# NORTH SALEM, NEW YORK

## 2021 Inventory of Community-Wide Greenhouse Gas Emissions

NEW YORK STATE | Climate Smart Communities
Certified Bronze

**Produced By:**
ICLEI – Local Governments for Sustainability USA
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## ICLEI – Local Governments for Sustainability USA

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# Letter from Councilmember Daniels

The Town of North Salem recognizes that greenhouse gas (GHG) emissions from human activity are contributing to climate change. We are experiencing the effects right now in the form of increased precipitation, storm severity and extreme temperatures. By acting diligently to reduce our GHG emissions, we not only do our part to mitigate this problem globally, we can also reduce energy and transportation costs for residents and businesses, improve health conditions and make North Salem a more comfortable and even more attractive place to live.

In 2009, the Town of North Salem registered as a Climate Smart Community ("CSC"). At that time, we made a pledge to take actions that will reduce our GHG emissions. In 2021, we created a Climate Smart Leadership Team and began to focus more intensively on the pledge. North Salem has now achieved Bronze status in the CSC program and is considered a leader among Westchester communities. Among other things, we completed an inventory of municipal emissions and set specific goals for municipal reduction in our Climate Action Plan, namely a 25% reduction in GHG emissions from the base year of 2019 by 2030, with a stretch target of 40% by 2030 and "net zero emissions" by 2050.

The attached inventory is focused on community-wide emissions. We will use the report to refine our goals and update our Climate Action Plan as needed. In 2021, North Salem emitted the equivalent of 43,761 metric tons of carbon dioxide (MTCO2e). The chart on page five shows how emissions break down by sector. By far, the largest emissions come from residences and transportation, so this is where we plan to focus our efforts.

To that end, this fall the CSC Leadership Team will be hosting a series of workshops about how to properly insulate homes and businesses to save energy and reduce emissions. The workshops will include presentations about how to incorporate solar and/or geothermal systems and air source heat exchange pumps into homes and businesses to further reduce the consumption of fossil fuels and save money. On the transportation side, we will be partnering with Bedford 2030 and others to encourage folks to make the switch to electric vehicles. With state and federal incentives available and the charging infrastructure improving every day, the time is right. If we can convince just 10% of North Salem drivers to switch to electric vehicles each year for the next five years, we will have made excellent progress. I personally own an electric car and could not be happier!

If you have any questions about this report, please do not hesitate to reach out. Better yet, consider joining the CSC Leadership Team and become a part of this critical endeavor.

Sincerely, Katherine Daniels,
North Salem Town Board Member
Chair, CSC Leadership Team

# Executive Summary

In 2022, North Salem adopted a Climate Action Plan (CAP), a comprehensive road map to achieve ambitions greenhouse gas (GHG) emission reductions and address climate-related challenges. As part of that Plan, North Salem committed to performing a community-wide GHG inventory, an accounting of all major sources and amounts of GHG being produced in the Town, to inspire action and act as a baseline to allow us to quantify our successes moving forward.

Our CAP includes a bold goal of achieving net zero carbon emissions by 2050, as well as an interim stretch target of reducing our emissions by 40% from 2019 levels by 2030. Currently, the best science suggests that we will need to reduce our emissions by more than 60% from 2019 levels by 2030 in order to reach net zero by 2050, a difficult goal but certainly one we shall consider.

Figure 1 shows community-wide emissions by sector. The largest contributor is Residential Energy, which includes heating fuel and emissions associated with electricity usage in residential buildings, with 46% of emissions. The next largest contributors are Transportation, which includes on-road traffic (31%), and Commercial Energy, which includes electricity usage in commercial buildings (12%). Solid Waste (which includes emissions from combustion of municipal waste and landfilling of construction and demolition debris), Water & Wastewater (which includes electricity from processing and transporting water, and process emissions from wastewater treatment), and Agriculture, Forestry, and Other Land Use (AFOLU; largely emissions associated with deforestation) were responsible for the remaining (less than 13%) emissions.

