ULSTER COUNTY, NEW YORK

2022 Inventory of Community-Wide Greenhouse Gas Emissions

Prepared For:

Ulster County,
New York

Produced By:

ICLEI – Local Governments for Sustainability USA
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ICLEI – Local Governments for Sustainability USA

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Executive Summary

Ulster County recognizes that greenhouse gas (GHG) emissions from human activity catalyze profound climate change, the consequences of which pose substantial risks to the community's future health, well-being, and prosperity. As a participating Silver Certified New York State Climate Smart Community, Ulster County is committed to tracking GHG emissions over time and implementing climate action measures to reduce emissions. This report provides estimates of GHGs resulting from community-scale activities in Ulster County in 2022 and compares these to the Mid-Hudson Regional Greenhouse Gas Emissions Inventory (2012), which is used as the baseline to measure against. The report serves as an update to the 2018 Ulster County Community Greenhouse Gas Inventory. In conjunction with the Ulster County Countywide Community GHG Inventory Report, community GHG profiles for each of the twenty-four (24) municipalities of Ulster County: twenty (20) towns, three (3) villages, and the City of Kingston are being compiled. These profiles are the first step for each local jurisdiction to complete a Community GHG Inventory report and Climate Action Plan and is an effort by the County to leverage the resources needed.

Executive Order 1-2023 (EO1-2023), "Regarding Implementation of the New York State Climate Leadership and Community Protection Act," contains thirteen climate action directives for Ulster County laid out by County Executive Jen Metzger that aligns with the New York State Climate Leadership and Community Protection Act. Within such directives include updated GHG emission reduction targets for both Ulster County government operations and community-wide GHG Emissions to "reduce greenhouse gas emissions by forty percent (40%) by 2030 and eighty-five percent (85%) by 2050, with an interim target of twenty-five percent (25%) by 2025" for Ulster County Government emissions specifically.

EO1-2023 community-wide targets are more aggressive than the 2018 Community GHG Inventory of "decreasing community-wide greenhouse gas emissions by 80% by 2050 (below 1990 levels)." Some of the directives are oriented to Ulster County government operations, while others are county-wide or a combination of both scales, such as "Ulster County shall endeavor to divert one hundred percent (100%) of organic waste from landfills and incinerators by 2030 to reduce climate-damaging emissions of methane, beginning with organics separation and recycling at County facilities." The directives are a combination of creating new policies, programs, or initiatives, or in other cases, improving or building upon existing ones. EO1-2023, along with the NYS Climate Smart Communities Program framework, combined with gained insight from this inventory report, will guide the County forward with its climate action efforts, starting with a Community Climate Action Plan (CCAP). The CCAP will set goals and initiatives to reduce GHG emissions through identifying priority actions through a stakeholder-driven process that the County of Ulster can lead or support at a community-wide scale.

This project has been funded in part by The Climate Smart Communities Grant Program, Title 15 of the Environmental Protection Fund through the NYS Department of Environmental Conservation.

Key Findings

Figure 1 shows community-wide emissions by sector. The largest contributor is Transportation, with 54% of emissions. The next largest contributors are Residential Energy (17%) and Commercial & Industrial Energy (9%). Upstream Impacts, Process & Fugitive, Solid Waste, Industry Fuel Oil & Coal, Agriculture, and Water & Wastewater were responsible for the remaining (less than 20%) emissions. Actions to reduce emissions in all of these sectors will be a key part of a climate action plan. Ulster County's total 2022 emissions were 2,148,946 metric tons of carbon dioxide equivalent (Mt CO2e).

The Inventory Results section of this report provides a detailed profile of emissions sources within Ulster County, New York–information that is key to guiding local reduction efforts. These data will also provide a baseline against which the county will be able to compare future performance and demonstrate progress in reducing emissions.

