centralized Wastewater Systems - Process Emissions	Process emissions from operation of wastewater treatment facilities located in the community	Source					NO		
	Process emissions associated with generation of wastewater by the community	Activity	•	•	•				39.1
Use of septic systems in the community		Source AND activity					NO		
Agriculture									
Domesticated animal production		Source					NO		
Manure decomposition and treatment		Source					NO		
Upstream Impacts of Community-Wide Activities									
Upstream impacts of fuels used in stationary applications by the community		Activity					NE		
Upstream and transmission and distribution (T&D) impacts of purchased electricity used by the		Activity		•	•		IE	T&D losses included in	

community							electricity use emissions	
Upstream impacts of fuels used for transportation in trips associated with the community	Activity					NE		
Upstream impacts of fuels used by water and wastewater facilities for water used and wastewater generated within the community boundary	Activity					NE		
Upstream impacts of select materials (concrete, food, paper, carpets, etc.) used by the whole community	Activity					NE		

Table A-2 provides details on calculation methods and data sources for each included activity and source.

Table A-2: Community Inventory Calculation Method and Data Source Details

Commercial Energy

Inventory Record	Notes	CO2 (MT)	CH4 (MT)	N2O (MT)	CO2e (MT)
City of Ypsilanti Commercial Electricity Consumption 2018 (Commercial)	Commercial electricity consumption data provided by DTE Energy.	33374.46	2.0020019	0.27934911	33504.5419
City of Ypsilanti Commercial Electricity Consumption 2018 (Commercial Outdoor Lighting)	2018 Commercial Outdoor Lighting electricity consumption data provided by DTE.	139.4057	0.0083624	0.00116685	139.949044
City of Ypsilanti Commercial Electric Consumption 2018 (Electric Streetlight and Automatic Traffic Signals)	Electric Streetlight and Automatic Traffic Signal commercial electricity consumption data for 2018 provided by DTE.	3.78085	0.0002268	3.1646E-05	3.79558683
City of Ypsilanti Commercial Natural Gas Consumption (Commercial)	Commercial natural gas consumption data provided by DTE. Average heat content of natural gas delivered to customers in 2018 provided by DTE.	10403.64	0.9811049	0.0196221	10436.307
Eastern Michigan University - CHP & Campus SFC	Emissions and energy usage provided by EMU. Direct entry emissions record.	37961.5	0.71	0.071	38000.195

Inventory Record	GPC Scope	GPC Ref Number	Factor Profiles	Global Warming Potential	Activity Source
City of Ypsilanti Commercial Electricity Consumption 2018 (Commercial)	Scope 2	I.2.2	DTE Energy 2018 Emissions Factor	IPCC 5th Assessment 100 Year Values	Activity
City of Ypsilanti Commercial Electricity Consumption 2018	Scope 2	I.2.2	DTE Energy 2018 Emissions Factor	IPCC 5th Assessment 100 Year	Activity

(Commercial Outdoor Lighting)				Values	
City of Ypsilanti Commercial Electric Consumption 2018 (Electric Streetlight and Automatic Traffic Signals)	Scope 2	I.2.2	DTE Energy 2018 Emissions Factor	IPCC 5th Assessment 100 Year Values	Activity
City of Ypsilanti Commercial Natural Gas Consumption (Commercial)	Scope 1	I.2.1		IPCC 5th Assessment 100 Year Values	Source and Activity
Eastern Michigan University - CHP & Campus SFC	Scope 1	I.2.1		IPCC 5th Assessment 100 Year Values	Source and Activity

Inventory Record	Energy Equivalent (MMBtu)	CO2 Emissions Factor	CH4 Emissions Factor	N2O Emissions Factor	Energy Used	CO2 lbs/MWh	CH4 lbs/GWh	N2O lbs/GWh
City of Ypsilanti Commercial Electricity Consumption 2018 (Commercial)	116772.587	-	-	-	3E+07	2150.5	129	18
City of Ypsilanti Commercial Electricity Consumption 2018 (Commercial Outdoor Lighting)	487.761092	-	-	-	1E+05	2150.5	129	18
City of Ypsilanti Commercial Electric Consumption 2018 (Electric Streetlight and Automatic Traffic Signals)	13.2286689	-	-	-	3876	2150.5	129	18
City of Ypsilanti Commercial Natural Gas	196220.977	53.02	0.005	0.0001	2E+06	-	-	-

Consumption (Commercial)								
Eastern Michigan University - CHP & Campus SFC	Direct Entry	53.02	0.005	0.0001	Direct Entry	-	-	-

Industrial Energy

Inventory Record	Notes	CO2 (MT)	CH4 (MT)	N2O (MT)	CO2e (MT)
City of Ypsilanti Industrial Electricity Consumption 2018	Industrial electricity consumption for 2018 provided by DTE Energy.	6167.819	0.369983	0.051626	6191.859
City of Ypsilanti Industrial Natural Gas Consumption 2018	Industrial natural gas consumption for the year 2018 provided by DTE. Average heat content of natural gas delivered to customers in 2018 (1,063 Btu/cf) provided by DTE.	10.63518	0.000201	2.01E-05	10.64611

Inventory Record	GPC Scope	GPC Ref Number	Factor Profiles	Global Warming Potential	Activity Source
City of Ypsilanti Industrial Electricity Consumption 2018	Scope 2	I.3.2	DTE Energy 2018 Emissions Factor	IPCC 5th Assessment 100 Year Values	Activity
City of Ypsilanti Industrial Natural Gas Consumption 2018	Scope 1	I.3.1	DTE natural gas emissions and ClearPath calculator	IPCC 5th Assessment 100 Year Values	Source

Inventory Record	Energy Equivalent (MMBtu)	CO2 Emissions Factor	CH4 Emissions Factor	N2O Emissions Factor	Energy Used	CO2 lbs/MWh	CH4 lbs/GWh	N2O lbs/GWh
City of Ypsilanti Industrial	21580.3	0.285807	1.71E-05	2.39E-06	6323040	2150.5	129	18

Electricity Consumption 2018								
City of Ypsilanti Industrial Natural Gas Consumption 2018	200.588	0.05302	0.000001	1E-07	2005.881	-	-	-

Residential Energy

Inventory Record	Notes	CO2 (MT)	CH4 (MT)	N2O (MT)	CO2e (MT)
City of Ypsilanti Electric Residential Outdoor Lighting	Data received from DTE.	32.89613	0.00197331	0.000275345	33.02435
City of Ypsilanti Residential Electric Consumption 2018	Data received from DTE.	40280.75	2.41628295	0.337155761	40437.75
City of Ypsilanti Residential Natural Gas Consumption 2018	Residential natural gas usage (ccf) provided by DTE Energy. Calculated using average heat content of natural gas delivered to consumers by DTE in 2018 (1063 Btu/cf) provided by DTE.	26976.31	2.54397479	0.050879496	27061.02

Inventory Record	GPC Scope	GPC Ref Number	Factor Profiles	Global Warming Potential	Activity Source
City of Ypsilanti Electric Residential Outdoor Lighting	Scope 2	I.1.2	DTE Energy 2018 Emissions Factor	IPCC 5th Assessment 100 Year Values	Activity
City of Ypsilanti Residential Electric Consumption 2018	Scope 2	I.1.2	DTE Energy 2018 Emissions Factor	IPCC 5th Assessment 100 Year Values	Activity
City of Ypsilanti Residential Natural Gas Consumption 2018	Scope 1	I.1.1	DTE natural gas emissions and ClearPath calculator	IPCC 5th Assessment 100 Year Values	Source and Activity

Inventory Record	Energy Equivalent (MMBtu)	CO2 Emissions Factor	CH4 Emissions Factor	N2O Emissions Factor	Energy Used	CO2 lbs/MWh	CH4 lbs/GWh	N2O lbs/GWh
City of Ypsilanti Electric Residential Outdoor Lighting	115.099	0.286	2E-05	2E-06	33724	2151	129	18
City of Ypsilanti Residential Electric Consumption 2018	140936.7	0.286	2E-05	2E-06	4E+07	2151	129	18
City of Ypsilanti Residential Natural Gas Consumption 2018	508795	53.02	0.005	0.0001	5E+06	-	-	-

Water & Wastewater

Inventory Record	Notes	CO2 (MT)	CH4 (MT)	N2O (MT)	CO2e (MT)
YCUA Wastewater Treatment 2018	YCUA wastewater treatment emissions data provided by Sree Mullapudi, Director Wastewater Operations/Compliance, Ypsilanti Community Utilities Authority. Note: utility data covers the FY Sep 2018-Aug 2019.	7153.665	0.471342	0.051902	7180.6169
YCUA Potable Water Supply	YCUA emissions from the supply of potable water to the city in 2018 provided by Michael Shaffer, Director of Service Operations.	24.91791	0.001495	0.000209	25.015032
YCUA Wastewater Treatment Nitrification/Denitrification	Nitrification/Denitrification emissions provided by YCUA.			0.147532	39.09598

Inventory Record	GPC Scope	GPC Ref Number	Factor Profiles	Global Warming Potential	Activity Source
YCUA Wastewater Treatment 2018	Scope 3	VI.1	DTE Energy 2018 Emissions Factor	IPCC 5th Assessment 100 Year Values	Activity
YCUA Potable Water Supply	Scope 3	VI.1	DTE Energy 2018 Emissions Factor	IPCC 5th Assessment 100 Year Values	Activity
YCUA Wastewater Treatment Nitrification/Denitrification	Scope 3	III.4.2	DTE Energy 2018 Emissions Factor	IPCC 5th Assessment 100 Year Values	Activity

Inventory Record	Energy Equivalent (MMBtu)	CO2 Emissions Factor	CH4 Emissions Factor	N2O Emissions Factor	Energy Used	CO2 lbs/MWh	CH4 lbs/ GWh	N2O lbs/ GWh
YCUA Wastewater Treatment 2018	67128.74	0.285807			60727006.08 kWh; 22569445.8 therms	2150.5	129	18
YCUA Potable Water Supply	87.1843	0.285807	1.7E-05		25545	2150.5	129	18
YCUA Wastewater Treatment Nitrification/ Denitrification	-	-	-	-	-	2150.5	129	18

Transportation

Inventory Record	Notes	CO2 (MT)	CH4 (MT)	N2O (MT)	CO2e (MT)

AAATA Ypsilanti Local Route (2018)	AAATA fleet fuel usage sourced from AAATA 2018 Budget and fuel consumption allocation sourced from AAATA Productivity by Route FIxed-Route Service 4th Quarter FY 2016 report.	792.5784	0	0	792.5784
Passenger Transportation - Non-Highway (Gasoline)	2018 VMT and distribution of highway and non-highway VMT provided by SEMCOG.	35056.84	1.67512842	0.983853	35364.47
Freight Transportation - Non-Highway (Diesel)	2018 VMT and distribution of highway and non-highway VMT provided by SEMCOG.	8275.322	0.02573062	0.024217	8282.46
Passenger Transportation - Non-Highway (Diesel)	2018 VMT and distribution of highway and non-highway VMT provided by SEMCOG.	720.2793	0.00116428	0.001827	720.796
Passenger Transportation - Highway (Gasoline)	2018 VMT and estimated breakdown of highway and non-highway VMT provided by SEMCOG.	37507.72	1.77548379	1.06415	37839.44
Passenger Transportation - Highway (Diesel)	2018 VMT and estimated breakdown of highway and non-highway VMT provided by SEMCOG.	1025.367	0.00205209	0.002704	1026.141
Freight Transportation - Highway (Diesel)	2018 VMT and breakdown of highway and non-highway VMT provided by SEMCOG.	19687.04	0.0612133	0.057613	19704.02
Rail Transportation - Passenger	Annual fuel consumption from Amtrak rail travel provided by Laura Fotiou, Lead Environmental Specialist, Amtrak Environment and Sustainability.	105.181	0.00824141	0.002678	106.1215

Rail Transportation - Freight	MDOT owns 2.15 miles of railroad passing through the City of Ypsilanti. There are no rail stops within the city boundaries. Railroad traffic is divided between passenger (operated by Amtrak) and freight (operated by Norfolk Southern). Annual fuel use for freight was determined by calculating total gallons of diesel consumed/mile/year by the Norfolk Southern railroad system and data was located in the 2018 Norfolk Southern Corporate Social Responsibility Report.	516.4528	0.04046643	0.013152	521.0711
Inventory Record	GPC Scope	GPC Ref Number	Factor Profiles	Global Warming Potential	Activity Source
AAATA Ypsilanti Local Route (2018)	Scope 1	II.1.1	DTE Energy 2018 Emissions Factor and 2018 AAATA	IPCC 5th Assessment 100 Year Values	Activity
Passenger Transportation - Non-Highway (Gasoline)	Scope 1	II.1.1	DTE Energy 2018 Emissions Factor and 2018 US National Defaults (updated 2020)	IPCC 5th Assessment 100 Year Values	Source and Activity

Freight Transportation - Non-Highway (Diesel)	Scope 1	II.1.1	DTE Energy 2018 Emissions Factor and 2018 US National Defaults (updated 2020)	IPCC 5th Assessment 100 Year Values	Source and Activity
Passenger Transportation - Non-Highway (Diesel)	Scope 1	II.1.1	DTE Energy 2018 Emissions Factor and 2018 US National Defaults (updated 2020)	IPCC 5th Assessment 100 Year Values	Source and Activity
Passenger Transportation - Highway (Gasoline)	Scope 1	II.1.1	DTE Energy 2018 Emissions Factor and 2018 US National Defaults (updated 2020)	IPCC 5th Assessment 100 Year Values	Source and Activity
Passenger Transportation - Highway (Diesel)	Scope 1	II.1.1	DTE Energy 2018 Emissions Factor and 2018 US National Defaults (updated 2020)	IPCC 5th Assessment 100 Year Values	Source and Activity

Freight Transportation - Highway (Diesel)	Scope 1	II.1.1	DTE Energy 2018 Emissions Factor and 2018 US National Defaults (updated 2020)	IPCC 5th Assessment 100 Year Values	Source and Activity
Rail Transportation - Passenger	Scope 3	II.2.3	DTE Energy 2018 Emissions Factor	IPCC 5th Assessment 100 Year Values	Activity
Rail Transportation - Freight	Scope 3	II.2.3	Norfolk Southern fleet performance metrics	IPCC 5th Assessment 100 Year Values	Activity

Inventory Record	On Road VMT	Fuel Type	Calculation Method	% Motorcycle	% Passenger Vehicle	% Light Truck	% Heavy truck
AAATA Ypsilanti Local Route (2018)	-	Biodiesel	VMT & MPG	-	-	-	-
Passenger Transportation - Non-Highway (Gasoline)	94657029.9	Gasoline	VMT & MPG	0.87	69.16	23.24	0
Freight Transportation - Non-Highway (Diesel)	94657029.9	Diesel	VMT & MPG	0	0	0	5.33
Passenger Transportation - Non-Highway (Diesel)	94657029.9	Diesel	VMT & MPG	0	0.34	1.06	0
Passenger Transportation - Highway	106879850	Gasoline	VMT & MPG	0.74	61.75	24.82	0

(Gasoline)							
Passenger Transportation - Highway (Diesel)	106879850	Diesel	VMT & MPG	0	0.31	1	0.15
Freight Transportation - Highway (Diesel)	106879850	Diesel	VMT & MPG	0	0	0	11.23
Rail Transportation - Passenger	-	Diesel	Fuel use and trip frequency	-	-	-	-
Rail Transportation - Freight	-	Diesel	Fuel use and trip frequency	-	-	-	-

Solid Waste

Inventory Record	Notes	CO2 (MT)	CH4 (MT)	N2O (MT)	CO2e (MT)
Community Compost 2018	Composting data metrics provided by City of Ypsilanti.		0.47816	0.17544	59.88008
EMU Waste Generation 2018	EMU data provided by Waste Management. Landfilled waste - 2,396.3 tons Diverted waste - 190.6 tons Total waste - 2,586.9 tons		24.03046		672.853
City of Ypsilanti Community Waste Generation 2018	Number of households and businesses obtained from U.S. Census data: https://www.census.gov/quickfacts/fact/table/ypsilanticitymichigan/AGE295218 Waste service has changed since 2012 GHG Inventory, Woodland Meadows Recycling and Disposal Facility is no longer utilized. 2018 waste disposal service provided by Republic and City waste is disposed at Saulk Trail Hills landfill in Canton, MI.		36.65933		1026.461

Inventory Record	GPC Scope	GPC Ref Number	Factor Profiles	Global Warming Potential	Activity Source
Community Compost 2018	Scope 1	III.2.1	Composting data provided by City of Ypsilanti	IPCC 5th Assessment 100 Year Values	Source
EMU Waste Generation 2018	Scope 3	III.1.2	2016 EPA Michigan Waste Characterization - Community	IPCC 5th Assessment 100 Year Values	Activity
City of Ypsilanti Community Waste Generation 2018	Scope 3	III.1.2	2016 EPA Michigan Waste Characterization - Community	IPCC 5th Assessment 100 Year Values	Activity

Inventory Record	Waste Generated (Wet Tons)	Waste Composted (Tons)	Landfill Methane Collection
Community Compost 2018	-	860	-
EMU Waste Generation 2018	2396.3	-	Aggressive Collection
City of Ypsilanti Community Waste Generation 2018	3475	-	Typical

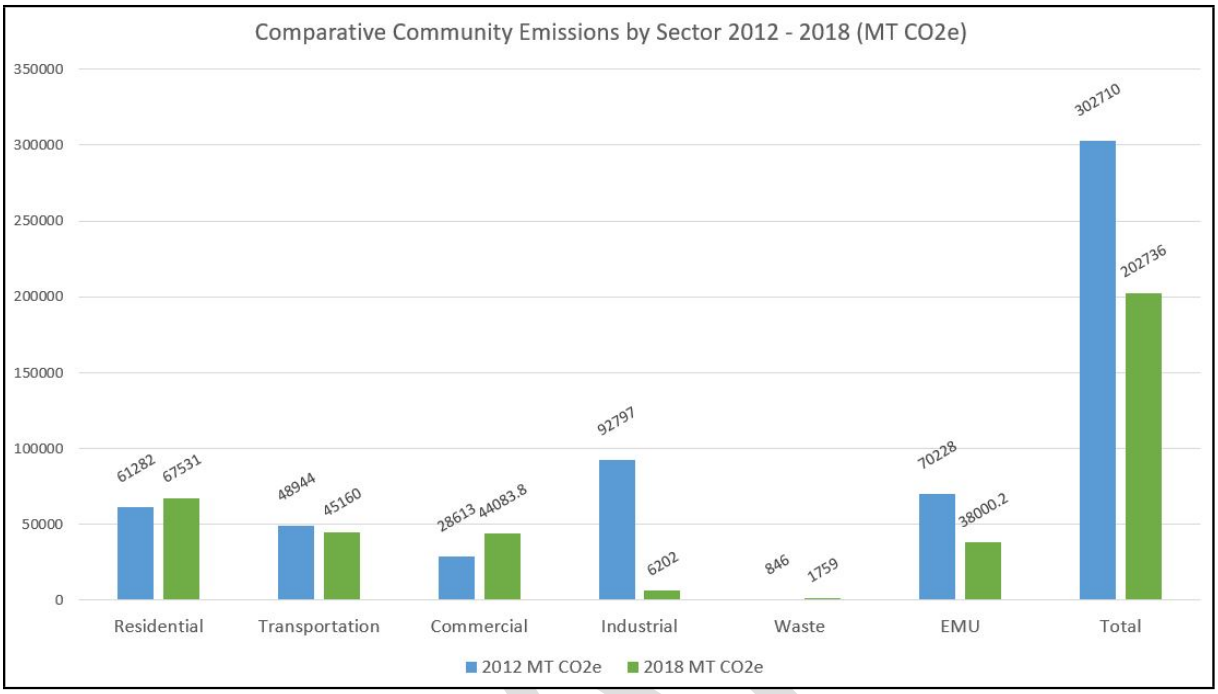
Appendix B: Comparison to 2012 Inventory

As noted in the methodology overview the City previously evaluated 2005/2008 community and government greenhouse gas emissions in coordination with the 2012 Climate Action Plan released in July of 2012. For consistency purposes, this report does not acknowledge the 2005/2008 emissions as an official base year for this inventory. The reason for not officially including the 2005/2008 emissions as a base year is that the report does not follow the Community Emissions Protocol because the Community Emissions Protocol did not exist during the 2012 inventory report process. Instead the 2012 community-wide inventory report followed methods outlined in the International Local Government Greenhouse Gas (GHG) Emissions Analysis. Both the 2012 and 2020 inventories for government emissions followed methods outlined in the Government Emissions Protocol.