## EMISSIONS AT A GLANCE

1 **Residential Energy** 46%

2 **Transportation** 31%

3 **Commercial Energy** 12%

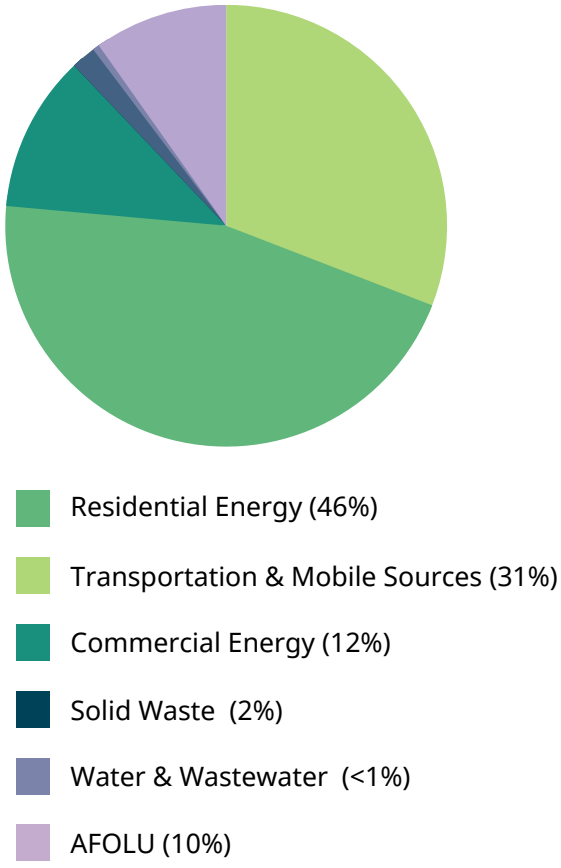


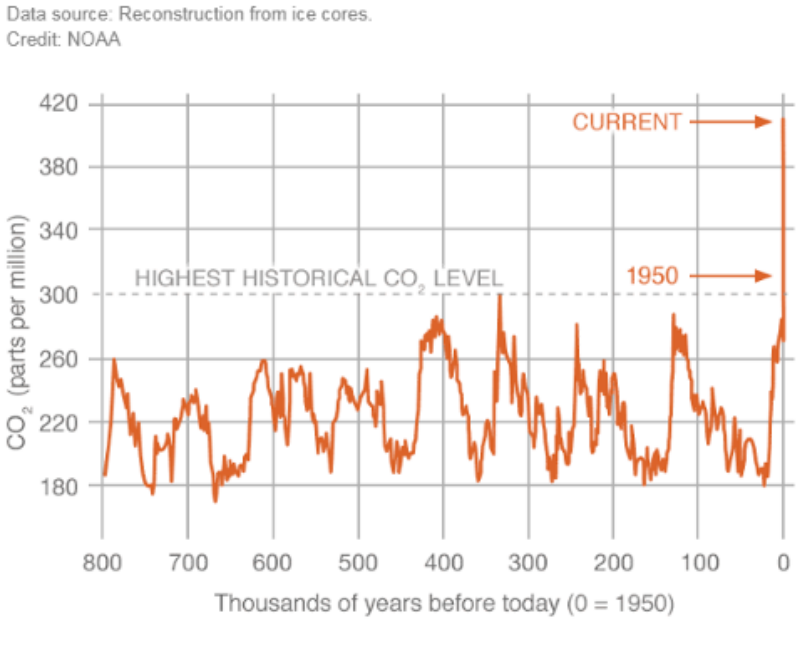

**Figure 1: Community-Wide Emissions by Sector**

# Introduction to Climate Change

Naturally occurring gases dispersed in the atmosphere play a part in 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 GHGs 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 GHGs 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 GHGs 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 North Salem is no exception.

**Figure 2: Atmospheric CO2 Concentration over the Past 800,000 Years**




[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.