COMMUNITY EMISSIONS AT A GLANCE

1 Transportation
54%

2 Residential Energy
17%

3 Commercial Energy
9%

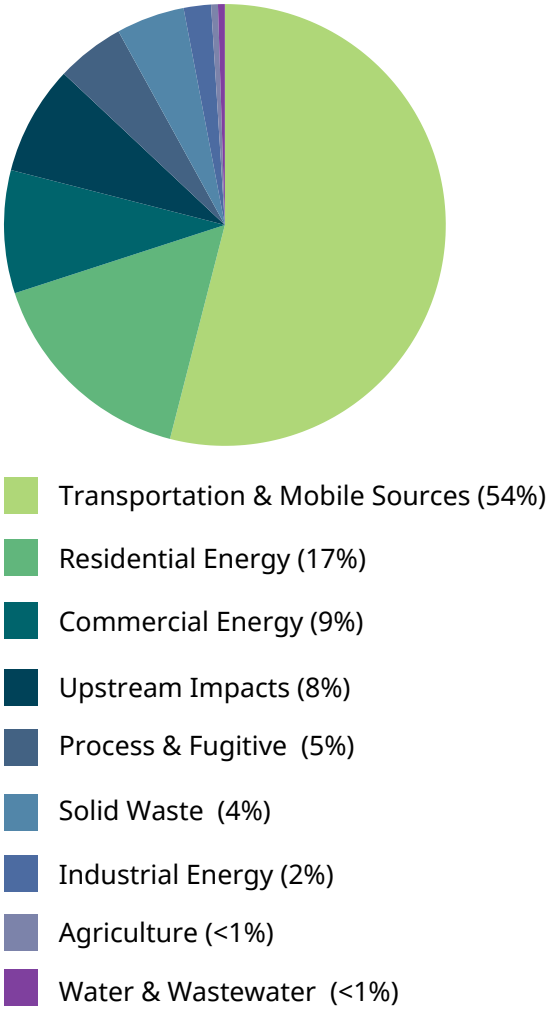
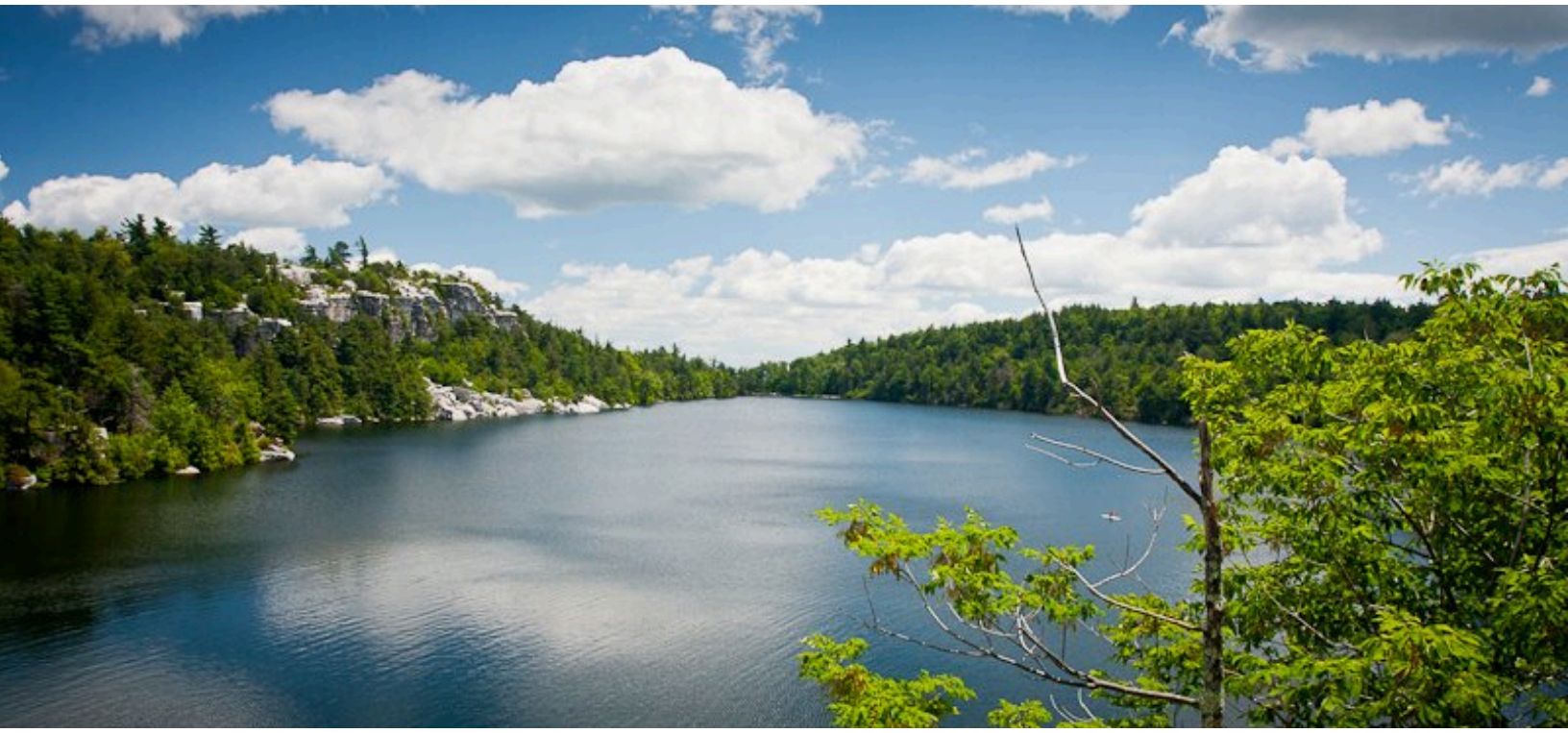


Figure 1: Community-Wide Emissions by Sector

Introduction to Climate Change

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 burning 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, threatening the safety, quality of life, and economic prosperity of global communities. Although the natural greenhouse effect is needed to keep the earth warm, a human-enhanced greenhouse effect with the rapid accumulation of Greenhouse Gases (GHG) in the atmosphere leads to too much heat and radiation being trapped. The Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report confirms that human activities have unequivocally caused an increase in carbon emissions [1]. Many regions are already experiencing the consequences of global climate change, and Ulster County is no exception.



[1] IPCC, 2021: Summary for Policymakers. In: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [MassonDelmotte, V., P. Zhai, A. Pirani, S. L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M. I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J. B. R. Matthews, T. K. Maycock, T. Waterfield, O. Yelekçi, R. Yu and B. Zhou (eds.)]. Cambridge University Press. In Press.

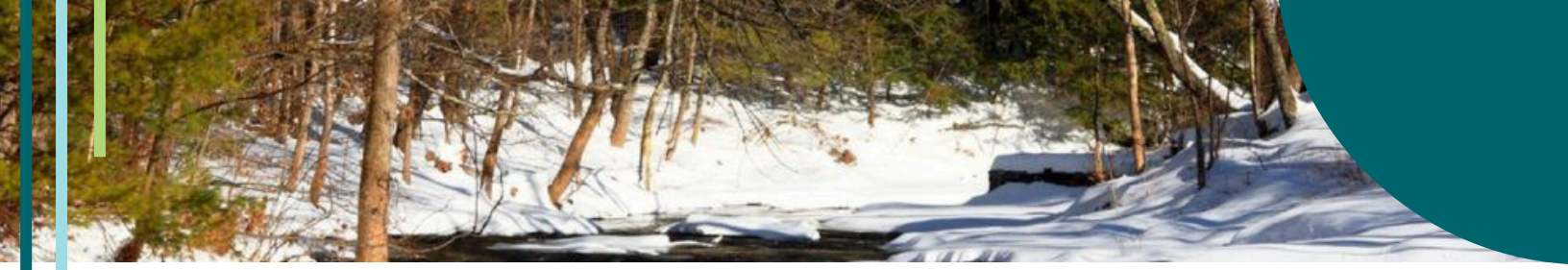
Ulster County is no stranger to extreme weather. The County experiences significant flooding and droughts, heat waves and freezes, and intense storms producing tornadoes, hail, and lightning. Climate change intensifies these patterns, leading to more frequent extreme events and more variability year to year.