It is important to know that the 2012 and 2020 inventories are not easily comparable due to variations in the data collected and the sectors evaluated. A simple comparison of these reports by sector is provided below for informational purposes.

Community Wide Emissions Inventory

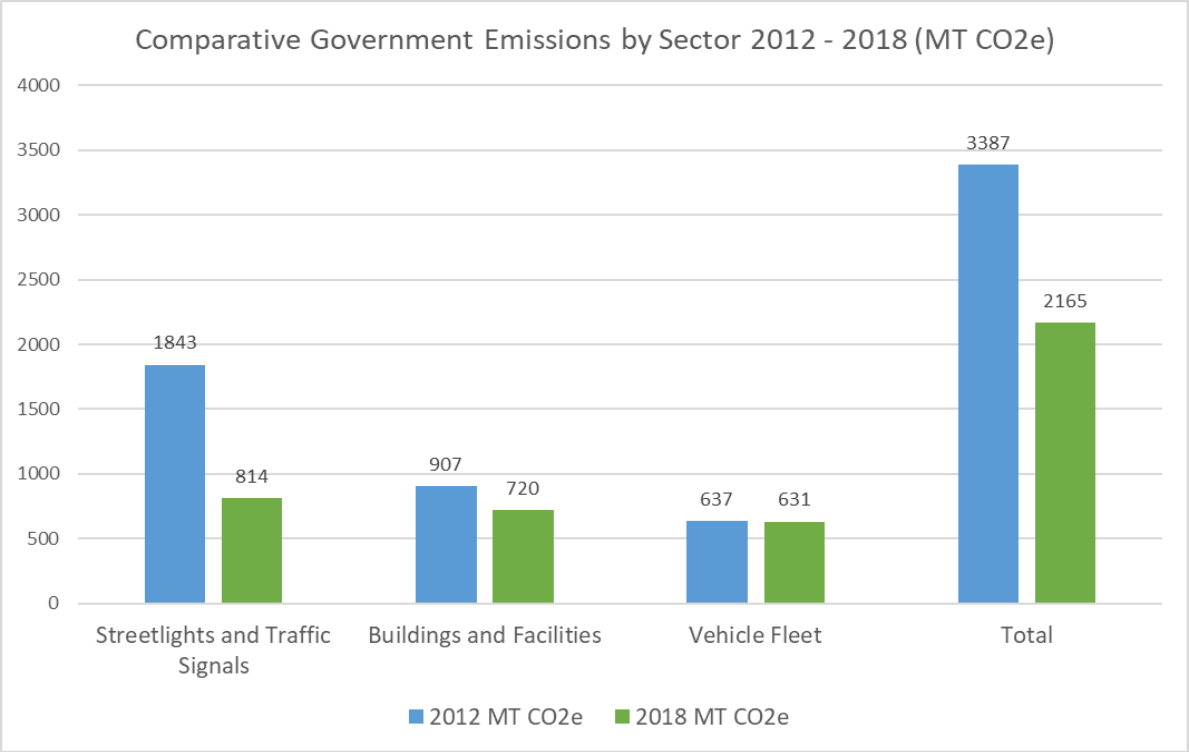
Figure 18: Comparison of changes in community-wide emissions since 2012 inventory



Overall community emissions have decreased from a total of 302,710 MT CO2e reported in the 2012 inventory to 202,736 MT CO2e for the 2018 inventory year. The largest declines occurred in the industrial energy sector and from Eastern Michigan University. It is important to note that due to varying account procedures used for both inventories the above results reflect sectors originally accounted for in the 2012 inventory and further analysis by sector is required for a comprehensive comparison between inventories.

For example, the DTE energy consumption data for the 2020 commercial inventory was determined based on the DTE accounts located within the spatial boundary of the City of Ypsilanti. Whereas the DTE provided energy consumption data for the 2012 report was not as specific and instead encompassed the two zip codes that the City of Ypsilanti lies within, 48197 and 48198. According to the 2012 City of Ypsilanti GHG Inventory report, “the electricity and gas data provided by DTE Energy for residential, commercial and industrial sectors were prorated based on the census number of occupied households in the City of Ypsilanti, divided by the total number of occupied households in the City and the two surrounding townships.”

Government Emissions Inventory



Comparison of changes in government emissions since 2012 inventory.

Overall government emissions decreased from 3,387 MT CO2e reported in the 2012 inventory to 2,165 MT CO2e for the 2018 inventory year. The largest decrease in emissions occurred in the Streetlights and Traffic Signals sector. This is most likely attributed to the City's conversion of the municipal streetlight portfolio to LED lighting. As with the community inventory above the variation in accounting methods used by both inventories requires further analysis for comparative emissions across sectors.

Ypsilanti Sustainability Section

This format is based on the scope from the accepted proposal, conversations with staff and commissions, and the format of the existing document

Introduction to the Topic of Sustainability

1. Why is Ypsilanti focusing on this topic? Why is it important/worth discussing?
    a. The effects of climate change – what are some localized effects in the region/Michigan
    b. Cities can adapt to the effects or help mitigate the effects (or both) – Discuss what these two methods mean
2. Why is this section being included in the master plan?
3. Definition of sustainability that we use for this section (EEE)
    a. Discuss how it's a difficult concept to define, the concept of intersectionality, and the varying ways that residents defined it from the survey results

Past/Present Policies

1. Environmental Challenges
2. Inventory of what the City has accomplished in the last 5-10 years regarding sustainability and what they are working on now
    a. Sustainability/Housing/Planning Commission minutes
    b. Staff projects
    c. News Articles
    d. County/Regional bodies work on sustainability
3. Discussion of 2012 CAP/GHG

Public Input/Sustainability Matrices

1. Explain the community input session/survey/installation
2. Summary of results show these are the 5 main topics
    a. Waste management, waste reduction, increased access to recycling and composting
    b. Communication, education, and outreach about sustainability goals and practices
    c. Complete streets and neighborhoods
    d. Increased Energy efficiency and renewable energy
    e. Disaster preparedness and response to climate change
3. Provide data/context for each major topic – what the trends in Michigan/the region, why is this important for sustainability/how does it help improve the city/resident's lives
4. Create the matrix with specific actions (example to start, below)

Sustainability Alignment/ Intersectionality	Action	Source (Plan it came from)	Adaptation/ Mitigation	Key Accountable Agency	Funding/ financing source

Environmental Challenges

Contamination

USTs

Ypsilanti's industrial history has left behind environmental contamination that the City is still contending with. Michigan's state agency Environment, Great Lakes, and Energy (EGLE) has a database of sites that have been affected in some way from former development. The table "Contamination by Census Tract" shows the most up-to-date data available for underground storage tanks, tanks that have been buried underground to store excess materials, usually petroleum. Many times, businesses do not remove them before leaving the site, and after years of deterioration, its contents leaks into the soil, and could reach groundwater or other sources of drinking water. There is a record of 47 LUSTs in the City, the majority of which are closed, meaning that corrective action has been taken to stop the spread of petroleum or other hazardous substances.[1]

Contamination by Census Tract

Census Tract	Sites of Environmental Contamination	Leaking Underground Storage Tanks (Open)	Leaking Underground Storage Tanks (Closed)	Total
Tract 4108	8	2	13	23
Tract 4106	4	3	3	10
Tract 4107	1	1	4	6
Tract 4103	3	1	7	11
Tract 4110	2	2	4	8
Tract 4112	1	1	1	3
Tract 4109	1	1	2	4
Tract 4102	0	0	1	1
Tract 4111	0	0	1	1
Total	20	11	36	67

Source: Michigan Department of Environment, Great Lakes, and Energy, EnviroMapper

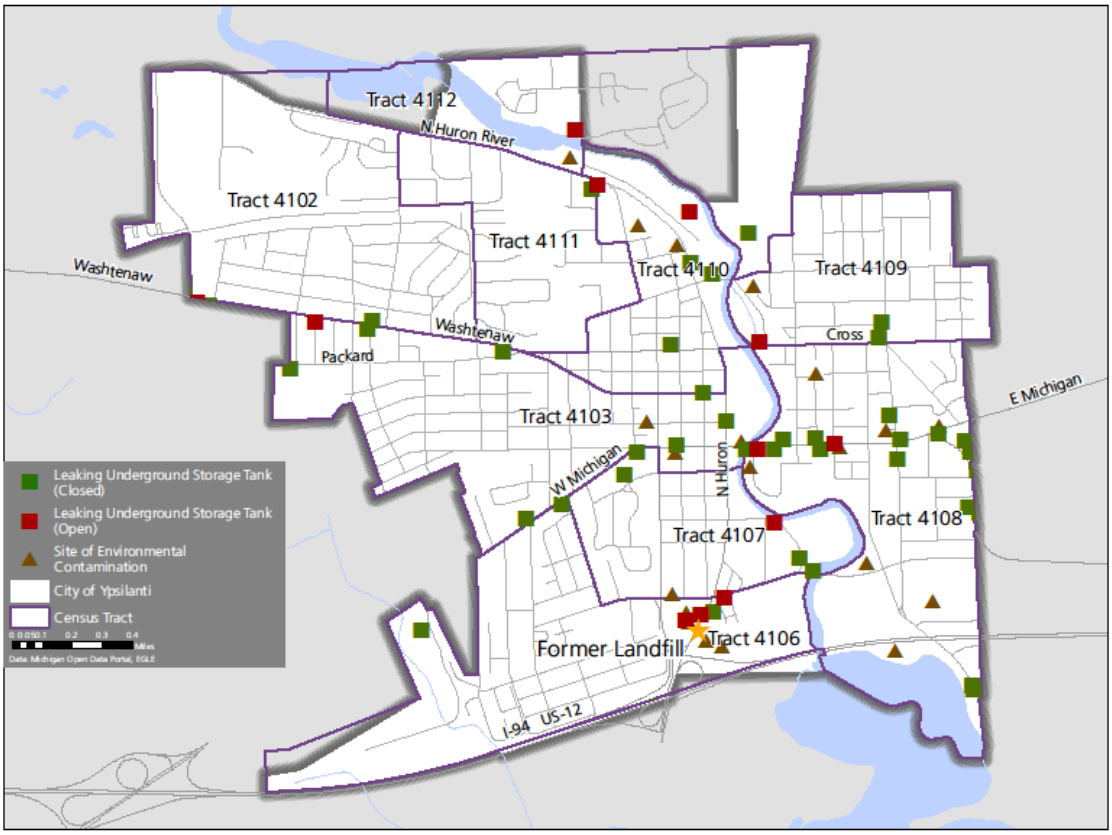
Environmental Contamination

EGLE tracks environmental contamination because of the significant impacts it can have on the drinking water supply and on residents living in proximity to these sites. This database is separate from the LUSTs so records are not duplicated between the two systems, the difference being the source of the contamination. If contamination originates in an underground storage tank it is managed under the Leaking Underground Storage Tank program. All other contamination releases are covered under the Environmental Remediation Program (part 201). There are a total of 20 sites of environmental contamination in the City, the "Contamination Map" illustrates the location of all known environmental contamination and LUSTs in the City. Specific information about each site, including type of hazardous substance and remediation actions can be obtained by contacting the

[1] Underground Storage Tanks, United States Environmental Protection Agency. https://www.epa.gov/ust/learn-about-underground-storage-tanks-usts

EGLE Jackson District Office. The map shows that these sites are primarily clustered along commercial corridors and less frequently in neighborhoods.

Contamination Map



Bell Kramer - 4106

Bell Kramer is an example of how environmental contamination, or even the threat of it, complicates land use planning. This small neighborhood, home to about a dozen households, is wedged north of I-94 and the intersection of S Huron Street where Harriet Street turns into Spring Street. Immediately adjacent to this neighborhood is a former city landfill that has not been used since 1967. Some of the content dumped here is unknown. The first phase of an environmental assessment was conducted in 2012 and 2013 with intention of placing a solar farm on the site. The results prompted further investigation; VOCs, PNAs, metals, benzo(a)pyrene, and methane gas were detected at higher levels than the state permits. Property owners were notified in 2013 with the results as evidence suggested that contaminations could be migrating through the neighborhood. In 2017 and 2018, indoor air was tested in some of the Bell Kramer homes and found that the concentrations of contaminants were within acceptable ranges for the residents to stay.

The City's involvement extended to zoning changes to Bell Kramer during this time. In 2014, as a result of the findings that contamination could be affecting households, Ypsilanti rezoned the neighborhood to an industrial-commercial use so that future homes could not be built there and to phase out residential development in a potentially hazardous area. The rezoning turned homes into non-conforming structures, making it more difficult to sell the homes or upgrade them. The resident's discontent coupled with the positive results from vapor testing in the home, the City rezoned the neighborhood back to residential uses.

The history of this neighborhood points to the complexity of changing land uses and monitoring the effects on environmental contamination. While the City will have to continue to deal with past instances of environmental negligence, it can tighten its land use standards to help prevent further conflicts.

Surface Water and Well Water

Ypsilanti is a part of the Huron River Watershed that follows the Huron River 125 miles from Big Lake near Pontiac, Michigan to Lake Erie. The enormity of the watershed calls for dividing into smaller branches to take a closer look at its features and conditions. The area of the watershed that encompasses the city of Ypsilanti covers 27.7 miles of the river from North Maple Road (Barton Pond) downstream to Belleville lake and includes the city and township of Ann Arbor, Superior Township, Ypsilanti Township, and Van Buren Township. Because a watershed crosses several jurisdictional boundaries, it is incumbent on these municipalities to cooperate on maintaining high-quality drinking water while permitting access to the river. The health of the river depends on the quality of all its tributaries, which is often linked, at least in part, to land use policy.

According to the Huron River Watershed Council (HRWC), a nonprofit group that works to protect and restore the river, this section of the Huron River is heavily impounded. Because of the seven dams that stretch across this area, 77% of the river is impounded, giving it more in common with a lake ecosystem than a river. Some of the major challenges afflicting the health of the watershed is runoff from impervious surfaces, new development along the river's bank that clears vegetation vital to the absorbing runoff based on land use codes from 2000. In particular, phosphorous and E.coli are entering the river from Mill, Honey, and Boyden creeks.

Subject[2]	Grade	Explanation
Watershed land use	D	High impervious surfaces along tributaries
Natural areas	D	12% of watershed has intact natural areas
River flow	F	Flashes following storms, erratic dam gate
River habitat	B	Where undammed, favorable features for river life
Aquatic Insect Community	C	Where undammed, good habitat for insects
Fish Community	B	Anglers enjoy good smallmouth bass
Phosphorous	C-	Concentrated of phosphorous exceed target; declining
E.Coli	C	After heavy rain, E.coli exceeds state standards
Total Suspended Solids	A	Low levels of TSS
Water Temperature	B	High maximum summer temperatures

[2] Huron River Watershed Council. Barton Pond to Belleville Lake Dam.
https://hrwc.maps.arcgis.com/apps/MapJournal/index.html?appid=67e1fd1bbc9a44cf853cd78dd6d8219f

Conductivity	B	Mostly measured at normal levels
Dams	F	High presence of dams and poorly controlled

The City also has four type 1 wells. According to EGLE, a type 1 well "provides year-round service to not less than 25 residents or not less than 15 living units."[3] At a minimum, these wells would reach 100 people. They are clustered between the Bell Kramer neighborhood and along the River in Gilbert Park and close to the Red Lion Apartments and the A&A Car Care. However, Ypsilanti does not have a wellhead protection area in place, which is defined as a geographic boundary surrounding the wells to protect them from contamination.[4] Typically, within these boundaries certain uses are prohibited to prevent any toxins from entering the groundwater.

Dam Removal

As aforementioned, the Peninsular Paper Dam, in its current state, is a cause of many troubling ecological indicators regarding the Huron River's health, namely creating impoundments where algae forms and changing water temperatures that increase and lower dissolved oxygen levels that harm fish habitats.[5] Ypsilanti and the HRWC conducted a feasibility report on removing the dam. The dam was classified as a high potential hazard, due to the severity of impending damage it could cause if it failed, and also classified as obsolete because it does not generate hydroelectric power or an economic benefit. Based on sediment quality and quantity, potential infrastructure and utility impacts, and riverfront land ownership, it was determined that removing the dam is feasible.[6] In 2016, estimates for repairing the dam would exceed $800,000 and removing it would cost closer to $2.7 million. In May 2019, City Council voted to approve $500,000 towards deconstructing the dam as opposed to continuing to pay for repairs.[7] It is recommended that to protect the environmental health of native species that rely on the Huron River, and to protect the City's budget, that funds are made available to dismantle the Peninsular Paper Dam.