As with the rest of New York, North Salem has experienced an increased average temperature of 3°F since 1970, and is expected to see those average temperatures rise by another 3°F by 2080. Rising annual temperatures will see our community experience significant changes in the local ecosystem, with the climate less supportive of native plants, insects, and wildlife. As these species move further north, we will see impacts to dependent industries such as fishing and tourism. The New York State Department of Environmental Conservation also notes that across the northeastern U.S., winter temperatures have increased by an average of 3°F, lessening snowfall and bringing about earlier snowmelt. In North Salem, these effects in particular will hamper winter recreation activities like cross-country skiing. Additionally, these winter effects will also endanger vegetation in the summer, increasing the risk of wildfires and extending the range of invasive insect species such as the emerald ash borer and southern pine beetle.

Alongside warmer-than-average temperatures, we will also suffer from increased frequency and intensity of extreme temperature events, with fewer cold waves and more heat waves. More severe heat waves equates to more dangerous conditions for human, animal, and ecosystem wellbeing, and also puts greater pressure on infrastructure systems such as electrical transmission lines.

As part of the northeastern U.S., our community has shared in experiencing the over 70% increase in heavy precipitation between 1958 and 2010 as a consequence of climate change. With precipitation continuing to undergo increased severity in frequency and intensity, and with alterations to precipitation type underway, North Salem will be more endangered by flooding, nutrient runoff-fed algal blooms, and diminished snowfall. Consequently, our recreational industry will suffer, from horseback riding to fishing. A warming climate will also heighten storm-related risks North Salem will face, leading to stronger tropical and subtropical cyclones striking New York State [2].

[2] Climate Change Effects and Impacts. New York State Department of Environmental Conservation.

According to the 2018 National Climate Assessment, the increasing temperature and extreme precipitation in our region will impact social and economic systems, particularly as infrastructure ages and populations shift to urban centers [3]. Rapid urbanization increases demand on the food, water, and energy sectors, which are also being stressed by extreme temperatures and weather events. These essential systems are interdependent, so all are affected when one is impacted, leading to cascading issues.

Many communities in the United States have started to take 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, when residents save on energy costs, they are more likely to spend 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.

[3] U.S. Global Change Research Program. 2018. National Climate Assessment – Ch 23: Southern Great Plains. Retrieved from https://nca2018.globalchange.gov/chapter/23/ .

# Greenhouse Gas Inventory as a Step Toward Net Zero Emissions

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. This baseline GHG inventory will help to inform and quantify the successes of North Salem's CAP, a roadmap for climate neutrality that has identified priority sectors for action, while considering climate justice, inclusiveness, local job creation, and other benefits of sustainable development.

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

> The targeted reduction of 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, North Salem 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.