The Ulster County Climate Hazards Summary (2023) provides a broad overview of observed and projected climate hazards in Ulster County. Rising temperatures contribute to hotter summers, warmer winters, disrupted seasonal patterns, and more frequent severe weather events. Weather data collected at the Mohonk Preserve weather station in New Paltz, New York, shows that the average temperature has risen approximately 2°F over the past 126 years. According to a New York State Department of Environmental Conservation (NYSDEC) study, by the 2080s, annual average temperatures across New York will increase by an additional 4°F under the lower emissions scenario and by more than 6°F under the high emissions scenario [2]. In addition, winters in the northeastern U.S. have warmed three times faster than summers, at a rate of more than 1°F per decade. Because warmer air holds more water, the decline in cold temperatures results in more precipitation falling as rain or sleet instead of snow, further contributing to flooding events [3].

In Ulster County, the 1-in-100-year storm, which has a 1% chance of being met or exceeded in any given year, has historically produced more than 7 inches of rain in 24 hours, but storms once considered to be 1% annual chance events are occurring more frequently, and are now likely to occur almost twice as often as in the 1950s [4].

Additionally, the topography of the Catskill Mountains often contributes to higher precipitation than in other parts of Ulster County. Another unique natural feature of Ulster County is the Hudson River. Increases in heavy precipitation, severe storms, and changing seasonal patterns lead to

[2]New York State Department of Environmental Conservation. 2021. Observed and Projected Climate Change in New York State: An Overview. Retrieved from https://extapps.dec.ny.gov/docs/administration_pdf/ccnys2021.pdf.
[3] U.S. Global Change Research Program. 2018. National Climate Assessment – Ch 18: Northeast. Retrieved from https://nca2018.globalchange.gov/chapter/18/.
[4] Northeast Regional Climate Center ACIS. 2010-2022. Extreme Precipitation in NY and New England Interactive Web Tool. Retrieved from https://precip.eas.cornell.edu/#/



increased flood risk, especially in riverine areas and Hudson River coastal and inland tidal areas. As sea levels continue to rise, some areas will experience more frequent high-tide flooding and may become permanently inundated [5]. Additionally, areas with large amounts of impervious surfaces can contribute to increased stormwater runoff and increased flood risk. This is of particular significance for the City of Kingston in Ulster County.

Ulster County is in the process of updating its Multi-Jurisdictional Hazard Mitigation Plan, with the plan update due for adoption by the end of the year 2024. The plan update process re-assesses risk and the County's vulnerability and capacity to mitigate a variety of natural hazards. The draft plan identifies wildfires as a high hazard in Ulster County, elevating the existing 2017 plan's risk assessment from moderate. Areas typically considered prone to wildfires include large tracts of wild lands containing heavier fuels [6]. According to the Ulster County Open Space Plan, approximately 32% of the County is protected open space, which consists largely of forest lands in the Catskill Park as well as Minnewaska State Park and Mohonk Preserve along the Shawangunk Ridge Wildfire events are expected to continue in Ulster County, and may increase if drought conditions become more prevalent in the future [7]. (See the complete Ulster County Multi-Jurisdictional hazard risk assessment and mitigation plan, to be available in Spring 2024)

Table 1: Climate Hazards and Projected Trends in Ulster County

Climate Hazards	Projected Trends
Extreme Heat	Increasing frequency & duration
Milder Winters & Shifting Seasons	Increasing frequency
Severe Weather	Increasing frequency & severity
Heavy Precipitation & Flooding	Increasing intensity, frequency & severity
Coastal Storm Surge & Sea Level Rise	Increasing frequency & severity
Drought	Increasing frequency & severity
Wildfire	Increasing risk

[5] NOAA National Centers for Environmental Information. 2022. New York Climate Summary. Retrieved from https://statesummaries.ncics.org/chapter/ny/.
[6] Ulster County. 2017. Multi-Jurisdictional Hazard Mitigation Plan. https://ulstercountyny.gov/emergency-services/management/index.html
[7] Ulster County. 2007.Open Space Plan. https://ulstercountyny.gov/planning/open-space-plan

According to the 2018 National Climate Assessment, increasing temperature and extreme precipitation in the County's region will impact social and economic systems, particularly as infrastructure ages and populations shift to urban centers [8]. Ulster County's diverse economy is largely driven by the thriving tourism industry, with many of the County's communities continuing to experience revitalization despite–and partly attributable to in recent years–the COVID-19 pandemic and proximity to New York City. There are abundant dining, lodging, shopping, and arts and entertainment opportunities throughout the County; an extensive outdoor recreation network includes parks and hiking trails (including the Catskill Mountains, Mohonk Preserve, and increasingly interconnected rail trails); agritourism (including seasonal activities such as apple and pumpkin picking); and many others. Every aspect of the tourism industry–including the many individual businesses and residents that support it–has the potential to increasingly be disrupted by future climate change. Extreme heat will discourage and limit outdoor recreation activities. Shifting seasons, especially milder winters, will impact some industries, like skiing and other winter-based activities, more than others. Severe weather events, heavy precipitation, and flooding can all cause unpredictable local and regional disruptions, including power outages and other utility service interruptions, as well as other impacts to not only assets and infrastructure but to business operations to the overall viability of the natural resource and other assets that support recreation and tourism activities; and to the essential functionality of the many interrelated systems needed to entice and support visitors in Ulster County (Ulster County Climate Adaptation Planning & Integration Opportunities).

Fortunately, Ulster County and many other communities around the world have started to address climate change at the local level, both by reducing GHG emissions and by taking actions to mitigate the effects that are already being seen. Many of these climate actions have multiple public benefits. For example, planting trees and weatherizing homes not only reduces GHGs but also helps the community deal with extreme heat. Retrofitting homes and businesses to be more efficient creates local jobs. More efficient use of energy decreases utility and transportation costs for residents and businesses. Increasing opportunities for walking and bicycling improves residents' health, and reducing fossil fuel use improves air quality. Taking climate action now not only reduces future climate hazards but can also improve the economy, public health, and quality of life.