Flooding & Green Infrastructure

Flooding is another cause for concern in that it has the potential to harm the water supply, human life, property, and infrastructure. The Federal Emergency Management Agency (FEMA) has designated flood zones based on the anticipated frequency an area is predicted to flood in a 100-year interval. These predictions are based on historical data, which means that they do not incorporate climate change predictions. Already, the FEMA floodplains are showing in many cases to be outdated as areas vulnerable to flooding have expanded outside of its boundaries. Part of the increase in instances of flooding is linked to increased precipitation falling in concentrated bursts. The Great Lakes Integrated Sciences and Assessment (GLISA) has tracked annual precipitation in southeast lower Michigan since 1900 and shows that instances of storms where two inches or

[3] Michigan Department of Environment, Great Lakes, and Energy. "What is a Public Water Supply?" https://www.michigan.gov/egle/0,9429,7-135-3313_3675_3691-9577--,00.html

[4] EGLE. The Michigan Wellhead Protection Program Guide. 2006.https://www.michigan.gov/documents/deq/deq-wb-dwehs-swpu-whpguidebook_256483_7.pdf

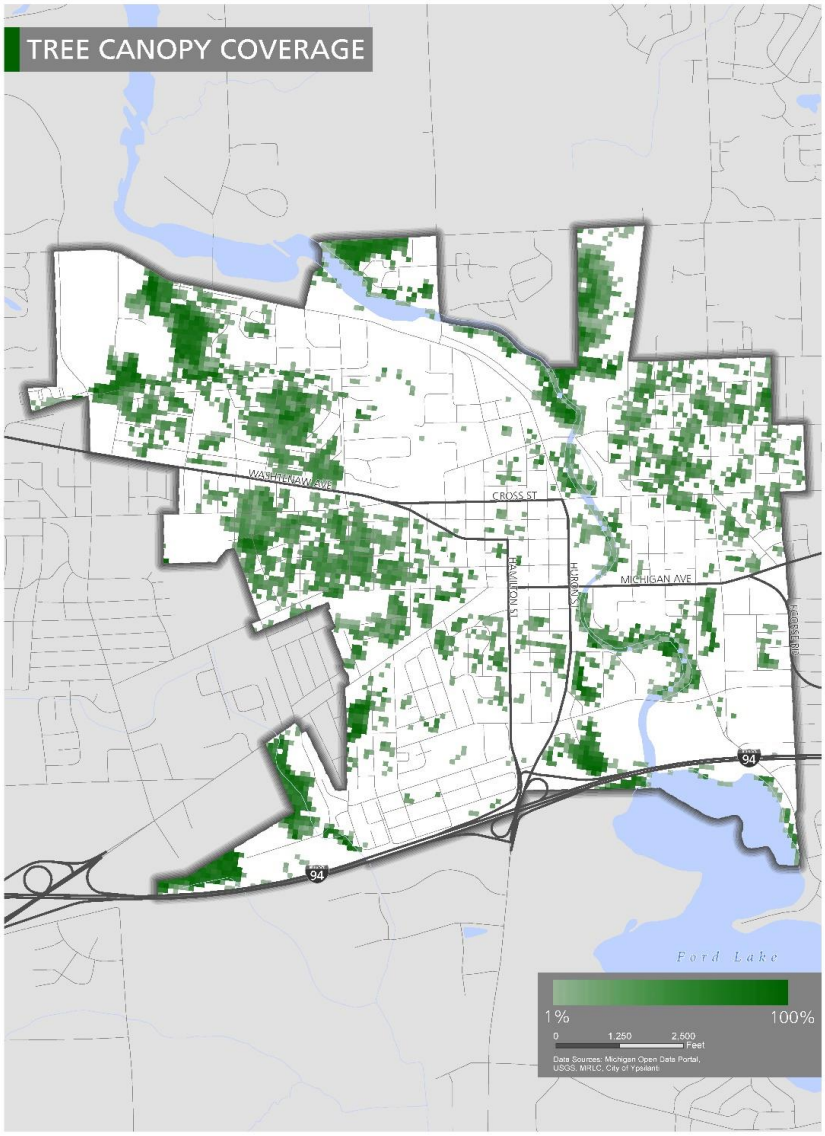
[5] Huron River Watershed Council. The Huron River Data Report: Ann Arbor and Ypsilanti Vicinity. https://www.hrwc.org/wp-content/uploads/LowerMiddleHuron-11x8.pdf

[6] Princeton Hydro. Peninsular Paper Dam: Dam Removal Assessment and Feasibility Report. September 2018. https://cityofypsilanti.com/DocumentCenter/View/1789/2018-11-21-Peninsular-Dam-Removal-Study-Report

[7] WXYZ Detroit. Ypsilanti City Council Votes to Tear Down Peninsular Dam. May 2019. https://www.wxyz.com/homepage-showcase/ypsilanti-city-council-votes-to-tear-down-peninsular-dam

more fall is picking up.[8] To gain more accurate depictions of how City floods, Ypsilanti can invest in an updated study that incorporates recent data and includes forecasts of more intense and frequent storms.

Green infrastructure is one way to reduce the impacts of excess stormwater. Green infrastructure is a broad term that includes several examples of practices of water management that protect or mimic the natural water cycle. As opposed to the convention grey infrastructure that uses hard surfaces and systems to channel excess water elsewhere, this approach hopes to protect and expand the natural environment so that water can be absorbed naturally and applied at several scales: a home, a downtown, an entire city, a watershed. Common used examples are rain gardens, green roofts, trees, planter boxes, rainwater harvesting systems, bioswales, in additional to better protection of wetlands and floodplains.



Trees

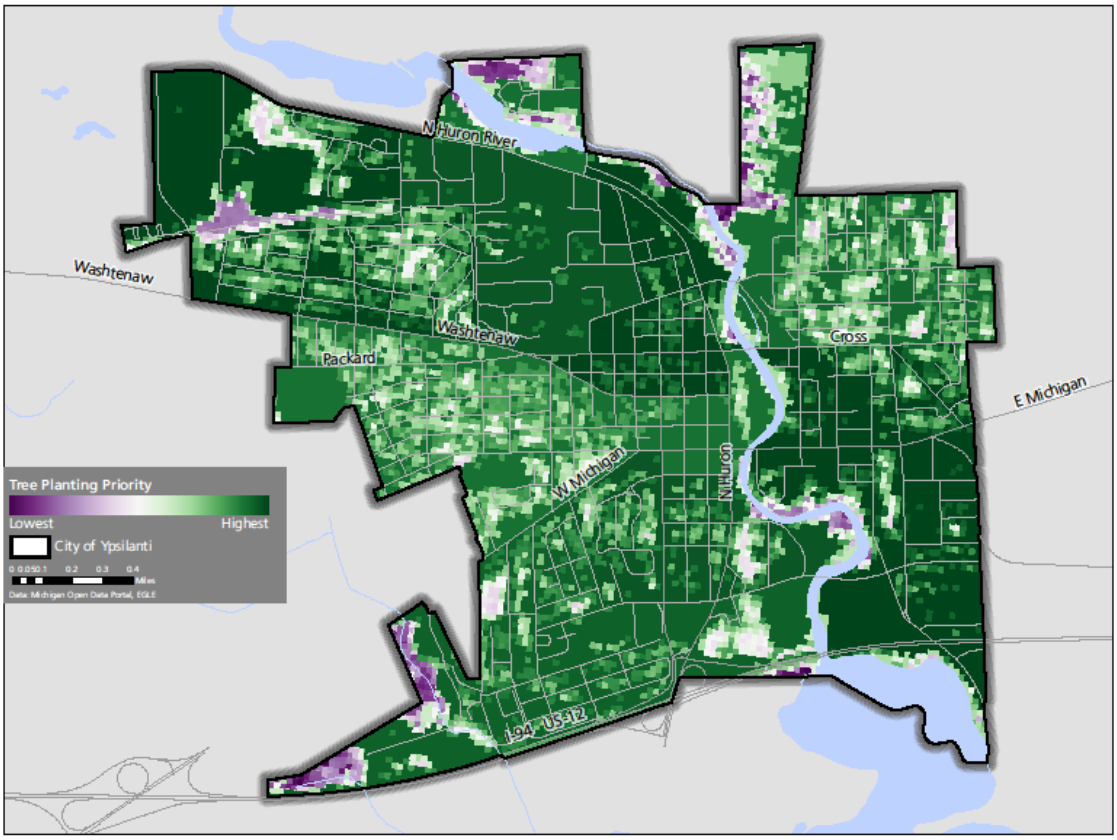
One of the most common types of green infrastructure is trees because they tend to pay back with dividends. In addition to capturing stormwater, they beautify cityscapes, improve property values, sequester

[8] GLISA. Southeast Lower Michigan. http://glisa.umich.edu/division/mi10

carbon, and provide cool refuges in the heat. The "Tree Canopy Coverage" map that trees are limited within central neighborhoods and along corridors where large swaths of the map are "white," representing zero coverage.

A tree placement model was run for the entire City to determine what areas are most in need of trees based on four factors. The four factors were weighted accordingly: existing tree canopy (55%), land use (25%), and low-income population and heat vulnerability index were both weighted at 10%. The results of the tree placement model are shown in the "Tree Placement Priority Map." The darker green areas represent where trees are most needed and the purple are where there is adequate tree canopy coverage. The challenge in tree planting is the initial funding and ongoing maintenance; the environmental challenges that result from a lacking tree canopy coverage come with high opportunity costs to human health, water quality, and aesthetics.

Tree Planting Priority Map



Challenges

Air

According to the National Air Toxics Assessment (NATA), the City of Ypsilanti (all census tracts except for EMU's campus) averages in the 65th percentile in the State of Michigan for exposure to fine particulate matter in the air (PM 2.5), NATA cancer risk from air toxics, and the air respiratory hazards index. Eastern Michigan's campus has slightly lower levels of air toxicity most likely due to the lack of intensive industrial land uses near the campus and fewer roads running through it.[9] Poor air quality has negative impacts on public health such as increasing the number of people that suffer from respiratory conditions, such as asthma. In Washtenaw County 11.6% of adults have asthma, which is higher than both the state and national averages at 10.7% and 9.5%, respectively. Additionally, the percentage of Medicare beneficiaries that are treated for has increased slightly and Washtenaw county ranks in the top 25th percentile for that metric. Despite the concerning statistics for adult and elderly populations, Washtenaw County has one of the lowest death rates due to chronic lower respiratory diseases in the state and a declining percentage of teens with asthma, illustrating that the elderly are most vulnerable to poor air quality.[10]

Waste Management

The City of Ypsilanti's waste disposal is contracted to Stevens Disposal, which serves Southeast Michigan. The solid waste generated in the City of Ypsilanti is transported to two landfills Carleton Farms located in New Boston, MI and the City of Riverview's municipal landfill Riverview Land Preserve.[11] Carleton Farms accepts 2.25 million tons of waste annually, the third highest volume in Michigan and has a total capacity of 101 million tons, the largest in the state. The landfill is estimated to produce 15.8 million cubic feet of gas per day, 40.1% of which is captured. Methane that cannot be captured is flared. Flaring gas is the process of lighting gas wells on fire to convert the more harmful methane to carbon dioxide as it enters the atmosphere. Carleton Farms flares 0.65 million cubic feet of landfill gas daily, roughly two-thirds the size of an Olympic size swimming pool. In 2018, Carleton Farms emitted 195,105 metric tons of carbon dioxide equivalents to the atmosphere.[12] Based on current capacity, Carleton Farms is anticipated to close in 2052.

River Land Preserve accepts 780,00 tons annually and has a capacity of 39 million tons. Riverview Land Preserve is expected to close in 2031.[13] In 2018, Riverview Land Preserve emitted 288,394 metric tons of carbon dioxide equivalents into the atmosphere. While the waste generated for Ypsilanti is only a fraction of the waste sent to these two facilities, it does contribute to emissions outside city boundaries and national and global increases in emissions, impacting global warming. As of 2020 the City of Ypsilanti could improve its curbside recycling or composting. The expansion of these services and an education campaign could reduce the amount of solid waste the city generates and sends to landfills. With the two landfills that Ypsilanti relies on closing in the next 30 years, the city should pursue all opportunities to reduce the solid waste generated.

---

[9] EJ Screen: Environmental Justice Screening and Mapping Tool, United States Environmental Protection Agency. https://ejscreen.epa.gov/mapper/.
[10] Health for All: Washtenaw, http://www.healthforallwashtenaw.org/indicators/index/dashboard?alias=alldata
[11] Stevens Disposal Customer Service. Phone call on January 20, 2020.
[12] FLIGHT, United States Environmental Protection Agency. https://ghgdata.epa.gov/ghgp/main.do
[13] Landfill Methane Outreach Program (LMOP) United States Environmental Protection Agency. https://www.epa.gov/lmop/project-and-landfill-data-state

The City of Ypsilanti

2020 Inventories of Community and Government Greenhouse Gas Emissions

Photo Credit: Solar Ypsi. http://www.solarypsi.org/installations/FireStation

Produced by EcoWorks

With Assistance from ICLEI - Local Governments for Sustainability USA

eco WORKS

Ypsilanti

CITY OF YPSILANTI

Home of Eastern Michigan University

Credits and Acknowledgements

City of Ypsilanti

Bonnie Wessler – City Planner

Sustainability Commission
Chair – Keith Michalowski
Vice Chair - Nancy Heine
Commission Member – Julia Bayha
Commission Member – Emily Drenen
Commission Member – Christian Cannon
Commission Member – Bryan Foley
Commission Member – Katy Greenwald
Commission Member – Takunia Collins
Commission Member – Beth Gibbons

City Council
Mayor Beth Bashert
Mayor Pro Tem Lois Richardson
Council Member – Ward 1, Nicole Brown
Council Member Ward 2, Steve Wilcoxen
Council Member – Ward 2, Jennifer Symanns
Council Member – Ward 3, Anthony Morgan
Council Member – Ward 3, Annie Somerville

ICLEI-Local Governments for Sustainability USA

This report was prepared by Henrik Mader, Energy Analyst, and Brittany Turner, Energy Analyst at EcoWorks. The authors would like to thank the City of Ypsilanti staff for providing much of the insight and local information necessary for the completion of this report.

This GHG Inventory Report was developed using a template provided by ICLEI – Local Governments for Sustainability, USA. This template and its appendices were published in January 2019.

Table of Contents

Tables and Figures

List of Figures

List of Tables

Executive Summary

The City of Ypsilanti (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. On November 19th the City of Ypsilanti City Council passed resolution No. 2019-260 declaring a "climate emergency" and a commitment to achieve carbon neutrality by year 2035.[1] Furthermore, the City has multiple opportunities to benefit by acting quickly to reduce community GHG emissions.

The City of Ypsilanti, released a Capital Action Plan and associated greenhouse gas inventory (including both the community and government inventories) in July of 2012. There are various nuanced differences between the 2012 inventories and the 2020 inventories; most significantly being that the ICLEI U.S. Community Protocol for Accounting and Reporting of GHG Emissions Version 1.1, did not exist when the 2012 community inventory was compiled.

This report provides estimates of greenhouse gas emissions resulting from activities in City of Ypsilanti as a whole and according with municipal operations in 2018 and was executed in parallel with the draft sustainability plan.

Key Findings

Community-Wide Emissions Subject to Community Activities

There are a variety of emissions sources and activities included in the City of Ypsilanti community-wide emissions inventory. Figure 1 shows a breakdown of the community emissions by sector. The largest contributor in this set is commercial energy with 30% of emissions. The next largest contributor is residential energy with 25% of emissions. Actions to reduce emissions in both of these sectors will be a key part of a carbon neutrality strategy. Transportation and mobile sources (non-highway), transportation and mobile sources (highway), waste and water waste, industrial energy, and solid waste were responsible for the remainder of community emissions.

[1] City of Ypsilanti. Regular Council Meeting November 19, 2019. Resolution No. 2019-260 p.5-6. https://cityofypsilanti.com/AgendaCenter/ViewFile/Item/1987?fileID=3730

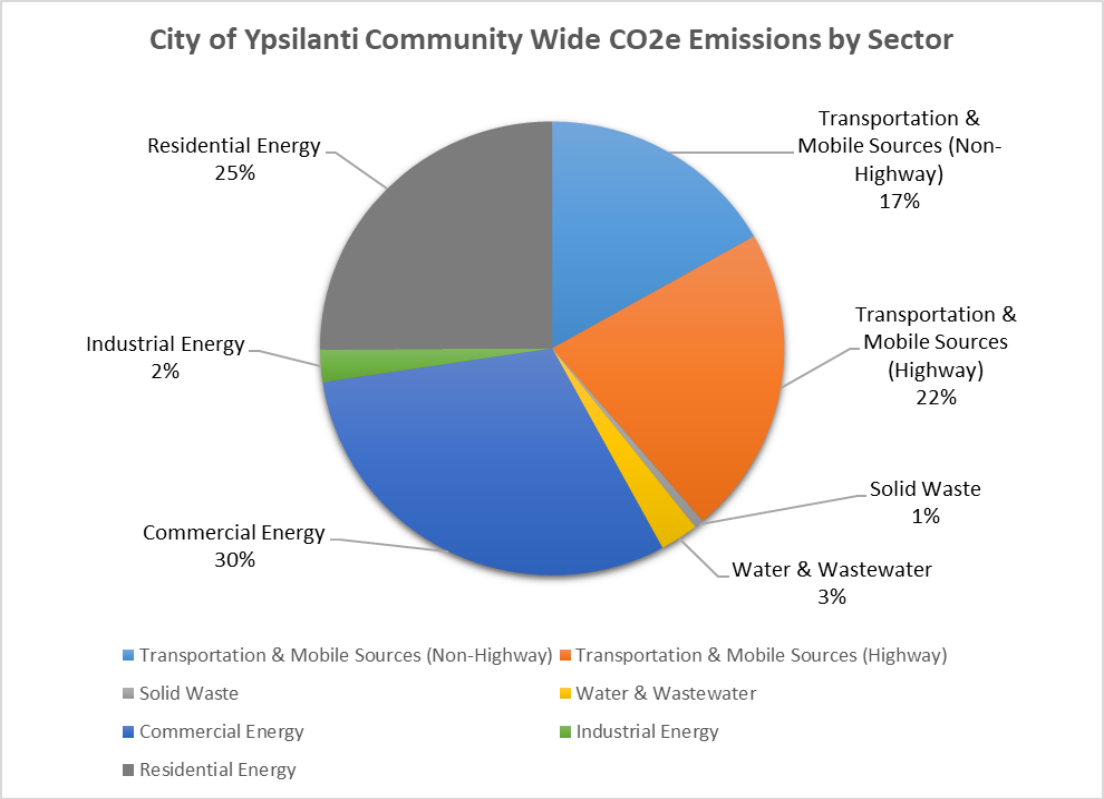


Figure 1 - Community-Wide CO2e Emissions by Sector

Community-Wide Emissions Subject to Local Government Significant Influence

A subset of community emissions, identified as local government significantly influenced emissions, are most policy relevant. Figure 2 shows the significantly influenced activity emissions. The largest contributor in this set is residential energy use of electricity with 23.75% of emissions. The next largest contributor is commercial/industrial use of electricity with 23.38% of emissions. Actions to reduce emissions in both of these sectors will be a key part of a carbon neutrality strategy. On road passenger vehicle travel, residential stationary combustion, commercial stationary combustion, on-road freight vehicle travel, use of energy in wastewater treatment, generation of solid waste, and use of electricity in potable water treatment and distribution were responsible for the remainder of significantly influenced emissions.