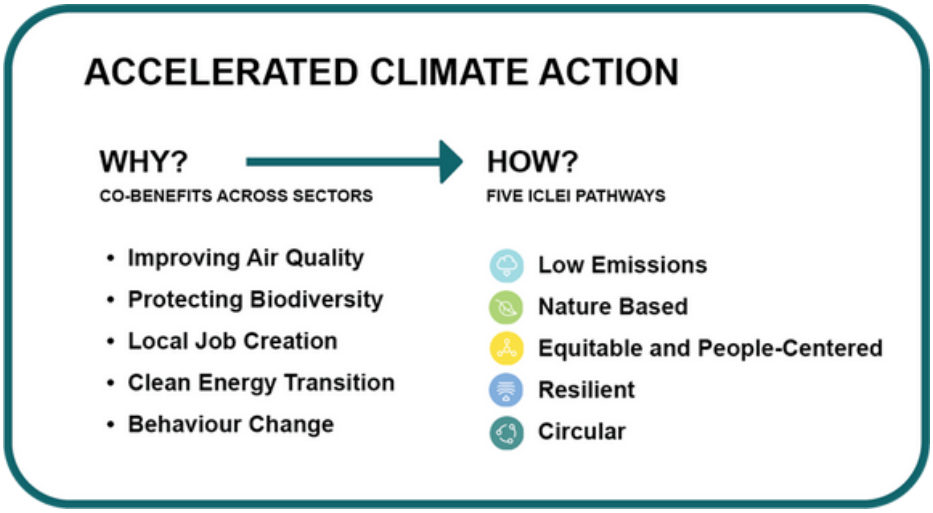



**Figure 3: Co-Benefits and ICLEI Pathways to Accelerated Climate Action**

# ICLEI Climate Mitigation Milestones

In response to the climate emergency, many communities in the United States are taking responsibility for addressing emissions at the local level. Since many of the major sources of GHG emissions are directly or indirectly controlled through local policies, local governments have a strong role to play in reducing GHG emissions within their boundaries, as well as influencing regional emissions through partnerships and advocacy. North Salem's CAP details our proactive measures around land use patterns, transportation demand management, energy efficiency, green building, waste diversion, and more, to dramatically reduce emissions in our community.

ICLEI provides a framework and methodology for local governments to identify and reduce GHG emissions, organized along with Five Milestones, also shown in Figure 2:

1. Conduct an inventory and forecast of local GHG emissions;
2. Establish a GHG emissions Science-Based Target [4];
3. Develop a CAP for achieving the emissions reduction target;
4. Implement the CAP; and,
5. Monitor and report on progress.

These milestones have informed North Salem's CAP; with the completion of our 2021 baseline GHG inventory, we are poised to quantify the successful implementation of that plan.


**Figure 4: ICLEI Climate Mitigation Milestones**

[4] Science-Based Targets are calculated climate goals, in line with the latest climate science, that represent your community's fair share of the ambition necessary to meet the Paris Agreement commitment of keeping warming below 1.5°C. To achieve this goal, the IPCC states that we must reduce global emissions by 50% by 2030 and achieve climate neutrality by 2050. Equitably reducing global emissions by 50% requires that high-emitting, wealthy nations reduce their emissions by more than 50%.

# 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 North Salem 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 GHG Emissions (Community Protocol) and the Local Government Operations Protocol for Accounting and Reporting GHG 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 (GWP) for methane and nitrous oxide from the IPCC 5th Assessment Report. [5]

**Table 1: Global Warming Potential Values (IPCC, 2014)**

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

[5] AR5 Synthesis Report: Climate Change 2014. IPCC. Retrieved from https://www.ipcc.ch/report/ar5/syr

# Community Emissions Protocol

Version 1.2 of the U.S. Community Protocol for Accounting and Reporting GHG Emissions [6] was released by ICLEI in 2019, and represents a 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.

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 of solid waste generated by the community

The community inventory also includes the following activities:

- Wastewater treatment processes
- Emissions from changes in land use

# Quantifying Greenhouse Gas Emissions

## *Sources and Activities*

Communities contribute to GHG 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 2: Source vs. Activity for GHG Emissions**

| 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. |

[6] ICLEI. 2012. US Community Protocol for Accounting and Reporting Greenhouse Gas Emissions. Retrieved from http://www.icleiusa.org/tools/ghg-protocol/community-protocol

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 replaces the scopes framework, which is used in government operations inventories, but does not have a clear application to community inventories.

## Base Year

The inventory process requires the selection of a base year with which to compare current emissions. North Salem's community GHG emissions inventory utilizes 2021 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 refer 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 listing of the activity data used in composing this inventory.

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

# Community Emissions Inventory Results

The total community-wide emissions for the 2021 inventory are shown in Table 3 and Figure 5.

Emissions from gasoline and diesel-powered vehicles, as well as residential electricity and home heating oil usage, are the largest contributors to North Salem's GHG emissions. The results indicate that North Salem residents can have the biggest impact on lowering our Town's emissions (as well as potentially reducing their long-term energy costs) by installing on-site renewable energy such as solar, increasing building efficiency by switching to energy-efficient appliances and improving home insulation, and switching to more efficient or electric vehicles.