[8] U.S. Global Change Research Program. 2018. National Climate Assessment – Ch 18: Northeast. Retrieved from https://nca2018.globalchange.gov/chapter/18/.

Greenhouse Gas Inventory as a Step Toward Carbon Neutrality

Facing the climate crisis requires the concerted efforts of local governments and their partners, those that are close to the communities directly dealing with the impacts of climate change.

Cities, towns, and counties are well placed to define coherent and inclusive plans that address integrated climate action — climate change adaptation, resilience and mitigation. Existing targets and plans need to be reviewed to bring in the necessary level of ambition and outline how to achieve net-zero emissions by 2050 at the latest. Creating a roadmap for climate neutrality requires Ulster County to identify priority sectors for action, while considering climate justice, inclusiveness, local job creation and other benefits of sustainable development.

To complete this inventory, Ulster County utilized tools and guidelines from ICLEI - Local Governments for Sustainability USA (ICLEI USA), which provides authoritative direction for GHG emissions accounting and defines climate neutrality as follows:

> The targeted reduction of greenhouse gas (GHG) emissions and GHG avoidance in government operations and across the community in all sectors to an absolute net-zero emission level at the latest by 2050. In parallel to this, it is critical to adapt to climate change and enhance climate resilience across all sectors, in all systems and processes.

To achieve ambitious emissions reduction, and move toward climate neutrality, Ulster County will need to set a clear goal and act rapidly following a holistic and integrated approach. Climate action is an opportunity for our community to experience a wide range of co-benefits, such as creating socio-economic opportunities, reducing poverty and inequality, and improving the health of people and nature.

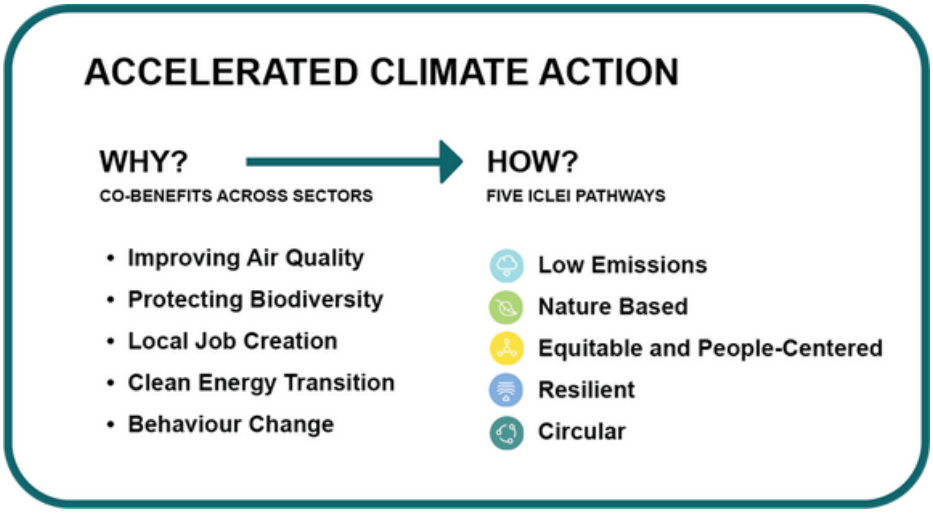


Figure 2: Co-Benefits and ICLEI Pathways to Accelerated Climate Action

Inventory Methodology

Understanding a Greenhouse Gas Emissions Inventory

The first step toward achieving tangible GHG emission reductions requires identifying baseline emissions levels and sources and activities generating emissions in the community. This report presents emissions from the Ulster County, NY community as a whole.

As local governments continue to join the climate protection movement, the need for a standardized approach to quantify GHG emissions has proven essential. This inventory uses the approach and methods provided by the U.S. Community Protocol for Accounting and Reporting Greenhouse Gas Emissions (Community Protocol) and the Local Government Operations Protocol for Accounting and Reporting Greenhouse Gas Emissions (LGO Protocol), both of which are described below.

Three GHGs are included in this inventory: carbon dioxide (CO2), methane (CH4), and nitrous oxide (N2O). Many of the charts in this report represent emissions in "carbon dioxide equivalent" (CO2e) values, calculated using the Global Warming Potentials (GWPs) for methane and nitrous oxide from the IPCC 5th Assessment Report [9]. Other gases, such as nitrous oxide and fluorinated gases (HFCs, PFC, etc.), were included as process emissions from electronics manufacturing, but they were only collected as CO2e measurements.

Table 2: Global Warming Potential Values (IPCC, 2014)

Greenhouse Gas	Global Warming Potential
Carbon Dioxide (CO2)	1
Methane (CH4)	28
Nitrous Oxide (N2O)	265

Community Emissions Protocol

Version 1.2 of the U.S. Community Protocol for Accounting and Reporting GHG Emissions [10] was released by ICLEI in 2019, and represents a national standard in guidance to help U.S. local

[9] AR5 Synthesis Report: Climate Change 2014. IPCC. https://www.ipcc.ch/report/ar5/syr
[10] "US Community Protocol for Accounting and Reporting Greenhouse Gas Emissions." 2012. ICLEI http://www.icleiusa.org/tools/ghg-protocol/community-protocol

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.

The community inventory in this report includes emissions from the five Basic Emissions Generating Activities required by the Community Protocol. These activities are:

- Use of electricity by the community
- Use of fuel in residential and commercial stationary combustion equipment
- On-road passenger and freight motor vehicle travel
- Use of energy in potable water and wastewater treatment and distribution
- Decomposition of solid waste generated by the community

The community inventory also includes the following activities:

- Wastewater treatment processes
- Public transit
- Industrial facilities energy consumption
- Agriculture
- Upstream impacts of energy
- Transportation of solid waste
- Process and fugitive emissions

Quantifying Greenhouse Gas Emissions

Sources and Activities

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

Table 3: Source vs. Activity for Greenhouse Gas Emissions (GHG)

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 emission 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 division of emissions into sources and activities can be used in addition to the scopes framework, which is used in government operations inventories, but does not always have a clear application to community inventories.