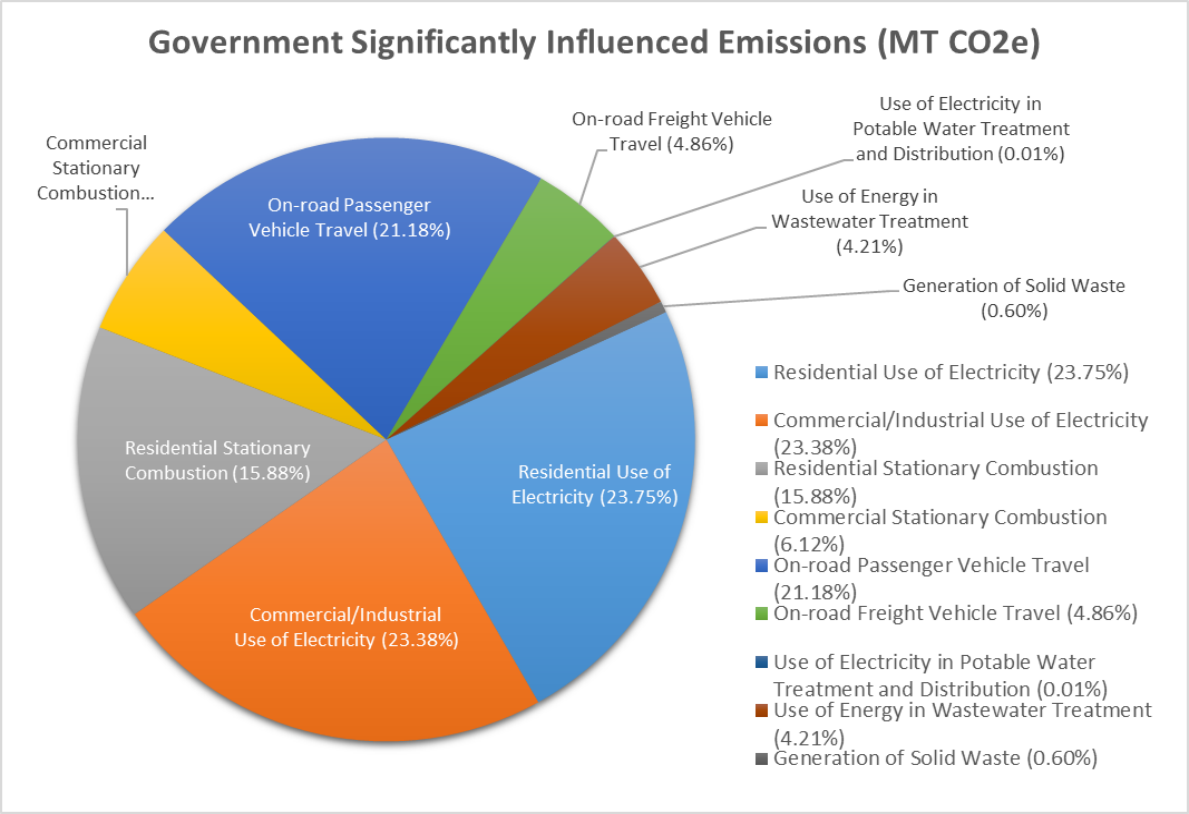


Figure 2 - Community-Wide Activity Emissions Subject to Local Government Significant Influence

Government Operations Emissions

As a subset of the City of Ypsilanti community-wide emissions inventory, the government operations emissions inventory takes a deeper dive into emissions from municipal operations. Figure 3 shows a breakdown of the government operations emissions inventory by scope and sector. The largest contributor in this set is street lights and traffic signals energy with 29% of emissions. The next largest contributor is vehicle fleet with 23% of emissions. Actions to reduce emissions in both of these sectors will be a key part of a carbon neutrality strategy. Buildings and facilities scope 1 and scope 2, employee commute, and solid waste are responsible for the remainder of government operations inventory emissions.

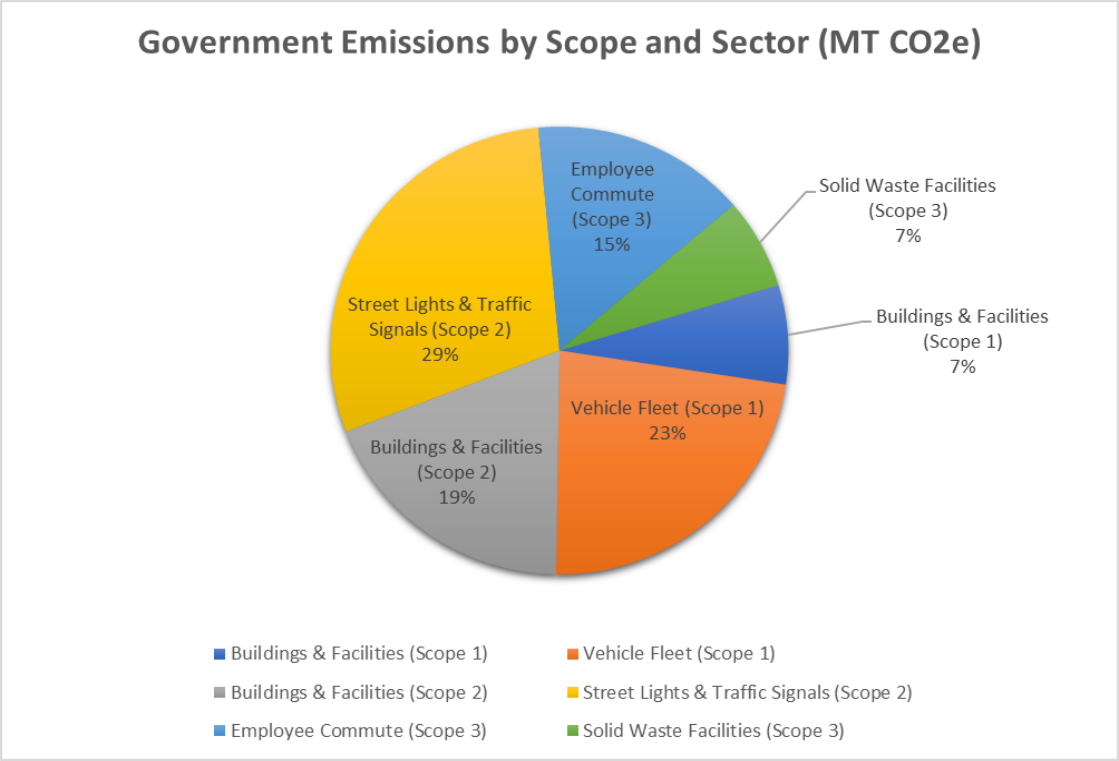


Figure 3 - Government Operations Inventory Emissions by Scope and Sector

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.

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 at local businesses and add 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."[2] 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.[3] These refinements expand upon the findings of previous IPCC Assessments – today, observational evidence from all continents and most oceans shows that "regional changes in temperature have had discernible impacts on physical and biological systems."

[2] 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

[3] 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.

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.

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

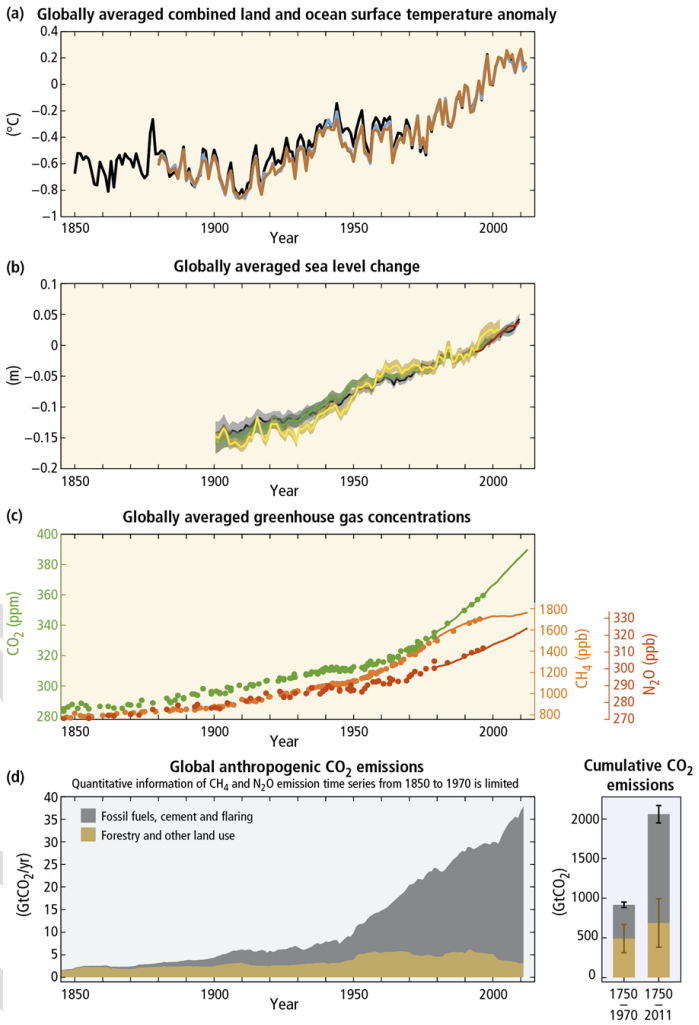


Figure: Observations and other indicators of a changing global climate system

Climate Policy Context

On November 19th the City of Ypsilanti City Council passed resolution No. 2019-260 declaring a "climate emergency" and a commitment to take action starting first with a public engagement process to helps outline how the entire Ypsilanti Community could achieve carbon neutrality by the year 2035, set a target date that is both ambitious and achievable; and develop a draft strategy for how the Ypsilanti community could achieve carbon neutrality.[4] The initial draft is to be presented to City Council not later than March 31, 2020.

[4] City of Ypsilanti. Regular Council Meeting November 19, 2019. Resolution No. 2019-260 p.5-6. https://cityofypsilanti.com/AgendaCenter/ViewFile/Item/1987?fileID=3730

Figure 4 - ICLEI Climate Mitigation Milestones

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 City of Ypsilanti.

Sustainability & Climate Change Mitigation Activities in City of Ypsilanti

The City of Ypsilanti has already implemented programs that have or will lead to ancillary benefits in the form of energy conservation and greenhouse gas mitigation:

- Through an ongoing collaborative effort with Solar Ypsi, the city has invested resources in installing solar PV arrays throughout the city.
- Commitment to establish a Sustainability Plan - anticipated to be released in 2020.
- Commitment to Carbon Neutrality by 2035 - Resolution No. 2019-260 passed November 19th, 2019. The resolution language can be found in Appendix #.
- Adoption of the 2018 Energy Plan.
- Gold SolSmart designation - recognized in 2016; Various variables of the program included: Determining path to designation; reviewing the zoning code, developing a checklist to make the solar permitting process more transparent; and cross-training inspection and permitting staff on solar PV.
- Michigan Green Communities bronze certification, received in 2018.

- Sustainability Commission – establishment effective February 2017 under Ordinance No. 1280.
- According to the City of Ypsilanti Resolution #2013-175, on April 2nd, 2013, “the City of Ypsilanti officially set its own goal of the City of Ypsilanti and its residents generate 5 MW of electricity from distributed solar, to reach 1,000 solar roofs by 2020.”
- Adoption of Climate Action Plan 2012.
- Completion of 2012 Greenhouse Gas Inventory – includes both a Community and Government Operations inventory.

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 City of Ypsilanti community as a whole and emissions from the City of Ypsilanti government operations. The government operations inventory is a subset of the community-wide inventory; for example, data on commercial energy use by the community includes energy consumed by municipal buildings, whereas the government operations inventory only includes energy consumed by municipal buildings.

As local governments have continued to join the climate protection movement, the need for a standardized approach to quantify GHG emissions has proven essential. The City of Ypsilanti community inventory uses the approach and methods provided by the ICLEI U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions (Community Emissions Protocol)[5]. The City of Ypsilanti government operations inventory uses the approach and methods provided by the Local Government Operations Protocol version 1.1 (Government Emissions Protocol).[6]

2018 Base Year

The inventory process requires the selection of a base year with which to compare current emissions. The base year for the City of Ypsilanti community inventory and government operations inventory is 2018. The reason for selecting 2018 as the base year is that it is the most recent full calendar year of data available at the time of data collection beginning in 2019 and meets the required reporting standards of the Community Emissions Protocol.

Please note that the City previously evaluated 2005/2008 community and government greenhouse gas emissions in coordination with the 2012 Climate Action Plan released in July of 2012. For consistency purposes, this report does not acknowledge the 2005/2008 emissions as an official base year for this inventory. The reason for not officially including the 2005/2008 emissions as a base year is that the report does not follow the Community Emissions Protocol because the Community Emissions Protocol did not exist during the 2012 inventory report process. Instead the 2012 community-wide inventory report followed methods outlined in the International Local Government Greenhouse Gas (GHG) Emissions Analysis. Both the 2012 and 2020 inventories for government emissions followed methods outlined in the Government Protocol. It is important to know that the 2012 and 2020 inventories are not easily comparable due to variations in the data collected and the sectors evaluated. A simple comparison of these reports by sector is provided under the inventory results section.

Quantification Methods

Greenhouse gas emissions can be quantified in two ways:

[5] http://www.icleiusa.org/tools/ghg-protocol/community-protocol
[6] https://icleiusa.org/ghg-protocols/

- 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.
- Calculation-based methodologies calculate emissions using activity data and emission factors.[7] To calculate emissions accordingly, the basic equation below is used: *Activity Data x Emission Factor = Emissions*

The majority of emissions sources in this inventory are quantified using calculation-based methodologies using the basic equation: *Activity Data x Emission Factor = Emissions*. 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. 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). Please see appendices for a detailed listing of the activity data and emissions factors used in composing these inventories.

Only one emission source in the community inventory is quantified using measurement-based methodology. That source is the Eastern Michigan University combined heat and power plant.

Community Emissions Protocol

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

Quantifying Greenhouse Gas Emissions - Community Emissions Protocol

Sources and Activities – Community Emissions Protocol

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”.

[7] This inventory utilized calculators provided by the ICLEI USA ClearPath online software tool:(.https://icleiusa.org/clearpath/).

Source	Activity
Any physical process inside the jurisdictional 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 community's jurisdictional 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 jurisdictional boundary. The City of Ypsilanti community emissions inventory is based on emissions resulting from activity + source, activity, and source emissions.

Local Governments Operation Protocol

The Local Governments Operations Protocol (Government Protocol) was released by ICLEI in May 2010, and "is designed to provide a standardized set of guidelines to assist local governments in quantifying and reporting GHG emissions associated with their government operations."[8] "Although elements of the ICLEI Reporting Standard are called "Required", there is currently no verification process for certifying that an inventory meets the standard."[9] It can be thought of as a drill-down from the community-wide inventory.

Quantifying Greenhouse Gas Emissions – Government Emissions Protocol

Scopes and Sectors – Government Emissions Protocol

The government emissions protocol contributes to greenhouse gas emissions through the categorization of scope accounting terms including scope 1, scope 2, and scope 3 emissions. Together the three scopes provide a comprehensive accounting framework for managing and reducing direct and indirect emissions.

Scopes
Scope 1: All direct GHG emissions (with the exception of direct CO2 emissions from biogenic sources).

[8] ICLEI. Local Governments Operations Protocol. V1.1. p.3. https://icleiusa.org/ghg-protocols/
[9] ICLEI. Local Governments Operations Protocol. V1.1. p.171. https://icleiusa.org/ghg-protocols/

Scope 2: Indirect GHG emissions associated with the consumption of purchased or acquired electricity, steam, heating, or cooling.

Scope 3: All other indirect emissions not covered in Scope 2, such as emissions resulting from the extraction and production of purchased materials and fuels, transport-related activities in vehicles not owned or controlled by the reporting entity (e.g., employee commuting and business travel), outsourced activities, waste disposal, etc.

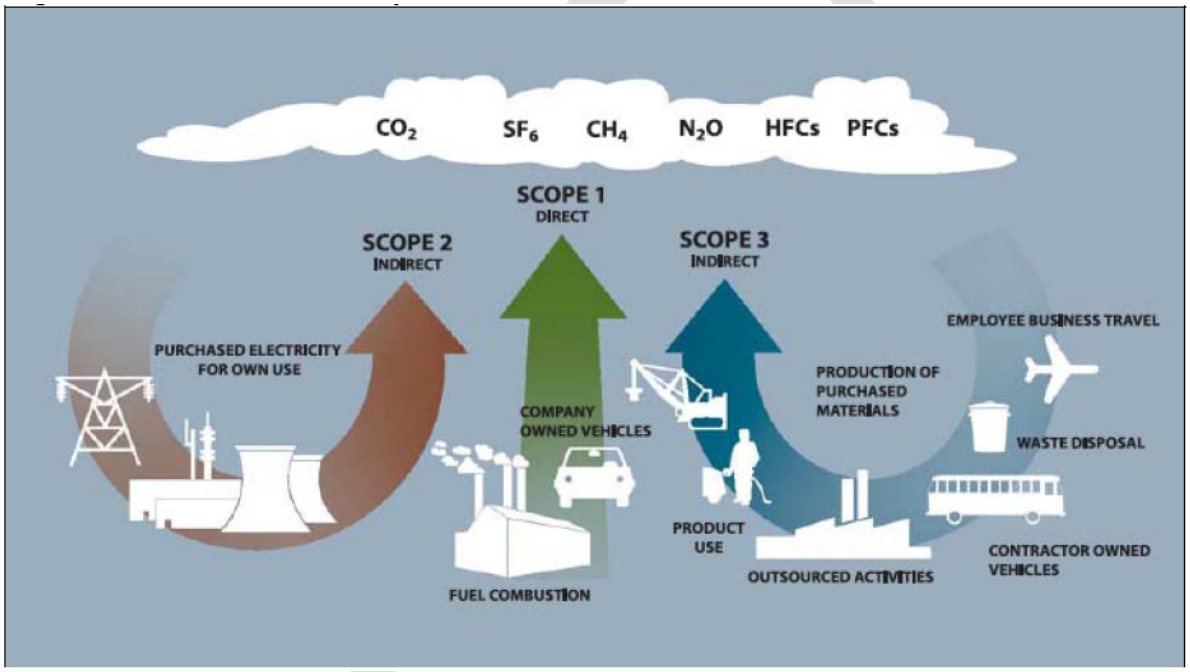


Figure 5 - Overview of Scopes and Emission Sources

“The local government sectors are meant to create a framework that is based on internationally recognized GHG accounting terms (i.e., Scope 1, Scope 2, stationary combustion, mobile combustion, etc.) but that is more policy relevant to local governments. By categorizing your GHG inventory according to these sectors, you may be able to more easily communicate your inventory results to the public and identify opportunities for reductions. P.23 A scope-based emissions inventory could be summed to estimate total emissions released.