**Table 3: Community-Wide Emissions Inventory**

| Sector | Fuel or Source | 2021 Usage | Usage Unit | 2021 Emissions (Mt CO2e) |
|---|---|---|---|---|
| Residential Energy | Electricity | 29,213 | kWh | 10,837 |
| | Distillate Fuel Oil No. 2 | 119,942 | MMBtu | 8,930 |
| | Propane | 26,799 | MMBtu | 1,663 |
| **Residential Energy Total** | | | | **21,430** |
| Commercial Energy | Electricity | 14,535 | MWh | 5,392 |
| **Commercial Energy Total** | | | | **5,392** |
| Transportation | On-Road Gasoline | 25,228,369 | VMT | 10,171 |
| | On-Road Diesel | 3,014,232 | VMT | 4,341 |
| **Transportation Total** | | | | **14,512** |
| Solid Waste | Combustion | 2,296 | Short Tons | 796 |
| | Construction & Development | 637 | Tons | 46 |
| **Solid Waste Total** | | | | **842** |

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

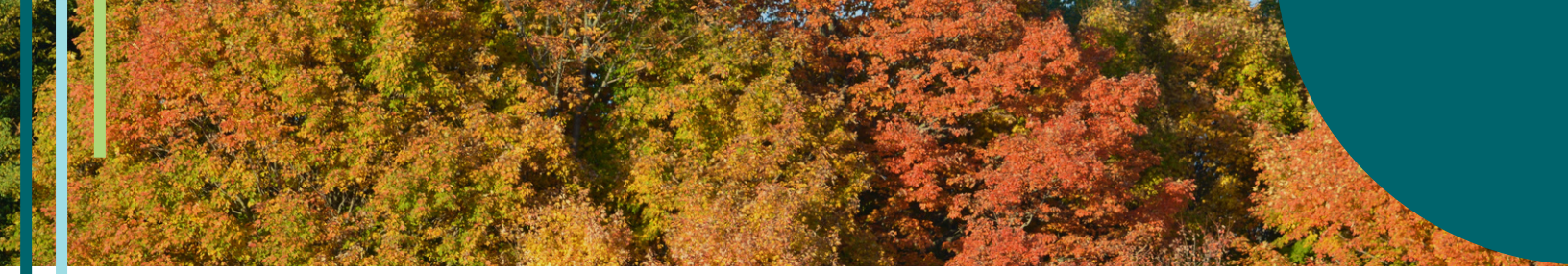


**Table 3: Community-Wide Emissions Inventory (continued)**

| Sector | Fuel or Source | 2021 Usage | Usage Unit | 2021 Emissions (Mt CO2e) |
|---|---|---|---|---|
| Water & Wastewater | Electricity - Wastewater Treatment | 337,377 | kWh | 125 |
| | Electricity - Potable Water | 168,398 | kWh | 62 |
| | N2O - Effluent Discharge | 5,241 | Population Served | 32 |
| | N2O - Wastewater Treatment | 5,241 | Population Served | 12 |
| **Water & Wastewater Total** | | | | **231** |
| AFOLU | Forest Disturbances | 4.9 | Hectares | 432 |
| | Forest to Settlement | 7 | Hectares | 668 |
| | Forest to Grassland | 9 | Hectares | 284 |
| | Forest to Other Non-Forest | 1 | Hectares | 46 |
| | Trees Outside Forests (Emissions) | 1,636 | Hectares | 3,201 |
| **AFOLU Total** | | | | **4,631** |
| **Total Gross Emissions** | | | | **47,038** |

Figure 5 shows the distribution of community-wide emissions by sector. Residential Energy is the largest contributor, followed by Transportation & Commercial Energy.