Inventory Scopes

In addition to the sources and activities framework for categorizing emissions, communities can also categorize emissions with the scopes framework, providing a supplemental lens for assessing emissions and identifying reduction measures. This inventory includes the following scopes:

- Scope 1: Direct emissions from in-boundary sources, such as the combustion of natural gas for heating and cooling buildings or diesel use in vehicles within Ulster County
- Scope 2: Indirect emissions from grid-supplied energy sources, such as electricity consumed by buildings in Ulster County
- Scope 3: Out-of-boundary emissions, such as those resulting from the export of solid waste to a landfill outside Ulster County

Base Year

The inventory process requires the selection of a base year with which to compare current emissions. Ulster County's community GHG emissions inventory utilizes 2018 as its baseline year because it is the most recent year for which the necessary data are available.

Quantification Methods

GHG emissions can be quantified in two ways:

- Measurement-based methodologies refer to the direct measurement of GHG 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. To calculate emissions accordingly, the basic equation below is used:

Activity Data x Emission Factor = Emissions

Most emissions sources in this inventory are quantified using calculation-based methodologies. Activity data refers to the relevant measurement of energy use or other GHG-generating processes,

such as fuel consumption by fuel type, metered annual electricity consumption, and annual vehicle miles traveled. Please see the appendices for a detailed list of the activity data composing this inventory.

Known emission factors are used to convert energy usage or other activity data into associated quantities of emissions. Emissions factors are usually expressed in terms of emissions per unit of activity data (e.g., lbs CO2/kWh of electricity). For this inventory, calculations were made using ICLEI USA's ClearPath Climate Planner tool.

Community Emissions Inventory Results

The total community-wide emissions for the 2022 inventory are shown by sector and scope in Figure 5.

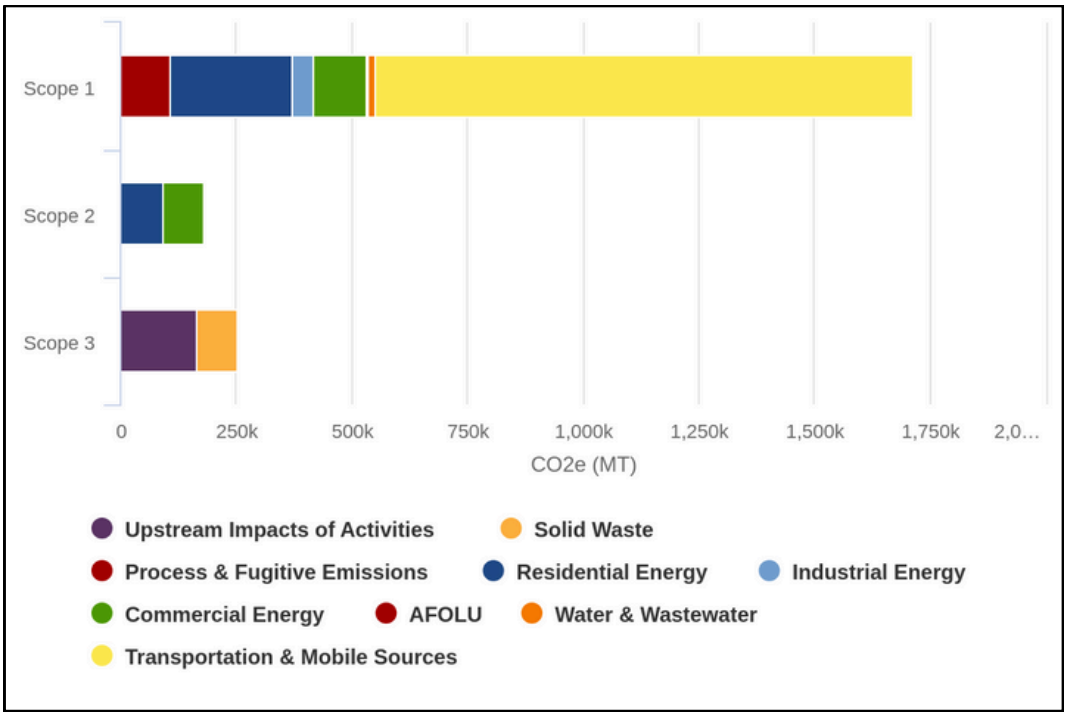


Figure 3: Community-Wide GHG Emissions by Scope and Sector

The total community-wide emissions for the 2022 inventory are shown by source and sector in Table 4.

Table 4: Community-Wide Emissions Inventory

Sector	Fuel or Source	2022 Usage	Usage Unit	2022 Emissions (Mt CO2e)
Residential Energy	Electricity	742,746	MWh	92,834
	Natural Gas	12,194,153	Therms	64,856
	Distillate Fuel Oil No. 2	2,324,959	MMBtu	173,108
	Propane	457,677	MMBtu	28,403
Residential Energy Total				**359,201**
Commercial Energy	Electricity	702,244	MWh	87,772
	Natural Gas	18,565,730	Therms	98,745
	Distillate Fuel Oil No. 2	1,130,347	Gallons	11,614
	Propane	747,631	Gallons	4,222
Commercial Energy Total				**202,353**
Industrial Energy	Distillate Fuel Oil No. 2	8,596	Gallons	88
	Bituminous Coal	18,179	Tons	42,661
Industrial Energy Total				**42,749**
Transportation & Mobile Sources	Gasoline	2,025,149,232	VMT	815,565
	Diesel	242,655,059	VMT	348,062
	Public Transit	1,388,923	VMT	1,555
Transportation & Mobile Sources total				**1,165,182**
Solid Waste	Waste Sent to Landfill	118,357	Tons	77,309
	Compost	3,002	Tons	531
	Process Emissions	118,357	Tons	1,941
	Waste Transportation			7,974
Solid Waste Total				**87,755**

*Blank cells are a result of variability in the format of available data by sector and fuel or source type.