The Government Emission Protocol sectors included in this Government Operations Inventory are:

1. Buildings and other facilities
2. Streetlights and traffic signals
3. Vehicle fleet
4. Transit fleet
5. Solid waste facilities

This Government Operations inventory does not include the following sectors because there are no water delivery facilities, port facilities, airport facilities, power generation facilities, or wastewater facilities located within city boundaries. Industrial and other process and fugitive refrigerant emissions were excluded due to lack of data.

The City of Ypsilanti wastewater is treated by the Ypsilanti Community Utility Authority (YCUA), quasigovernmental regional authority managed by a board with representatives from member communities. Emissions from YCUA were not included in the government emissions inventory because the City of Ypsilanti does not have significant financial or operational control over the treatment center. According to the Government Emissions Protocol, “If you do not have financial or operational control over the treatment facility, you should not report the fugitive emissions from that facility as Scope 1 emissions. You are encouraged, however, to optionally report these emissions as Scope 3.” (p. 105-106)

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 greenhouse gas emissions (emissions). This report looks at the City of Ypsilanti community emissions through two frames:

- Local Government Significant Influence
- Community-Wide Activities

Community Profile

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

Table 1: City of Ypsilanti Community Indicators

2010 Population	**19,435 people**
2010 Households	**7,865**

Community-Wide Activities Frame

The City of Ypsilanti has chosen to look at emissions through multiple frames including 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 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 upstream electricity transmission and distribution losses. When used for comparison across communities, this framework is helpful in illustrating relative urban efficiencies. Table 2 summarizes community-wide activity and source CO2e emissions by sector. Table 3 provide a detailed breakdown of the community-wide activity and source emissions by sector and includes an overall total of emissions for the community-wide activity frame and a total excluding highway transportation. An additional total without highway transportation was provided for comparison purposes to the 2012 community inventory report that does not include highway transportation.

Table 2: Summary of Community-Wide Activity and Source GHG Emissions

Community – Wide Sector	CO2e (MT)
Transportation & Mobile Sources (Highway)	59,197
Transportation & Mobile Sources (Non-Highway)	45,160

Solid Waste	1,759
Water & Wastewater	7,244
Commercial Energy	82,084
Industrial Energy	6,202
Residential Energy	67,531
Total	**269,177**
Total Without Highway Transportation	*209,980*

Table 3: Community-Wide Activity and Source GHG Emissions by Sector

Sector	Source or Activity	Activity Data Quantity and Unit	Emissions Factor	Emissions (metric tons CO2e)
Residential Energy				
Residential Use of Electricity	Activity	41,328,187 kWh	ClearPath, 2018 DTE, and 2018 eGRID	40,470.77
Residential Stationary Combustion	Source and Activity	5,087,949.6 therms	ClearPath, 2018 DTE, and 2018 eGRID	27,061.02
Commercial Energy Use				
Commercial Use of Electricity	Activity	34,361,158 kWh	ClearPath, 2018 DTE, and 2018 eGRID	33,648.3
Commercial Stationary Combustion	Source and Activity	1,962,209.7 therms	ClearPath, 2018 DTE, and 2018 eGRID	10,436.31
Commercial Stationary Combustion – EMU	Source and Activity	7,404,239.9 therms	Emissions reported by EMU	38,000.2
Industrial Energy				
Industrial Use of Electricity	Activity	6,323,040 kWh	ClearPath, 2018 DTE, and 2018 eGRID	6,191.86
Industrial Stationary Combustion	Source	2,005.88 therms	ClearPath, 2018 DTE, and 2018 eGRID	10.65

Transportation and Other Mobile Sources				
On-road Passenger Vehicle Travel (Highway)	Source and Activity	94,877,242.7 vehicle miles	2018 US National Default	38,865.58
On-road Freight Vehicle Travel (Highway)	Source and Activity	12,002,607.13 vehicle miles	2018 US National Default	19,704.02
On-road Passenger Vehicle Travel (Non-Highway)	Source and Activity	89,611,810.17 vehicle miles	2018 US National Default	36,085.27
On-road Freight Vehicle Travel (Non-Highway)	Source and Activity	5,045,219.69 vehicle miles	2018 US National Default	8,282.46
Public Transit – AAATA Local Routes	Activity	411,870.4 vehicle miles	AAATA and 2018 US National Default	792.58
Water and Wastewater				
Use of Electricity in Potable Water Treatment and Distribution	Activity	25,545 kWh	ClearPath, 2018 DTE, and 2018 eGRID	25.02
Use of Energy in Wastewater Treatment	Activity	6,072,706.08 kWh and 233,819.5 therms	ClearPath, 2018 DTE, and 2018 eGRID	7,180.62
Wastewater Treatment Nitrification/Denitrification	Activity		Provided by YCUA	39.1
Solid Waste				
Generation of Solid Waste (Ypsilanti)	Activity	3,475 tons	2016 EPA Michigan Waste Characterization	1,026.46
Generation of Solid Waste (EMU)	Activity	2,396.3 tons	2016 EPA Michigan Waste Characterization	672.85
Total Community-Wide Activity Emissions				**269,177 MT**

Looking at the community-wide activities frame shows that commercial energy, residential energy and transportation are important ways in which the City of Ypsilanti community contributes to emissions. Households and businesses in City of Ypsilanti may want to consider these activities as they think about how to reduce their own emissions.

Figure 6 shows a breakdown of the community emissions by sector. The largest contributor in this set is commercial energy with 30% of emissions. The next largest contributor is residential energy with 25% of

emissions. Actions to reduce emissions in both of these sectors will be a key part of a carbon neutrality strategy. Transportation and mobile sources (non-highway), transportation and mobile sources (highway), waste and water waste, industrial energy, and solid waste were responsible for the remainder of community emissions.

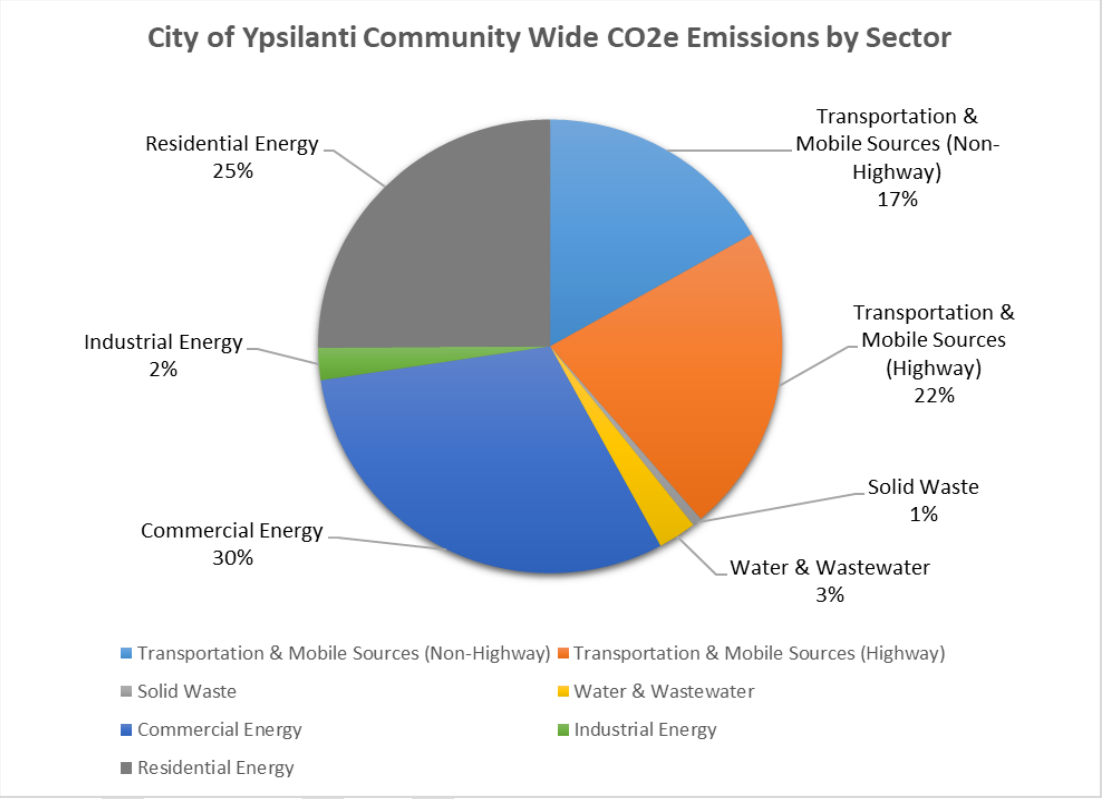


Figure 6 – Community-Wide CO2e Emissions by Sector, Identical to Figure 1

Figure 7 shows a breakdown of community-wide CO2e emissions by activity, source, and source and activity.

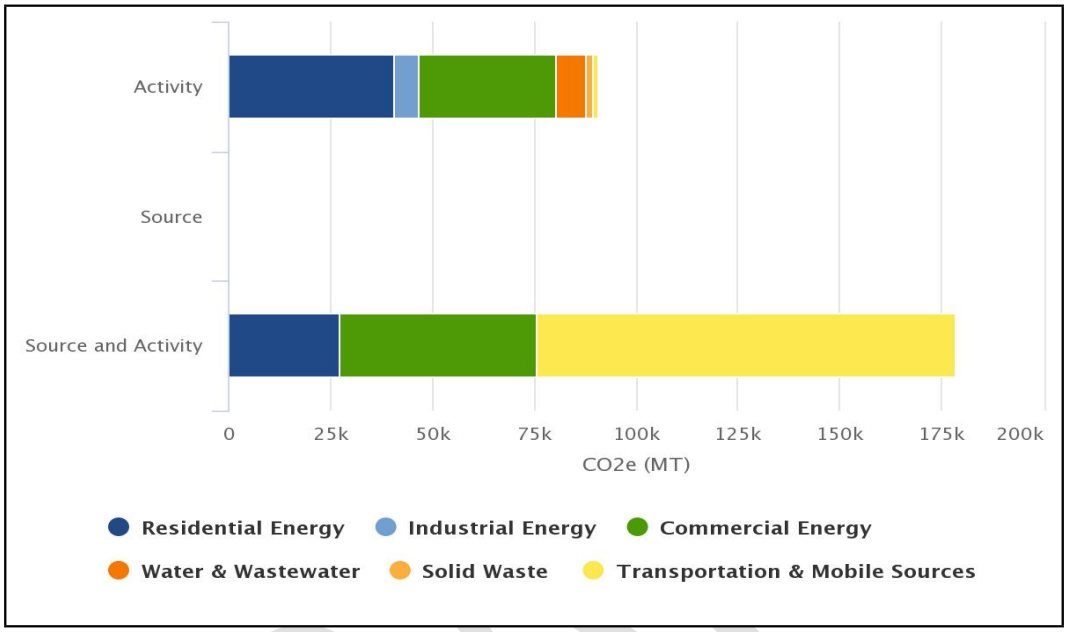


Figure 7 - Community-Wide CO2e Emissions by Activity and Source

Source does not show on the figure 7 bar graph, thus figure 8 is provided to illustrate source emissions produced as a result of solid waste generation.

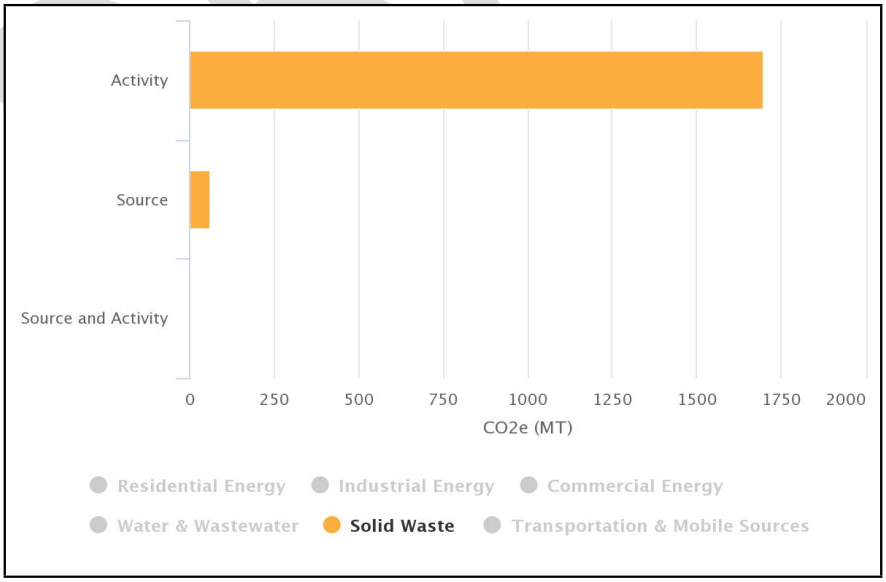


Figure 8 - Community-Wide Solid Waste CO2e Emissions by Activity and Source

Transportation and Other Mobile Sources

Transportation within the geographical boundaries of the City of Ypsilanti resulted in a total of 104,357.1 MT CO2e representing 39% of total community emissions. Table 4 below provides a breakdown of transportation sectors included in the emissions inventory.

Table 4: Community-Wide Transportation and Other Mobile Sources CO2e Emissions

Sources Inventory Record	CO2e (MT)
AAATA Ypsilanti Local Route	792.58
Passenger Transportation – Non-Highway (Gasoline)	35,364.47
Freight Transportation – Non-Highway (Diesel)	8,282.46
Passenger Transportation – Non-Highway (Diesel)	720.8
Passenger Transportation – Highway (Gasoline)	37,839.44
Passenger Transportation – Highway (Diesel)	1,026.14
Freight Transportation – Highway (Diesel)	19,704.02
Rail Transportation – Passenger	106.12
Rail Transportation – Freight	521.07
Total Transportation	104,357.1

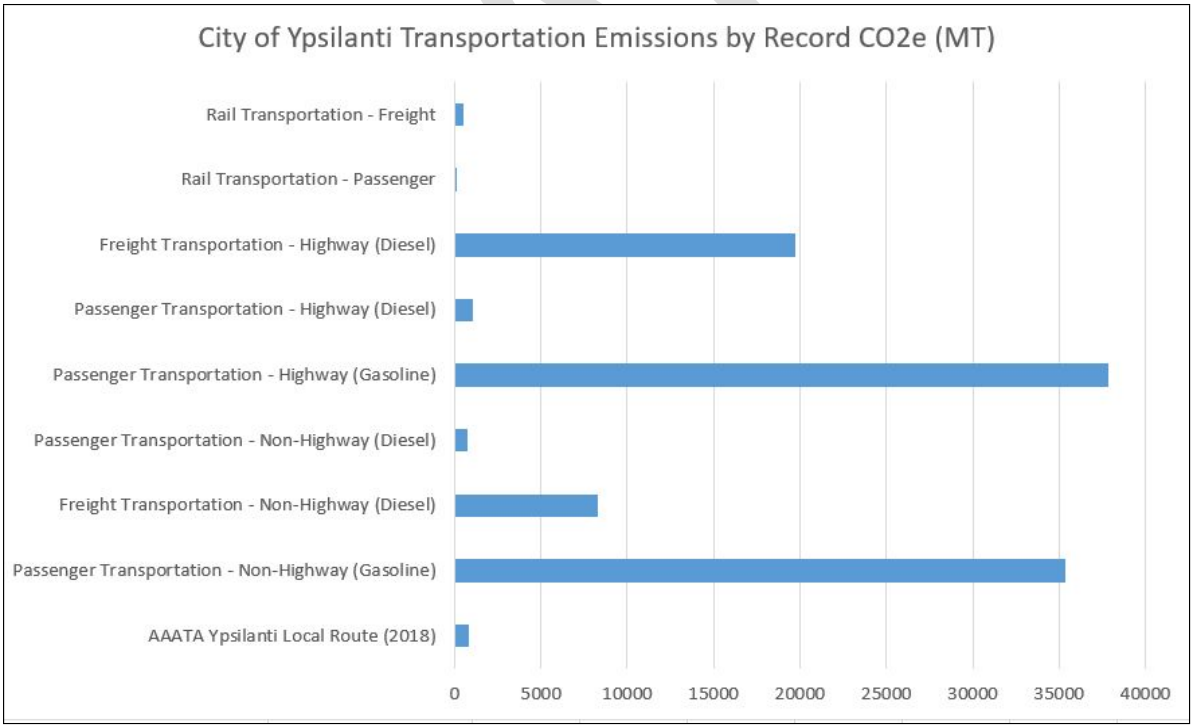


Figure 9 - Community-Wide Transportation CO2e Emissions

I-94 passes through the southern boundary of the City of Ypsilanti and represents a significant source of transportation related emissions which are not directly attributable to the community. The Southeast Michigan Council of Governments (SEMCOG) estimates that highway travel on I-94 represents 53% of

all total on-road vehicle miles traveled within the City annually while non-highway vehicle miles represent 47%. The City of Ypsilanti also contains approximately 2.15 miles of railway owned by MDOT. Norfolk Southern operates freight lines and Amtrak operates passenger rail lines that both utilize this railway. Emissions from highway transportation and railway transportation are considered outside the jurisdiction of local control but are included in total community emissions calculations due to emissions occurring within the boundaries of the city. Figure 10 below provides a breakdown of emissions by local attribution.