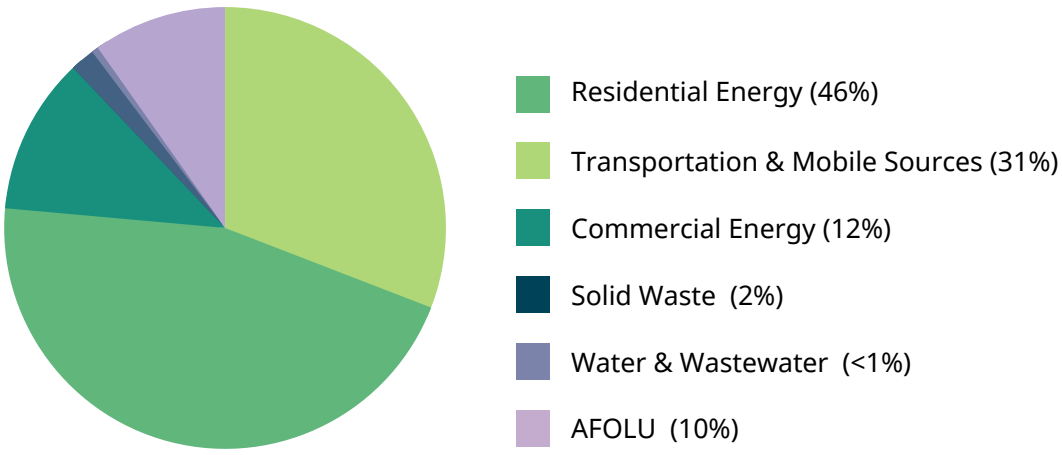



**Figure 5: Community-Wide Emissions by Sector**

# 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, a number of updates to protocols and guidance on estimating carbon from the 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, North Salem 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 2016-2019 [7]. This analysis reported six "land use" categories which were defined by data on land cover—forest land, grassland, cropland, wetland, settlement and other land (barren). In 2019, North Salem's total land base was approximately 14,864 acres (23.2 square miles), with nearly 14.8% Settlement (i.e. developed areas of varying intensity), around 67.1% forest, 11.4% grassland (which includes hay/pasture, shrub/scrub and other herbaceous cover), 0% cropland, 6.6% wetland and 0.1% other land. 2019 is the most recent year available of the National Land Cover Dataset. Over the period 2016 to 2019, the Net GHG balance of forests and trees was -26,859 MTCO2e per year, offsetting approximately 57% of North Salem's total emissions. Total GHG emissions for North Salem across all sectors could be reduced if additional forests/trees were added to its land base, and/or if losses of trees were reduced further. However, sequestration through increased vegetation can only go so far; it is still critical that we reduce our dependence on fossil fuels if we are to achieve our 2050 net zero goal. These measurements are only for trees, so carbon sequestration from other vegetation, such as grassland, likely mean that what is measured by the LEARN tool is actually an underestimate of total sequestration for the Town.

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 2021. North Salem can expect its next AFOLU analysis to cover changes from 2019-2025.

[7] US Community Protocol's Land Emissions And Removals Navigator (LEARN) tool. Available at 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:

- Community electricity use
  - Increased residential solar distribution
  - Increased number of energy efficient appliances
  - Coordinate with local utilities, residents, and the commercial sector to plan electricity use reduction efforts
  - Adopt residential and commercial energy conservation ordinances
- 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 to expand public transportation options
  - Promote compact development for new buildings

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 in the ClearPath Climate Planner tool and a master data Excel file provided to North Salem, will be helpful to complete a future inventory consistent with this one.

# Conclusion

This inventory marks the completion of Milestone One of the Five ICLEI Climate Mitigation Milestones. The next steps are to forecast emissions and build upon the existing North Salem CAP[8] with a climate action plan that identifies specific quantified strategies that can cumulatively meet that target.

The 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 targets that are ambitious enough to 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 to achieve a science-based target. To meet and exceed our science-based target, North Salem has officially committed to reducing its emissions to zero by 2050 in the Town's CAP.

To support the bold climate action of North Salem, ICLEI has calculated the Town's Science-Based Target [9] of reducing 2019 emissions levels by 62.9% by 2030. This exceeds our current CAP stretch goal of 40%, but we will use this gap as inspiration for further action.