Table 4: Community-Wide Emissions Inventory (continued)

Sector	Fuel or Source	2022 Usage	Usage Unit	2022 Emissions (Mt CO2e)
Water & Wastewater	Process N2O			78
	Septic			13,156
Water and Wastewater Total				**13,234**
Process & Fugitive	Natural Gas Distribution	30,759,883	Therms	5,337
	Ozone Depleting Substances Substitutes (ODS)			96,442
	Sulfur Hexaflouride (SF6)			4,539
Process & Fugitive Total				**106,317**
Upstream Impacts	Electricity	1,444,990	MWh	52,211
	Natural Gas	3,076,000	MMBtu	37,284
	Fuel Oil	2,480,947	MMBtu	70,642
	Residential Propane	457,677	MMBtu	5,817
Upstream Impacts Total				**165,954**
Agriculture	Enteric Fermentation			4,004
	Manure Management			1,932
	Crop Residues			265
Agriculture Total				**6,201**
Total Gross Emissions				**2,148,946**
Forests & Trees	Forests & Trees			-1,455,692
	Trees Outside of Forests			-136,352
Forests & Trees Total				**-1,592,044**
Total Emissions with Sequestration				**556,902**

*Blank cells are a result of variability in the format of available data by sector and fuel or source type.

Tree Canopy Analysis

The manner in which GHG inventories are estimated for different types of land use is more complicated than for other sectors. In addition to both emitting and removing GHGs, there are multiple carbon pools that respond differently to management activities and natural disturbances, interannual variability is high, and measurements may not be as precise as it is in other sectors (see the USCP, Appendix J). Beginning in 2019, several updates to protocols and guidance on estimating carbon from the Agriculture, Forestry, and Other Land Use (AFOLU) sector required that communities include the "net flux" of carbon emissions and removals–carbon emitted to the atmosphere from the land and carbon removed from the atmosphere to the land.

In coordination with ICLEI USA, Ulster County was able to use the US Community Protocol's Land Emissions And Removals Navigator (LEARN) tool to calculate the net flux of AFOLU emissions from 2016 to 2019 [15]. This analysis reported six "land use" categories, defined by land cover data—forest land, grassland, cropland, wetland, settlement, and other land (barren). In 2019, Ulster County's total land base was approximately 742,776 acres, with 8.9% settlement (i.e., developed areas of varying intensity), around 79.6% forest, 7.1% grassland (which includes hay/pasture, shrub/scrub and other herbaceous cover), 1.0% cropland, 3.2% wetland, and 0.2% other lands. 2019 is the most recent year available from the National Land Cover Dataset. Over the period 2016 to 2019, the net GHG balance of forests and trees was -1,592,044 Mt CO2e per year. Total GHG emissions for Ulster County across all sectors could be reduced if additional forests and trees were added to its land base or if losses of trees were reduced further. These measurements are only for trees, so carbon sequestration from other vegetation, such as grassland, likely means that what is measured by the LEARN tool is actually an underestimate of total sequestration for the County.

While GHG Inventories are recommended every 2-3 years, AFOLU data is meant to measure change over the course of three years. Therefore, this analysis could not be used to measure differences between 2019 and 2022. Ulster County can expect its next AFOLU analysis to cover changes from 2019 to 2022.

[15] US Community Protocol's Land Emissions And Removals Navigator (LEARN) tool. https://icleiusa.org/LEARN/

Next Steps

The inventory should be used to focus and prioritize actions to reduce emissions. Based on the inventory results, the following areas have the greatest potential for emissions reduction:

- On-road transportation
  - Vehicle electrification: Transition from internal combustion engine vehicles (passenger, transit fleets, municipal fleets, etc.) to electric-powered
  - Land use/infrastructure planning: Improving infrastructure to incentivize public transit usage, walking, and biking
  - Work with communities to expand public transportation options
- Community electricity use
  - Increase distributed solar
  - Coordinate with local electric utilities to aid in decarbonization planning
- Community stationary fuel use
  - Convert gas-powered appliances (e.g., water heaters, stoves, clothes dryers) to electric-powered
- Solid Waste
  - Improve recycling and composting programs to reduce organic waste content in waste streams

The next steps for Ulster County are to utilize the results of the 2022 inventory to develop the strategies and initiatives of the County's Community Climate Action Plan (CCAP), currently underway. A final CCAP is expected to be completed by the end of the year 2024. The CCAP is a strategy document that will establish GHG emissions reduction goals and identify initiatives, such as the examples above, to achieve those goals through a robust stakeholder engagement process, using a GHG Inventory as a foundational component. This inventory and CCAP project builds from the Ulster County Government Operations Climate Action Plan adopted in 2019 as well as the Ulster County Community Greenhouse Gas Emissions Inventory (2018) and will identify GHG reduction goals and priority initiatives at the community scale, inclusive of residents, businesses, local nonprofit and community organizations, and other county stakeholders. Ulster County will focus on initiatives that can be facilitated by the Ulster County government and leveraged via the Ulster County government's organizational strengths and resources. Executive Order 1 of 2023 is a guiding reference to inform the CCAP's overall goals and framework.

Completion of another GHG inventory in two to five years is recommended to assess progress resulting from any actions implemented. The detailed methodology section of this report, as well as notes and attached data files within the ClearPath Climate Planner tool and a master data Excel file provided to Ulster County, will be helpful to complete a future inventory consistent with this one. The completed GHG Inventory and final CCAP will count toward completion of the NYS Climate Smart Communities Program PE2 Action: Community GHG Inventory and PE2 Action: Community Climate Action Plan for Ulster County.

Greenhouse Gas Emissions Forecasts

Ulster County's most recent community-wide GHG inventory includes emissions from activities and sources that took place within the County during the 2022 calendar year. Using the 2022 GHG inventory as a baseline, ICLEI prepared a basic "business-as-usual" (BAU) forecast for 2030.