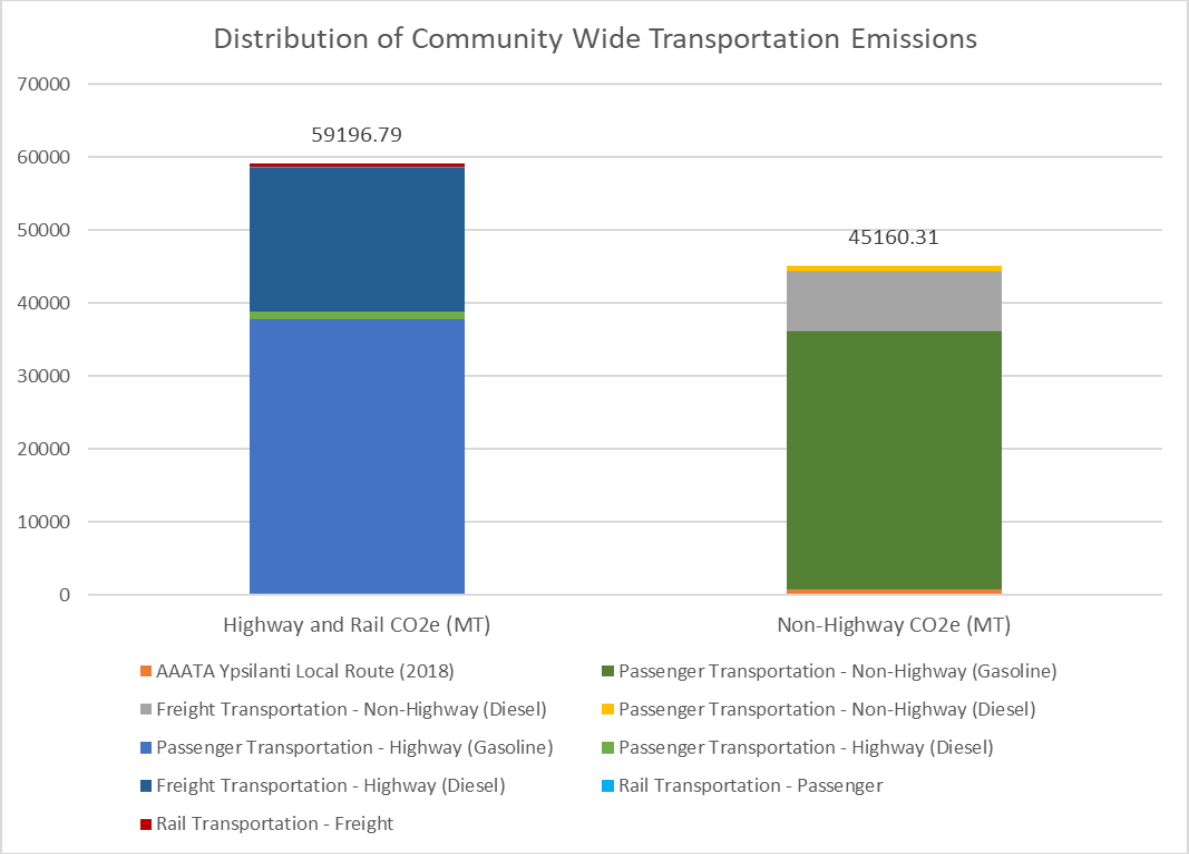


Figure 10 - Distribution of Community-Wide Transportation Emissions

Figure 10 above shows the distribution of transportation emissions that can be considered influenced by the local community and government. Emissions grouped under 'Highway and Rail CO2e' are considered out of jurisdiction and include highway travel by passenger vehicles, freight vehicles, Amtrak passenger rail emissions and Norfolk Southern freight rail emissions. Emissions considered within jurisdiction are grouped under 'Non-Highway CO2e' and include on-road passenger and freight travel within the city boundaries as well as emissions associated with AAATA local bus routes.

Solid Waste

Solid waste generation resulted in 1,759 MT CO2e emissions for 2018 and represented 1% of total community emissions. Solid waste generation data was collected for both the community of Ypsilanti and Eastern Michigan University. Solid waste generated by the community resulted in 1,026.46 MT CO2e emissions, community composting resulted in 59.7 MT CO2e emissions, and solid waste generated by

EMU resulted in 672.85 MT CO2e emissions. Emissions resulting from the collection and transportation of waste by contracted service providers within city boundaries are accounted for in the transportation sector. Solid waste generation and annual composting data was provided by the City of Ypsilanti, Eastern Michigan University, and Waste Management.

Water & Wastewater

Wastewater treatment and the supply of potable water resulted in 7,244 MT CO2e and account for 3% of total community emissions. Within this sector the supply of potable water generated 25.02 MT CO2e, wastewater treatment generated 7,180.62 MT CO2e, and emissions from wastewater treatment nitrification and denitrification generated 39.1 MT CO2e. Energy use data and process specifications were provided by the Ypsilanti Community Utilities Authority (YCUA) and emissions were determined using the potable water and wastewater ClearPath calculators.

Commercial Energy

Commercial energy use within the City of Ypsilanti generated 82,084.81 MT CO2e representing 30% of total greenhouse gas emissions. Figure X below shows the distribution of emissions between commercial energy consumption.

The City of Ypsilanti is home to Eastern Michigan University (EMU) which operates a 7.8 MW cogeneration plant to generate 98% of the university's heat and 93% of the university's electricity needs. In 2017 EMU replaced an aging cogeneration unit with a new high efficiency unit projected to reduce annual emissions of CO2 by 21,305 tons/year and reduce NOx emissions by 112 tons annually. Emissions from Eastern Michigan University represent 46% of total commercial emissions in the City of Ypsilanti.[10]

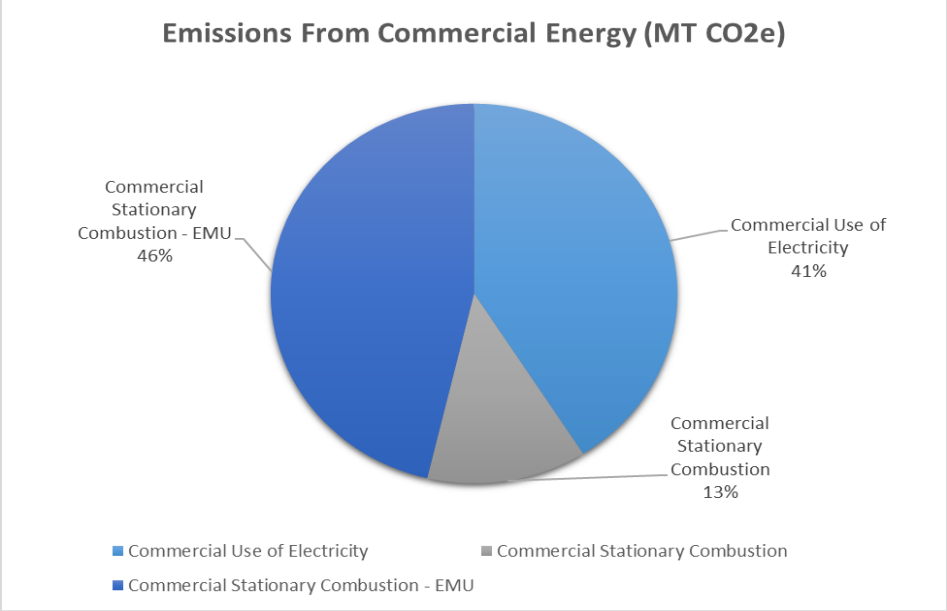


Figure 11 - Commercial Energy CO2e Emissions

[10] Project summary provided by Eastern Michigan University.

Industrial Energy
Consumption of electricity and natural gas by industry generated 6,202.51 MT CO2e in 2018. This represents 2% of total community emissions and the second lowest emitting sector in the City of Ypsilanti. Industrial energy usage data was provided by DTE and emissions were determined using 2018 grid emissions data and the industrial energy ClearPath calculators.

Residential Energy
Residential consumption of electricity and natural gas generated 67,531 MT CO2e representing 25% of total community emissions. The table below shows the breakdown of emissions by energy usage for the residential sector.

Emissions from Residential Energy Use		
Residential electricity use	40,470.77 MT CO2e	60%
Residential natural gas use	27,061.02 MT CO2e	40%
Total	67,531.79 MT CO2e	100%

Comparative residential emissions by energy type.

Within the residential sector electricity use accounted for 60% of emissions while natural gas use in stationary combustion accounted for 40%. As a significant source of community emissions this suggests that targeting reductions in residential electricity use is a priority for emissions reductions planning. Residential natural gas consumption for space conditioning or water heating is considered a source while residential electricity usage is considered an activity under the community emissions protocol.

Significantly Influenced Emissions Frame

The City of Ypsilanti has chosen to also 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 the City of Ypsilanti has the greatest opportunity to address. This frame includes all of the five Basic Emissions Generating Activities required by the community protocol. Table 5 and Figure 12 summarize significantly influenced emissions by source and activity.

Table 5: Significantly Influenced GHG Emissions by Activity and Source

Source or Activity	Activity Data Quantity and Unit	Emissions Factor	Emissions (metric tons CO2e)
Residential Use of Electricity	41,328,187 kWh	DTE and eGRID emissions	40,470 MT
Commercial/Industrial Use of Electricity	40,684,198 kWh	DTE and eGRID emissions	39,840.16 MT
Residential Stationary Combustion	5,087,949.6 therms	DTE emissions factors	27,061.02 MT
Commercial Stationary Combustion	1,962,209.7 therms	DTE emissions factors	10,436.31 MT
On-road Passenger Vehicle Travel	89,611,810.17 vehicle miles	ClearPath calculator	36,085.27 MT
On-road Freight Vehicle Travel	5,045,219.69 vehicle	ClearPath	8,282.46 MT

	miles	calculator	
Use of Electricity in Potable Water Treatment and Distribution	25,545 kWh	DTE and eGRID emissions	25.02 MT
Use of Energy in Wastewater Treatment	6,072,706.08 kWh & 233,819.5 therms	DTE and eGRID emissions	7,180.62 MT
Generation of Solid Waste	3,475 tons	EPA Michigan waste characterization	1,026.46 MT
Total Significantly Influenced Emissions			**170,407.32 MT**

City of Ypsilanti will focus on these emissions sources and activities in developing a climate action plan. The total significantly influenced emissions of 170,407.32 metric tons CO2e will be the baseline for setting an emissions reduction target and measuring future emissions reductions against.

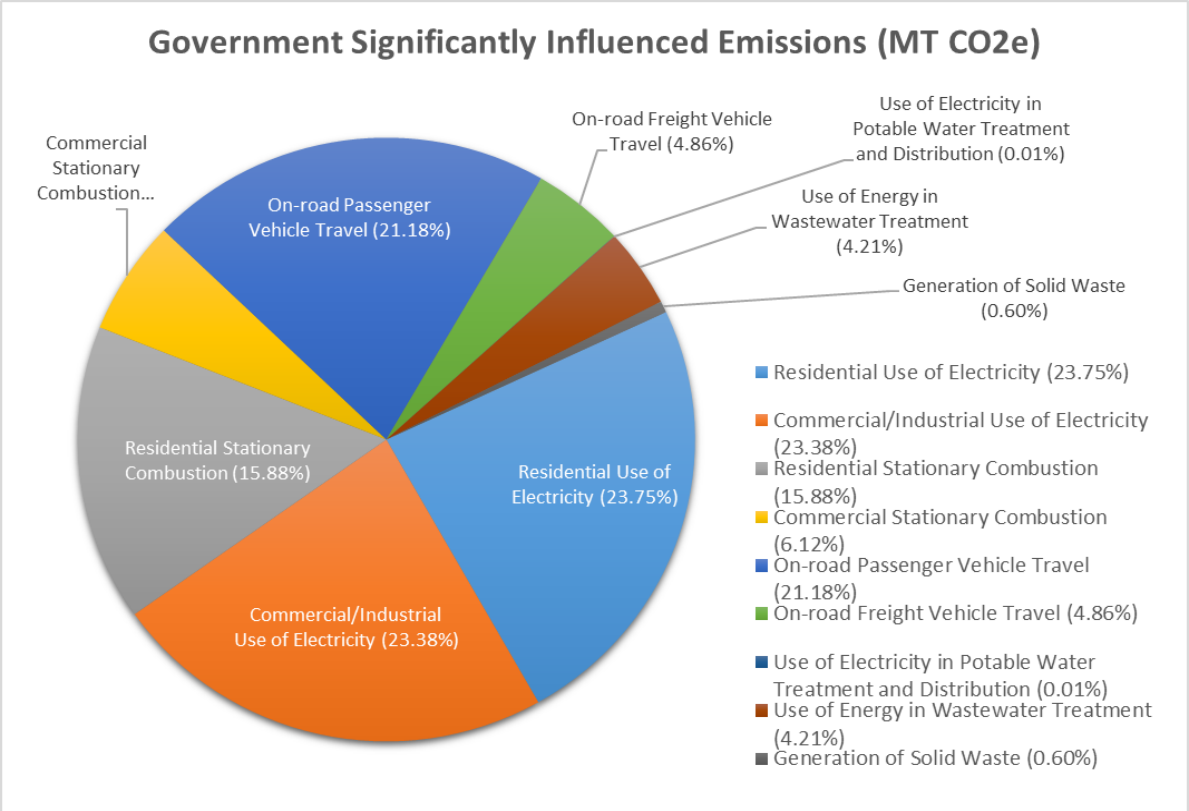


Figure 12: Community-Wide Activity Emissions Subject to Local Government Significant Influence, Identical to Figure 2

Residential use of electricity is the largest contributor to emissions over which City of Ypsilanti has significant influence. This will be an important activity to focus efforts on in developing a climate action

plan. Commercial and industrial electricity use as well as on-road passenger vehicle travel also account for a large part of significantly influence emissions, and will also be important to address.

Government Emissions Inventory Results

City of Ypsilanti Government Operations Profile

To put emissions inventory data in context, it is helpful to have some basic information about the government. This information is provided in Table 6.

Table 6: City of Ypsilanti Government Indicators

2018 Size	**4.51 square miles**
2010 Population	**19,435 people**
Annual Budget	
Employees (FTE staff)[11]	**136**
Climate Zone	
Heating Degree Days	**6615**
Cooling Degree Days	**853**

Government Operation Emissions by Sectors

Following the Government Protocol, this inventory report organizes emissions by sectors as shown in table 7.

Table 7: Government Operations GHG Emissions Scopes by Sector

Sector	Scope	Data Quantity and Unit	Emissions Factor	Emissions (metric tons CO2e)
Buildings & Facilities				
Building Electricity Use	Scope 2	494722 kWh	DTE and eGRID emissions data	523 MT
Building Stationary Combustion	Scope 1	37415.47 therms	DTE emissions and ClearPath calculator	199 MT
Street Lights & Traffic Signals				
Street Lights & Traffic Signal Electricity Use	Scope 2	772880.44 kWh	DTE and eGRID emissions data	814.6 MT

[11] Full time equivalent (FTE) staff employed by the City of Ypsilanti.

Vehicle Fleet				
Vehicle Fleet Emissions	Scope 1	555,353.1 vehicle miles	City fleet data, ClearPath calculator	631.44 MT
Solid Waste				
Generation of Solid Waste	Scope 3	702 tons	Waste generation metrics and ClearPath calculator	181.6 MT
Employee Commute				
Employee Commute Emissions	Scope 3	1,129,427 vehicle miles	Employee commute survey and ClearPath calculator	421.96 MT
Total Government Emissions				**2,771.6 MT**

The City of Ypsilanti generated 2,771.6 MT CO2e through municipal operations in 2018. Emissions from government operations are classified as Scope 1, Scope 2, or Scope 3. More information on emissions scopes is available on page 17 of this report. Figure X and Figure Y below show municipal emissions by scope and sector.

Table 8: Government Operations CO2e Emissions by Scope and Sector

Scope	Sector	CO2e (MT)
Scope 1	Buildings & Facilities	198
Scope 1	Vehicle Fleet	631
Scope 2	Buildings & Facilities	522
Scope 2	Street Lights & Traffic Signals	814
Scope 3	Employee Commute	421
Scope 3	Solid Waste Facilities	181

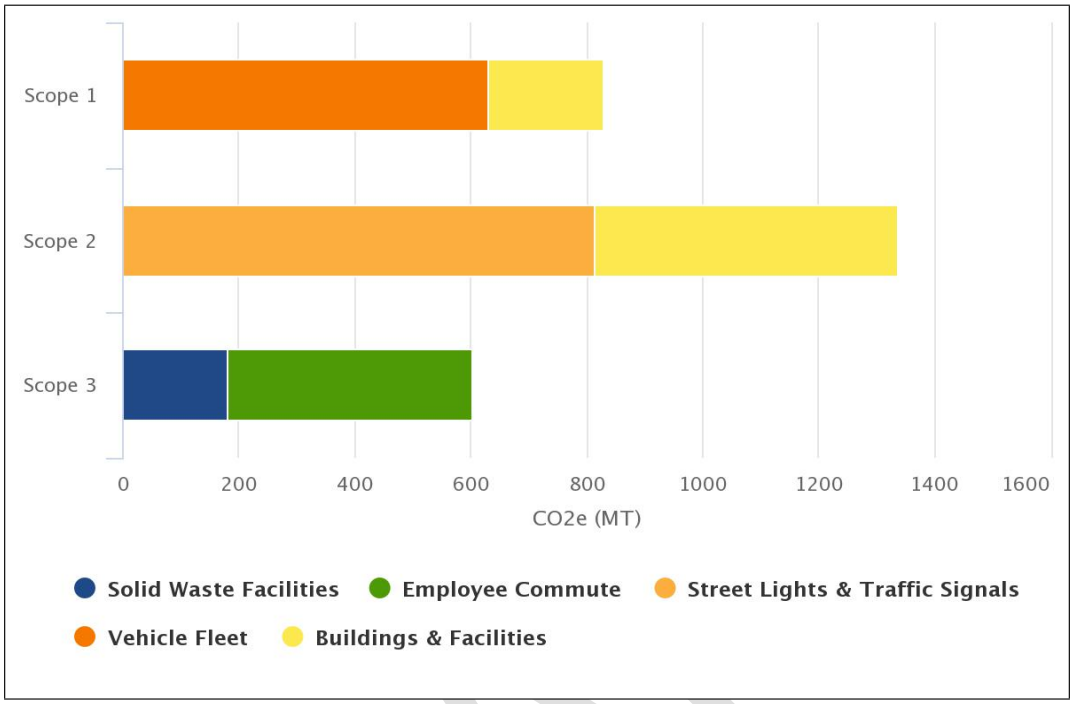


Figure 13 - City of Ypsilanti Government Operations Emissions by Scope and Sector

Buildings and Facilities

Energy consumption by municipally owned buildings and facilities resulted in 722 MT CO2e emissions in 2018 representing 26% of total municipal emissions. Table 9 below shows emissions associated with this sector by building and fuel use. Emissions resulting from natural gas combustion for space conditioning and water heating are classified as Scope 1 emissions while emissions resulting from electricity consumption are classified as Scope 2 as emissions occur outside city boundaries.