Science-Based Targets are climate goals in line with the latest climate science. They represent the Town's fair share of the ambition necessary to meet the Paris Agreement commitment to keep warming below 1.5°C.

In addition, North Salem will continue to track key energy use and emissions indicators on an on-going 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 change of an anomalous year being incorrectly interpreted. This inventory shows that community-wide transportation as well as the electricity across all sectors will be particularly important to focus on. Through these efforts and others, North Salem can achieve environmental, economic, and social benefits beyond reducing emissions.

[8] North Salem Climate Action Plan, North Salem and the Climate Smart Community Leadership Committee, https://www.northsalemny.org/sites/g/files/vyhlif4801/f/uploads/climate_action_plan_final_052622.pdf
[9] "Science Based Climate Targets: A Guide for Cities." Science Based Targets Network, November 4, 2021. https://sciencebasedtargetsnetwork.org/.

# Appendix: Methodology Details

## Energy

**Table 5: Energy Data Sources**

| Activity | Data Source | Data Gaps/Assumptions |
|---|---|---|
| Residential Electricity | New York State Energy Research and Development Authority, Utility Energy Registry | N/A |
| Residential Fuel Oil | U.S. Energy Information Administration | N/A |
| Residential Propane | U.S. Energy Information Administration | N/A |
| Commercial Electricity | New York State Energy Research and Development Authority, Utility Energy Registry | N/A |

**Table 6: Emissions Factors for Electricity Consumption**

| Emissions Factor/ Year | CO2 (lbs./MWh) | CH4 (lbs./GWh) | N2O (lbs./GWh) | Data Gaps and Assumptions |
|---|---|---|---|---|
| **NPCC NYCW (eGRID) 2021** | 816.8 | 19 | 2 | N/A |

# Transportation

**Table 7: Transportation Data Sources**

| Activity | Data Source | Data Gaps/Assumptions |
|---|---|---|
| On-Road Transportation | Google EIE, U.S. Census | N/A |

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**

| Fuel | Vehicle Type | MPG | CH4 (g/mile) | N2O (g/mile) |
|---|---|---|---|---|
| Gasoline | Passenger car | 25.3 | 0.0084 | 0.0069 |
| Gasoline | Light truck | 18.2 | 0.0117 | 0.0087 |
| Gasoline | Heavy truck | 5.4 | 0.0719 | 0.0611 |
| Gasoline | Motorcycle | 18.2 | 0.0117 | 0.0087 |
| Diesel | Passenger car | 25.3 | 0.0005 | 0.001 |
| Diesel | Light truck | 18.2 | 0.001 | 0.0015 |
| Diesel | Heavy truck | 6.6 | 0.0051 | 0.0048 |
| Diesel | Transit Bus | 18.2 | 0.001 | 0.0015 |

# Wastewater

**Table 9: Wastewater Data Sources**

| Activity | Data Source | Data Gaps/Assumptions |
|---|---|---|
| Wastewater Treatment Energy Use | Town records | Estimated missing/ill-fitting data |
| Potable Water Supply | Town records | Estimated missing/ill-fitting data |
| N2O from Wastewater | U.S. Census | N/A |

# Solid Waste

**Table 10: Solid Waste Data Sources**

| Activity | Data Source | Data Gaps/Assumptions |
|---|---|---|
| Solid Waste Combustion | WIN Waste Innovations | Assuming that all MSW, cardboard, and yard waste is combusted, that C&D is landfilled, and recycling is diverted. |
| Waste Generation | WIN Waste Innovations | Assuming that all MSW, cardboard, and yard waste is combusted, that C&D is landfilled, and recycling is diverted. |

# AFOLU

**Table 11: AFOLU Emissions Data Sources**

| Activity | Data Source | Data Gaps/Assumptions |
|---|---|---|
| Forest Disturbances | LEARN | N/A |
| Forest to Settlement | LEARN | N/A |
| Forest to Grassland | LEARN | N/A |
| Forest to Other Non-Forest | LEARN | N/A |

# Inventory Calculations

The 2021 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.