Business-As-Usual (BAU) Forecast

The BAU forecast (Figure 5) is a projection of emissions through the year 2030. The projected emissions estimated population decline [11], changes in automotive fuel efficiency standards [12], and changes to the carbon intensity of grid electricity [13].

Ulster County's 2022 emissions were 2,148,946 MT CO2e. Based on population decline, increasing on-road vehicle fuel efficiency, and utility decarbonization plans, Ulster County's 2030 emissions will be 1,856,356 MT CO2e. This is a 14% reduction in emissions.

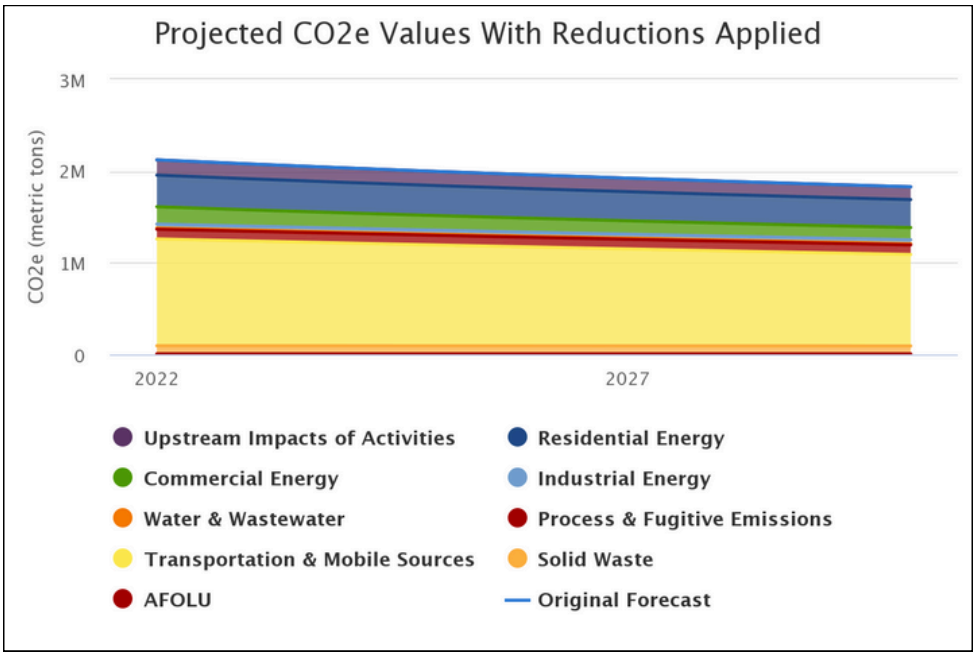


Figure 4: Business-As-Usual Forecast for Community-Wide Emissions from 2022-2030

[11] Cornell University. 2018. County Projections Explorer. Retrieved from https://pad.human.cornell.edu/counties/projections.cfm
[12] Statewide Energy Efficiency Collaborative. nd. SEEC ClearPath California Reference Sheet – Default Carbon Intensity Factors. Retrieved from https://s3.amazonaws.com/CEMS_Docs/SEEC+ClearPath+Carbon+Intensity+Reference+Sheet.pdf
[13] New York State Energy Research & Development (NYSERDA). 2023. Clean Energy Standards. Retrieved from https://www.nyserda.ny.gov/All-Programs/Clean-Energy-Standard

Conclusion

At the completion of this inventory report, Ulster County is sequentially developing a Community Climate Action Plan. The main objectives are to reach the County's community-wide emissions reduction target of forty percent (40%) by 2030 and eighty-five percent (85%) by 2050, build upon the existing relevant County plans and implement Executive Order 1 of 2023 (EO1-2023) directives [14]. The County plans to utilize the results of this 2022 inventory to develop the strategies and initiatives of the County's Community Climate Action Plan (CCAP), with a focus on initiatives that meet the needs of disadvantaged communities and those that are implementable and can be supported by the County. The CCAP will be a reference guide and road map for implementing initiatives to reach GHG emissions targets and will align with directives of EO1-2023, the NYS Climate Leadership and Community Protection Act, and the NYS Climate Smart Communities Program framework.

The Intergovernmental Panel on Climate Change (IPCC) states that to meet the Paris Agreement commitment of keeping warming below 1.5°C, we must reduce global emissions by 50% by 2030 and reach climate neutrality by 2050. Equitably reducing global emissions by 50% requires that high-emitting, wealthy nations reduce their emissions by more than 50%. More than ever, it is imperative that countries, regions, and local governments set ambitious targets that will slash carbon emissions between now and mid-century.

Science-Based Targets are calculated climate goals, in line with the latest climate science, that represent a community's fair share of the global ambition necessary to meet the Paris Agreement commitment. Community education, involvement, and partnerships will be instrumental in achieving a science-based target.

To support the climate action of Ulster County, ICLEI has calculated the County's Science-Based Targets [15]:

- **Per-Capita SBT: 63.3%**
- **Absolute SBT: 63.4%**

In addition, Ulster County will continue to track key energy use and emissions indicators on an ongoing basis. It is recommended that communities update their inventories on a regular basis, especially as plans are implemented to ensure measurement and verification of impacts. Regular inventories also allow for "rolling averages" to provide insight into sustained changes and can help reduce the chance of an anomalous year being incorrectly interpreted. This inventory shows that community-wide transportation, as well as energy use across all sectors, will be particularly important to focus on. Through these efforts and others, Ulster County can achieve environmental, economic, and social benefits beyond reducing emissions.

[14] Ulster County. 2017. Multi-Jurisdictional Hazard Mitigation Plan. https://ulstercountyny.gov/emergency-services/management/index.html
[15] Science Based Targets Network. 2021. Science Based Climate Targets: A Guide for Cities. Retrieved from https://sciencebasedtargetsnetwork.org/.