Table 9: Government Operations Buildings and Facilties CO2e Emissions

Building	MT CO2e
DPS - Parks (80 River Park Dr.) Electricity	0.50
City Hall (1 S. Huron St.) Electricity	81.24
City Hall (1 S. Huron St.) Natural Gas	36.9
DPS - Parks (221 River Park Dr. Bldg. Ped) Electricity	1.29
Fire Station (525 W. Michigan) Electricity	133.39
Fire Station Natural Gas (525 W. Michigan)	47
Senior Center (1015 N. Congress St.) Electricity	24.45
Senior Center (1015 N. Congress St.) Natural Gas	9.72
DPS - Parks (1620 Roosevelt) Electricity	0.11
DDA - (45 N Huron St Electricity)	0.02
DPS - Parks (217 River Park Dr.) Electricity	17.7
Public Works Yard (14 W. Forest Ave.) Electricity	56.54
Public Works Yard (14 W Forest Ave) Natural Gas	47.99
DPS - Parks (430 Rice Ave.) Electricity	0.02

DPS - Parks (515 E Cross St.) Electricity	0.47
Police Station (505 W. Michigan) Electricity	105.05
Police Station (505 W. Michigan) Natural Gas	20.87
Parkridge Community Center (791 Harriet) Electricity	58.05
Parkridge Community Center (791 Harriet) Electricity	0.01
Parkridge Community Center (791 Harriet) Natural Gas	36.52
RCY (651 Rice St.) Electricity	4.91
DPS – Parks (1017 Congress St.) Electricity	0.49
DPS – Parks (304 N Huron St.) Electricity	0.20
City Ypsilanti Government Buildings and Facilities Electric Power Transmission and Distribution Losses	38.54
Total	**722**

The Fire Department represents the largest emitter in this sector at 25% of total building emissions. The second largest emission source is the Police Department (17.4%) followed by City Hall (16.4%). Notably, Scope 2 emissions resulting solely from electric power transmission and distribution losses represent 5.34% of total building emissions. In future emissions reduction planning it is recommended that energy efficiency and renewable energy projects account for the benefits associated with reducing transmission losses in addition to reducing on-site energy consumption. Figure 14 below illustrates the proportional contribution to total building sector emissions by facility.

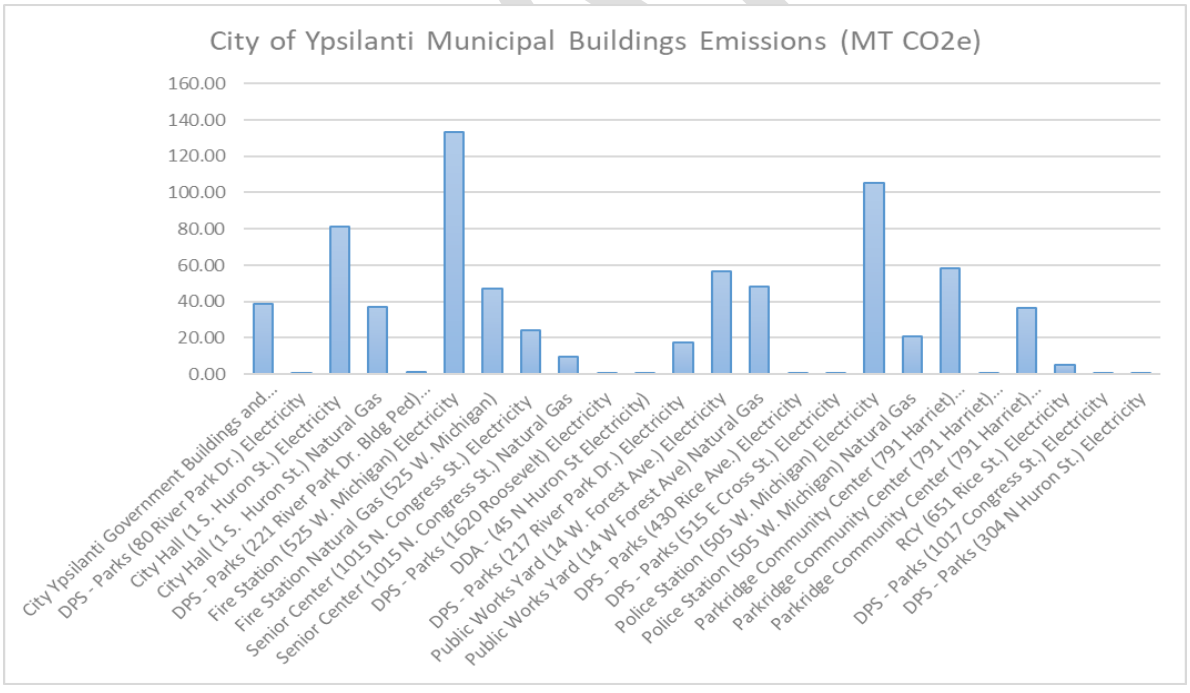


Figure 14 - Comparative Emissions from Municipal Buildings and Facilities

Streetlights and Traffic Signals

Electricity consumption by electric streetlights and traffic signals resulted in 814.59 MT CO2e representing 29.39% of total government emissions. Emissions resulting from electricity consumption are classified as Scope 2 and utility data was provided by DTE. The City of Ypsilanti has completed an LED

retrofit of the municipal street lighting portfolio and an overview of emissions reductions in the lighting sector is available in the comparison section of this report. Table 10 below provides detail on streetlight sector emissions and emissions resulting from transmission and distribution losses.

Table 10: Government Operations Streetlights and Traffic Signals CO2e Emissions

Record	MT CO2e
Electric Streetlights and Traffic Signals	736.23 MT
DPS – Streetlights (9 Washington)	8.22 MT
DPS – Streetlights (12 N Adams St.)	1.23 MT
DPS – Streetlights (30 S Huron)	9.75 MT
DPS – Streetlights (31 E Cross St.)	1.42 MT
Streetlight and Traffic Signal Electric Power Transmission and Distribution Losses	57.75 MT
Total Streetlight and Traffic Signal	814.59 MT

Vehicle Fleet

The City of Ypsilanti municipal vehicle fleet generated 631.44 MT CO2e representing 22.78% of total government emissions. Table 11 and Figure 15 below provide vehicle fleet emissions by department and fuel type.

Table 11: Government Operations Municipal Vehicle Fleet Emissions

Department and Fuel Type	MT CO2e
DPW – Gasoline	113.31 MT
DPW – Diesel	118.74 MT
Environmental Services – Gasoline	0.44 MT
Environmental Services – Diesel	47.83 MT
DPS – Diesel	2.37 MT
Building – Gasoline	6.5 MT
City Hall – Gasoline	6.14 MT
Fire Department – Diesel	58.37 MT
Fire Department – Gasoline	162.56 MT
Police – Gasoline	115.16 MT
Total Vehicle Fleet Emissions	**631.44 MT**

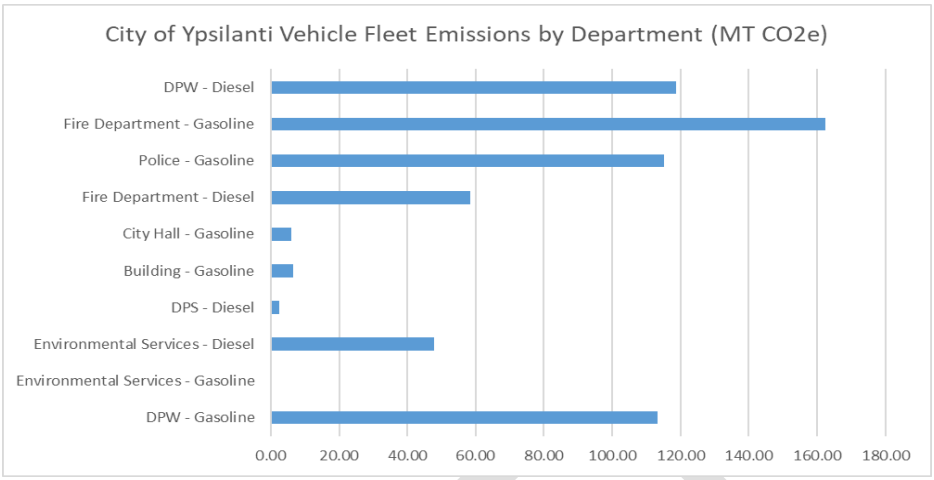


Figure 15 - Comparative Emissions from municipal Vehicle Fleet by Department

The DPW, Fire Department, and Police fleets represent the highest contribution to total emissions. Vehicle fleet emissions data is categorized as Scope 1 and emissions were calculated using data from the city budgeting process, fuel purchase records, and vehicle reports.

Solid Waste Facilities

The City of Ypsilanti does not have solid waste facilities within the City and contracts waste collection and disposal to a third-party provider. In 2018 solid waste generation from municipal activities generated 181.6 MT CO2e. Emissions resulting from solid waste generation by municipal operations is classified as scope 3 and represents 6.55% of total 2018 government CO2e emissions.

Employee Commute

Government employee commutes generated 421.96 MT CO2e in 2018 representing 15.22% of total government emissions. Commuting data was gathered through a survey of City of Ypsilanti employees and emissions calculated based on vehicle data and mileage provided through the survey. Table 12 below illustrates annual commuting emissions by travel method.

Table 12: Government Operations Employee Commute Emissions by Method

Commute Method	CO2e (MT)
Employee Commute – Air Travel	1.02 MT
Employee Commute – Gasoline	420.63 MT
Employee Commute – Bus	0.32 MT
Total Commute Emissions	421.96 MT

Commuting by gasoline fueled vehicle was the most prevalent commuting type among survey respondents. Among employees commuting by personal vehicle passenger vehicles represent 38% of vehicles and light trucks make up 62%. The employee commute survey indicated that 4.17% of city employees bike to work, 8.3% of city employees walk to work, and 6.25% of city employees commute by public transit sometimes or always. Survey results also indicate that the average roundtrip commute to work for city employees is 32.43 miles/day.

Appendix A: Community Inventory Details

Table A-1 provides a summary of the emissions sources and activities that are included in the community inventory, as well as those potential sources that are excluded.

Table A-1: Summary of Included and Excluded Community Emissions

Emissions Type		Source or Activity?	Required Activities	Included under reporting frameworks: SI	CA	IS (EMU)	Excluded (IE, NA, NO, or NE)	Explanatory Notes	Emission ($MTCO_2e$)
Built Environment									
Use of fuel in residential and commercial stationary combustion equipment		Source AND Activity	•	•	•	•			75497.53
Industrial stationary combustion sources		Source	•						10.56
Electricity	Power generation in the community	Source	•		•	•		EMU Combined Heat and Power, in commercial SFC	
	Use of electricity by the community	Activity	•						80,310.93
District Heating/ Cooling	District heating/cooling facilities in the community	Source					NO		
	Use of district heating/cooling by the community	Activity					NO		
Industrial process emissions in the community		Source					NO		
Refrigerant leakage in the community		Source					NE	Data unavailable	
Transportation and Other Mobile Sources									
On-road Passenger Vehicles	On-road passenger vehicles operating within the community boundary	Source	•					Includes highway and non-highway	74950.85
	On-road passenger vehicle travel associated with community land uses	Activity					IE	Included in community boundary VMT	

On-road Freight Vehicles	On-road freight and service vehicles operating within the community boundary	Source	•					Includes highway and non-highway	27986.48
	On-road freight and service vehicle travel associated with community land uses	Activity					IE	Included in community boundary VMT	
On-road transit vehicles operating within the community boundary		Source	•						792.58
Transit Rail	Transit rail vehicles operating within the community boundary	Source					NO		
	Use of transit rail travel by the community	Activity					NO		
Inter-city passenger rail vehicles operating within the community boundary		Source	•						106.12
Freight rail vehicles operating within the community boundary		Source	•						521.07
Emissions Type		**Source or Activity?**	**Required Activities**	**Included under reporting frameworks: SI**	**CA**	**IS (EMU)**	**Excluded**	**Notes**	**Emissions (MTCO2e)**
Marine	Marine vessels operating within the community boundary	Source					NO		
	Use of ferries by the community	Activity					NO		
Off-road surface vehicles and other mobile equipment operating within the community boundary		Source					NO		
Use of air travel by the community		Activity					NO		
Solid Waste									
Solid Waste	Operation of solid waste disposal facilities in the community	Source					NO		
	Generation and disposal of solid waste by the community	Activity	•	•	•	•			1699.31
Water and Wastewater									
Potable Water - Energy Use	Operation of water delivery facilities in the community	Source					NO		
	Use of energy associated with use of potable water by the community	Activity	•	•	•				25.02
Use of energy associated with generation of wastewater by the community		Activity	•	•	•				7180.62
Centralized Wastewater Systems - Process Emissions	Process emissions from operation of wastewater treatment facilities located in the community	Source					NO		
	Process emissions associated with generation of wastewater by the community	Activity	•	•	•				39.1
Use of septic systems in the community		Source AND					NO		

	activity							
Agriculture								
Domesticated animal production	Source					NO		
Manure decomposition and treatment	Source					NO		
Upstream Impacts of Community-Wide Activities								
Upstream impacts of fuels used in stationary applications by the community	Activity					NE		
Upstream and transmission and distribution (T&D) impacts of purchased electricity used by the community	Activity		•	•		IE	T&D losses included in electricity use emissions	
Upstream impacts of fuels used for transportation in trips associated with the community	Activity					NE		
Upstream impacts of fuels used by water and wastewater facilities for water used and wastewater generated within the community boundary	Activity					NE		
Upstream impacts of select materials (concrete, food, paper, carpets, etc.) used by the whole community	Activity					NE		

Table A-2 provides details on calculation methods and data sources for each included activity and source.

Table A-2: Community Inventory Calculation Method and Data Source Details

Commercial Energy

Inventory Record	Notes	CO2 (MT)	CH4 (MT)	N2O (MT)	CO2e (MT)
City of Ypsilanti Commercial Electricity Consumption 2018 (Commercial)	Commercial electricity consumption data provided by DTE Energy.	33374.46	2.0020019	0.27934911	33504.5419
City of Ypsilanti Commercial Electricity Consumption 2018 (Commercial Outdoor Lighting)	2018 Commercial Outdoor Lighting electricity consumption data provided by DTE.	139.4057	0.0083624	0.00116685	139.949044
City of Ypsilanti Commercial Electric Consumption 2018 (Electric Streetlight and Automatic Traffic Signals)	Electric Streetlight and Automatic Traffic Signal commercial electricity consumption data for 2018 provided by DTE.	3.78085	0.0002268	3.1646E-05	3.79558683
City of Ypsilanti Commercial Natural Gas Consumption (Commercial)	Commercial natural gas consumption data provided by DTE. Average heat content of natural gas delivered to customers in 2018 provided by DTE.	10403.64	0.9811049	0.0196221	10436.307
Eastern Michigan University - CHP & Campus SFC	Emissions and energy usage provided by EMU. Direct entry emissions record.	37961.5	0.71	0.071	38000.195

Inventory Record	GPC Scope	GPC Ref Number	Factor Profiles	Global Warming Potential	Activity Source
City of Ypsilanti Commercial Electricity Consumption 2018 (Commercial)	Scope 2	I.2.2	DTE Energy 2018 Emissions Factor	IPCC 5th Assessment 100 Year Values	Activity
City of Ypsilanti Commercial Electricity Consumption 2018 (Commercial Outdoor Lighting)	Scope 2	I.2.2	DTE Energy 2018 Emissions Factor	IPCC 5th Assessment 100 Year Values	Activity
City of Ypsilanti Commercial Electric Consumption 2018 (Electric Streetlight and Automatic Traffic Signals)	Scope 2	I.2.2	DTE Energy 2018 Emissions Factor	IPCC 5th Assessment 100 Year Values	Activity

City of Ypsilanti Commercial Natural Gas Consumption (Commercial)	Scope 1	I.2.1		IPCC 5th Assessment 100 Year Values	Source and Activity
Eastern Michigan University - CHP & Campus SFC	Scope 1	I.2.1		IPCC 5th Assessment 100 Year Values	Source and Activity

Inventory Record	Energy Equivalent (MMBtu)	CO2 Emissions Factor	CH4 Emissions Factor	N2O Emissions Factor	Energy Used	CO2 lbs/MWh	CH4 lbs/GWh	N2O lbs/GWh
City of Ypsilanti Commercial Electricity Consumption 2018 (Commercial)	116772.587	-	-	-	3E+07	2150.5	129	18
City of Ypsilanti Commercial Electricity Consumption 2018 (Commercial Outdoor Lighting)	487.761092	-	-	-	1E+05	2150.5	129	18
City of Ypsilanti Commercial Electric Consumption 2018 (Electric Streetlight and Automatic Traffic Signals)	13.2286689	-	-	-	3876	2150.5	129	18
City of Ypsilanti Commercial Natural Gas Consumption (Commercial)	196220.977	53.02	0.005	0.0001	2E+06	-	-	-
Eastern Michigan University - CHP & Campus SFC	Direct Entry	53.02	0.005	0.0001	Direct Entry	-	-	-

Industrial Energy

Inventory Record	Notes	CO2 (MT)	CH4 (MT)	N2O (MT)	CO2e (MT)
City of Ypsilanti Industrial Electricity Consumption 2018	Industrial electricity consumption for 2018 provided by DTE Energy.	6167.819	0.369983	0.051626	6191.859
City of Ypsilanti Industrial Natural Gas Consumption 2018	Industrial natural gas consumption for the year 2018 provided by DTE. Average heat content of natural gas delivered to customers in 2018 (1,063 Btu/cf) provided by DTE.	10.63518	0.000201	2.01E-05	10.64611

Inventory Record	GPC Scope	GPC Ref Number	Factor Profiles	Global Warming Potential	Activity Source
City of Ypsilanti Industrial Electricity Consumption 2018	Scope 2	I.3.2	DTE Energy 2018 Emissions Factor	IPCC 5th Assessment 100 Year Values	Activity
City of Ypsilanti Industrial Natural Gas Consumption 2018	Scope 1	I.3.1	DTE natural gas emissions and ClearPath calculator	IPCC 5th Assessment 100 Year Values	Source

Inventory Record	Energy Equivalent (MMBtu)	CO2 Emissions Factor	CH4 Emissions Factor	N2O Emissions Factor	Energy Used	CO2 lbs/MWh	CH4 lbs/GWh	N2O lbs/GWh
City of Ypsilanti Industrial Electricity Consumption 2018	21580.3	0.285807	1.71E-05	2.39E-06	6323040	2150.5	129	18
City of Ypsilanti Industrial Natural Gas Consumption 2018	200.588	0.05302	0.000001	1E-07	2005.881	-	-	-

Residential Energy

Inventory Record	Notes	CO2 (MT)	CH4 (MT)	N2O (MT)	CO2e (MT)
City of Ypsilanti Electric Residential Outdoor Lighting	Data received from DTE.	32.89613	0.00197331	0.000275345	33.02435
City of Ypsilanti Residential Electric Consumption 2018	Data received from DTE.	40280.75	2.41628295	0.337155761	40437.75
City of Ypsilanti Residential Natural Gas Consumption 2018	Residential natural gas usage (ccf) provided by DTE Energy. Calculated using average heat content of natural gas delivered to consumers by DTE in 2018 (1063 Btu/cf) provided by DTE.	26976.31	2.54397479	0.050879496	27061.02