Appendix: Methodology Details

Energy

Table 5: Energy Data Sources

Activity	Data Source	Data Gaps/Assumptions
Residential Electricity Consumption	Utility Energy Registry	Data was unavailable for July-December from NYSEG. Used the ratio of residential electricity consumption from NYSEG and Central Hudson to estimate July-December.
Residential, Commercial & Industrial Natural Gas Consumption	Utility Energy Registry	No data gaps or assumptions identified.
Commercial & Industrial Electricity Consumption	Utility Energy Registry	Data was unavailable for July-December; therefore, doubled the total consumption from January-June in order to estimate the missing data.
Residential Propane and Fuel Oil Consumption	American Community Survey, U.S. Energy Information Administration	No data gaps or assumptions identified.
Commercial & Industrial Propane and Fuel Oil Consumption	Commercial Buildings Energy Consumption Survey (CBECS), Ulster County	Data was unavailable for 2022; therefore, used 2018 inventory values for the total number of buildings and the average size of buildings. The most recent available data on the percentage of commercial buildings using propane was also from 2018.
Industrial Distillate Fuel No. 2 and Bituminous Coal Consumption	EPA Flight Tool	Data from 2022 not yet available; therefore, used 2021 data.

Table 6: Emissions Factors for Electricity Consumption

Emissions Factor/ Year	CO2 (lbs./MWh)	CH4 (lbs./GWh)	N2O (lbs./GWh)	Data Gaps and Assumptions
NPCC Upstate NY eGRID 2022	274.6	15	2	No data gaps or assumptions identified.

Transportation

Table 7: Transportation Data Sources

Activity	Data Source	Data Gaps/Assumptions
On-Road Gasoline and Diesel Consumption	Ulster County	2022 data not yet available; therefore, used 2021 data and scaled up to estimate 2022 data due to COVID-19 impacts to 2021 data. Used the 2021/2022 ratio of vehicle miles traveled (VMT) in Ulster County from Google Environmental Insights Explorer to scale to 2022. Assumed all in-boundary data. Vehicle type and mix were calculated using VMT by vehicle type in 2020 from EPA's State Inventory Tool.
Public Transit - Diesel, Biodiesel, and Gasoline Consumption	Ulster County Area Transit	Vehicle miles traveled unavailable; therefore, used fuel consumption data to estimate.

For vehicle transportation, it is necessary to apply average miles per gallon and emissions factors for CH4 and N2O to each vehicle type. The factors used are shown in Table 8.

Table 8: MPG and Emissions Factors by Vehicle Type (2021)

Fuel	Vehicle Type	MPG	CH4 (g/mile)	N2O (g/mile)
Gasoline	Passenger car	25.30	0.0084	0.0069
Gasoline	Light truck	18.20	0.012	0.0087
Gasoline	Heavy truck	5.38	0.072	0.061
Gasoline	Para Transit Bus	18.20	0.01170	0.0087
Gasoline	Motorcycle	44.00	0.00840	0.0069
Diesel	Transit Bus	18.20	0.00100	0.0015
Diesel	Light truck	18.20	0.0010	0.0015
Diesel	Heavy truck	6.56	0.0051	0.0048

Wastewater

Table 9: Wastewater Data Sources

Activity	Data Source	Data Gaps/Assumptions
Septic Systems	Ulster County	No data gaps or assumptions identified.
Process N2O	Ulster County	No data gaps or assumptions identified.

Solid Waste

Table 10: Solid Waste Data Sources

Activity	Data Source	Data Gaps/Assumptions
Solid Waste Process Emissions	New York State Department of Environmental Conservation	No data gaps or assumptions identified.
Solid Waste Landfill Disposal	New York State Department of Environmental Conservation	Excluded construction and demolition waste to align with 2018 inventory.
Compost (sludge)	New York State Department of Environmental Conservation	No data gaps or assumptions identified.
Transport of Solid Waste from UCRRA and New Paltz	New York State Department of Environmental Conservation	No data gaps or assumptions identified.

Process and Fugitive Emissions

Table 11: Fugitive Emissions Data Sources

Activity	Data Source	Data Gaps/Assumptions
Fugitive Emissions from Natural Gas Distribution	Utility Energy Registry	No data gaps or assumptions identified.
Fugitive Emissions from Ozone Depleting Substances Substitutes (ODS)	US Census Bureau, EPA Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2020	Applied US national-level per capita rate to Ulster County's population.
Fugitive Emissions from sulfur hexaflouride (SF6)	US Census Bureau, EPA Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2020	Applied US national-level per capita rate to Ulster County's population.

Agriculture, Forestry and Land Use (AFOLU)

Table 12: Forests and Urban Trees Sequestration and Emissions Data Sources

Activity	Data Source	Data Gaps/Assumptions
Forests & Trees	ICLEI LEARN tool	Analyzed for change from 2016 to 2019.
Agriculture	Ulster County	No data gaps or assumptions identified.

Upstream Impacts

Table 13: Upstream Impacts Data Sources

Activity	Data Source	Data Gaps/Assumptions
Electricity upstream impacts	Utility Energy Registry	See Table 5 for additional information on electricity consumption data.
Natural Gas Upstream Impacts	Utility Energy Registry	No data gaps or assumptions identified.
Propane Upstream Impacts	American Community Survey, U.S. Energy Information Adminitstration,	See Table 5 for additional information on propane consumption data.
Fuel Oil Upstream Impacts	American Community Survery,	See Table 5 for additional information on fuel oil consumption data.

Inventory Calculations

The 2022 inventory was calculated following the US Community Protocol and ICLEI's ClearPath Climate Planner Climate Planner software. As discussed in Inventory Methodology, the IPCC 5th Assessment was used for global warming potential (GWP) values to convert methane and nitrous oxide to CO2 equivalent units. ClearPath Climate Planner's inventory calculators allow for input of the sector activity (i.e. kWh or VMT) and emission factor to calculate the final carbon dioxide equivalent (CO2e) emissions.