Inventory Record	GPC Scope	GPC Ref Number	Factor Profiles	Global Warming Potential	Activity Source
City of Ypsilanti Electric Residential Outdoor Lighting	Scope 2	I.1.2	DTE Energy 2018 Emissions Factor	IPCC 5th Assessment 100 Year Values	Activity
City of Ypsilanti Residential Electric Consumption 2018	Scope 2	I.1.2	DTE Energy 2018 Emissions Factor	IPCC 5th Assessment 100 Year Values	Activity
City of Ypsilanti Residential Natural Gas Consumption 2018	Scope 1	I.1.1	DTE natural gas emissions and ClearPath calculator	IPCC 5th Assessment 100 Year Values	Source and Activity

Inventory Record	Energy Equivalent (MMBtu)	CO2 Emissions Factor	CH4 Emissions Factor	N2O Emissions Factor	Energy Used	CO2 lbs/MWh	CH4 lbs/GWh	N2O lbs/GWh
City of Ypsilanti Electric Residential Outdoor Lighting	115.099	0.286	2E-05	2E-06	33724	2151	129	18

City of Ypsilanti Residential Electric Consumption 2018	140936.7	0.286	2E-05	2E-06	4E+07	2151	129	18
City of Ypsilanti Residential Natural Gas Consumption 2018	508795	53.02	0.005	0.0001	5E+06	-	-	-

Water & Wastewater

Inventory Record	Notes	CO2 (MT)	CH4 (MT)	N2O (MT)	CO2e (MT)
YCUA Wastewater Treatment 2018	YCUA wastewater treatment emissions data provided by Sree Mullapudi, Director Wastewater Operations/Compliance, Ypsilanti Community Utilities Authority. Note: utility data covers the FY Sep 2018-Aug 2019.	7153.665	0.471342	0.051902	7180.6169
YCUA Potable Water Supply	YCUA emissions from the supply of potable water to the city in 2018 provided by Michael Shaffer, Director of Service Operations.	24.91791	0.001495	0.000209	25.015032
YCUA Wastewater Treatment Nitrification/Denitrification	Nitrification/Denitrification emissions provided by YCUA.			0.147532	39.09598

Inventory Record	GPC Scope	GPC Ref Number	Factor Profiles	Global Warming Potential	Activity Source
YCUA Wastewater Treatment 2018	Scope 3	VI.1	DTE Energy 2018 Emissions Factor	IPCC 5th Assessment 100 Year Values	Activity

YCUA Potable Water Supply	Scope 3	VI.1	DTE Energy 2018 Emissions Factor	IPCC 5th Assessment 100 Year Values	Activity
YCUA Wastewater Treatment Nitrification/Denitrification	Scope 3	III.4.2	DTE Energy 2018 Emissions Factor	IPCC 5th Assessment 100 Year Values	Activity

Inventory Record	Energy Equivalent (MMBtu)	CO2 Emissions Factor	CH4 Emissions Factor	N2O Emissions Factor	Energy Used	CO2 lbs/MWh	CH4 lbs/GWh	N2O lbs/GWh
YCUA Wastewater Treatment 2018	67128.74	0.285807			6072706.08 kWh; 22569445.8 therms	2150.5	129	18
YCUA Potable Water Supply	87.1843	0.285807	1.7E-05		25545	2150.5	129	18
YCUA Wastewater Treatment Nitrification/Denitrification	-	-	-	-	-	2150.5	129	18

Transportation

Inventory Record	Notes	CO2 (MT)	CH4 (MT)	N2O (MT)	CO2e (MT)
AAATA Ypsilanti Local Route (2018)	AAATA fleet fuel usage sourced from AAATA 2018 Budget and fuel consumption allocation sourced from AAATA Productivity by Route FIxed-Route Service 4th Quarter FY 2016 report.	792.5784	0	0	792.5784

Passenger Transportation - Non-Highway (Gasoline)	2018 VMT and distribution of highway and non-highway VMT provided by SEMCOG.	35056.84	1.67512842	0.983853	35364.47
Freight Transportation - Non-Highway (Diesel)	2018 VMT and distribution of highway and non-highway VMT provided by SEMCOG.	8275.322	0.02573062	0.024217	8282.46
Passenger Transportation - Non-Highway (Diesel)	2018 VMT and distribution of highway and non-highway VMT provided by SEMCOG.	720.2793	0.00116428	0.001827	720.796
Passenger Transportation - Highway (Gasoline)	2018 VMT and estimated breakdown of highway and non-highway VMT provided by SEMCOG.	37507.72	1.77548379	1.06415	37839.44
Passenger Transportation - Highway (Diesel)	2018 VMT and estimated breakdown of highway and non-highway VMT provided by SEMCOG.	1025.367	0.00205209	0.002704	1026.141
Freight Transportation - Highway (Diesel)	2018 VMT and breakdown of highway and non-highway VMT provided by SEMCOG.	19687.04	0.0612133	0.057613	19704.02
Rail Transportation - Passenger	Annual fuel consumption from Amtrak rail travel provided by Laura Fotiou, Lead Environmental Specialist, Amtrak Environment and Sustainability.	105.181	0.00824141	0.002678	106.1215

Rail Transportation - Freight	MDOT owns 2.15 miles of railroad passing through the City of Ypsilanti. There are no rail stops within the city boundaries. Railroad traffic is divided between passenger (operated by Amtrak) and freight (operated by Norfolk Southern). Annual fuel use for freight was determined by calculating total gallons of diesel consumed/mile/year by the Norfolk Southern railroad system and data was located in the 2018 Norfolk Southern Corporate Social Responsibility Report.	516.4528	0.04046643	0.013152	521.0711
Inventory Record	GPC Scope	GPC Ref Number	Factor Profiles	Global Warming Potential	Activity Source
AAATA Ypsilanti Local Route (2018)	Scope 1	II.1.1	DTE Energy 2018 Emissions Factor and 2018 AAATA	IPCC 5th Assessment 100 Year Values	Activity
Passenger Transportation - Non-Highway (Gasoline)	Scope 1	II.1.1	DTE Energy 2018 Emissions Factor and 2018 US National Defaults (updated 2020)	IPCC 5th Assessment 100 Year Values	Source and Activity

Freight Transportation - Non-Highway (Diesel)	Scope 1	II.1.1	DTE Energy 2018 Emissions Factor and 2018 US National Defaults (updated 2020)	IPCC 5th Assessment 100 Year Values	Source and Activity
Passenger Transportation - Non-Highway (Diesel)	Scope 1	II.1.1	DTE Energy 2018 Emissions Factor and 2018 US National Defaults (updated 2020)	IPCC 5th Assessment 100 Year Values	Source and Activity
Passenger Transportation - Highway (Gasoline)	Scope 1	II.1.1	DTE Energy 2018 Emissions Factor and 2018 US National Defaults (updated 2020)	IPCC 5th Assessment 100 Year Values	Source and Activity
Passenger Transportation - Highway (Diesel)	Scope 1	II.1.1	DTE Energy 2018 Emissions Factor and 2018 US National Defaults (updated 2020)	IPCC 5th Assessment 100 Year Values	Source and Activity

Freight Transportation - Highway (Diesel)	Scope 1	II.1.1	DTE Energy 2018 Emissions Factor and 2018 US National Defaults (updated 2020)	IPCC 5th Assessment 100 Year Values	Source and Activity
Rail Transportation - Passenger	Scope 3	II.2.3	DTE Energy 2018 Emissions Factor	IPCC 5th Assessment 100 Year Values	Activity
Rail Transportation - Freight	Scope 3	II.2.3	Norfolk Southern fleet performance metrics	IPCC 5th Assessment 100 Year Values	Activity

Inventory Record	On Road VMT	Fuel Type	Calculation Method	% Motorcycle	% Passenger Vehicle	% Light Truck	% Heavy truck
AAATA Ypsilanti Local Route (2018)	-	Biodiesel	VMT & MPG	-	-	-	-
Passenger Transportation - Non-Highway (Gasoline)	94657029.9	Gasoline	VMT & MPG	0.87	69.16	23.24	0
Freight Transportation - Non-Highway (Diesel)	94657029.9	Diesel	VMT & MPG	0	0	0	5.33
Passenger Transportation - Non-Highway (Diesel)	94657029.9	Diesel	VMT & MPG	0	0.34	1.06	0
Passenger Transportation - Highway	106879850	Gasoline	VMT & MPG	0.74	61.75	24.82	0

(Gasoline)							
Passenger Transportation - Highway (Diesel)	106879850	Diesel	VMT & MPG	0	0.31	1	0.15
Freight Transportation - Highway (Diesel)	106879850	Diesel	VMT & MPG	0	0	0	11.23
Rail Transportation - Passenger	-	Diesel	Fuel use and trip frequency	-	-	-	-
Rail Transportation - Freight	-	Diesel	Fuel use and trip frequency	-	-	-	-

Solid Waste

Inventory Record	Notes	CO2 (MT)	CH4 (MT)	N2O (MT)	CO2e (MT)
Community Compost 2018	Composting data metrics provided by City of Ypsilanti.		0.47816	0.17544	59.88008
EMU Waste Generation 2018	EMU data provided by Waste Management. Landfilled waste - 2,396.3 tons Diverted waste - 190.6 tons Total waste - 2,586.9 tons		24.03046		672.853
City of Ypsilanti Community Waste Generation 2018	Number of households and businesses obtained from U.S. Census data: https://www.census.gov/quickfacts/fact/table/ypsilanticitymichigan/AGE295218 Waste service has changed since 2012 GHG Inventory, Woodland Meadows Recycling and Disposal Facility is no longer utilized. 2018 waste disposal service provided by Republic and City waste is disposed at Saulk Trail Hills landfill in Canton, MI.		36.65933		1026.461

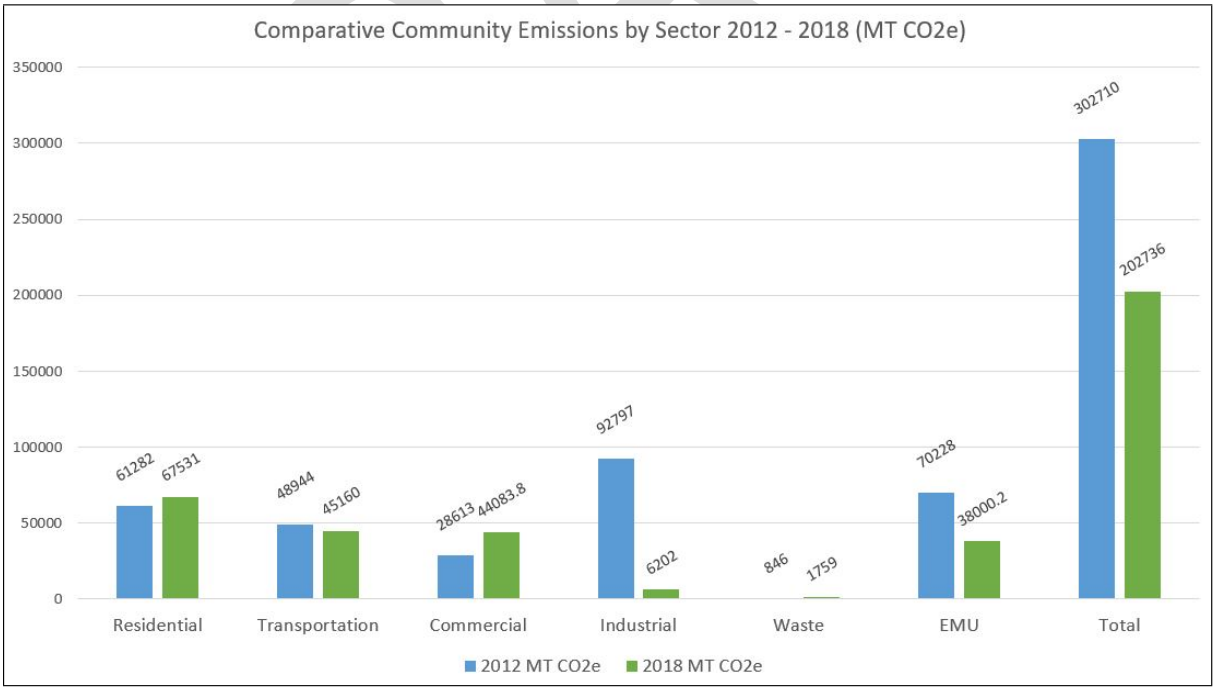
Inventory Record	GPC Scope	GPC Ref Number	Factor Profiles	Global Warming Potential	Activity Source
Community Compost 2018	Scope 1	III.2.1	Composting data provided by City of Ypsilanti	IPCC 5th Assessment 100 Year Values	Source
EMU Waste Generation 2018	Scope 3	III.1.2	2016 EPA Michigan Waste Characterization - Community	IPCC 5th Assessment 100 Year Values	Activity
City of Ypsilanti Community Waste Generation 2018	Scope 3	III.1.2	2016 EPA Michigan Waste Characterization - Community	IPCC 5th Assessment 100 Year Values	Activity

Inventory Record	Waste Generated (Wet Tons)	Waste Composted (Tons)	Landfill Methane Collection
Community Compost 2018	-	860	-
EMU Waste Generation 2018	2396.3	-	Aggressive Collection
City of Ypsilanti Community Waste Generation 2018	3475	-	Typical

Appendix B: Comparison to 2012 Inventory

As noted in the methodology overview the City previously evaluated 2005/2008 community and government greenhouse gas emissions in coordination with the 2012 Climate Action Plan released in July of 2012. For consistency purposes, this report does not acknowledge the 2005/2008 emissions as an official base year for this inventory. The reason for not officially including the 2005/2008 emissions as a base year is that the report does not follow the Community Emissions Protocol because the Community Emissions Protocol did not exist during the 2012 inventory report process. Instead the 2012 community-wide inventory report followed methods outlined in the International Local Government Greenhouse Gas (GHG) Emissions Analysis. Both the 2012 and 2020 inventories for government emissions followed methods outlined in the Government Protocol. It is important to know that the 2012 and 2020 inventories are not easily comparable due to variations in the data collected and the sectors evaluated. A simple comparison of these reports by sector is provided below for informational purposes.

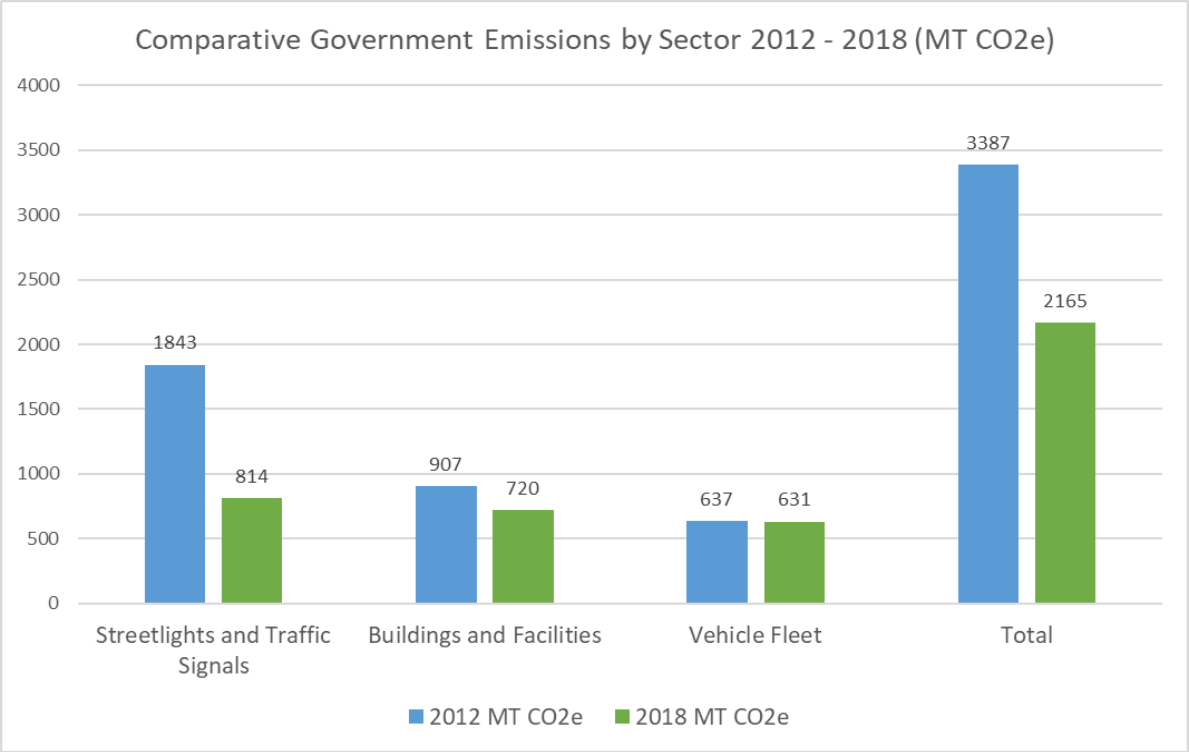
Community Wide Emissions Inventory



Comparison of changes in community-wide emissions since 2012 inventory.

Overall community emissions have decreased from a total of 302,710 MT CO2e reported in the 2012 inventory to 202,736 MT CO2e for the 2018 inventory year. The largest declines occurred in the industrial energy sector and from Eastern Michigan University. It is important to note that due to varying account procedures used for both inventories the above results reflect sectors originally accounted for in the 2012 inventory and further analysis by sector is required for a comprehensive comparison between inventories.

Government Emissions Inventory



Comparison of changes in government emissions since 2012 inventory.

Overall government emissions decreased from 3,387 MT CO2e reported in the 2012 inventory to 2,165 MT CO2e for the 2018 inventory year. The largest decrease in emissions occurred in the Streetlights and Traffic Signals sector. This is most likely attributed to the City's conversion of the municipal streetlight portfolio to LED lighting. As with the community inventory above the variation in accounting methods used by both inventories requires further analysis for comparative emissions across sectors.

City of Ypsilanti
Greenhouse Gas Assessment Report Review

Monday March 16th, 2020
1:00pm – 2:00pm
Dial-in: (252) 745-1062
PIN: 963 529 622#

1. Welcome and Introductions

2. Overview of Community Inventory (Page 23 – 32)
    a. Review of sectors
    b. Key findings and top emitters
    c. Government Significant Influence (SI) frame and relevant sectors

3. Overview of Government Inventory (Page 34 – 42)
    a. Review of sectors
    b. Key findings and top emitters

4. Reporting on Non-Emitting Actions
    a. Renewable energy sources
    b. Carbon neutral transportation methods

5. Comparison to 2012 Inventory Results (Page 58)
    a. Overview of changes
    b. Comparison methodology

6. Closing and Next Steps
    a. Alignment with 2035 carbon neutrality resolution

Education
Services
Training + Jobs

313.849.1030
ecoworksdetroit.org
building sustainable solutions

22400 W. Seven Mile Rd.
Detroit, MI 48219