

City Of New Rochelle
2020
Annual GHG Emissions Inventory

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CITY OF NEW ROCHELLE ANNUAL GHG EMISSIONS INVENTORY

A. SUMMARY

INTRODUCTION

Because of the growing consensus that human activity resulting in greenhouse gas (GHG) emissions has the potential to profoundly impact the Earth's climate, countries and municipalities around the world have undertaken efforts to reduce emissions by implementing both global and local measures addressing energy consumption and production, land use, and other sectors.

Many local governments worldwide, including the City of New Rochelle, have committed to sustainable development as part of ICLEI-Local Governments for Sustainability (ICLEI). In 1993, ICLEI began the Cities for Climate Protection™ campaign to provide assistance to local governments in setting and achieving sustainability milestones. The City of New Rochelle became a participating member in the Cities for Climate Protection™ campaign and have committed to adopting policies and implementing quantifiable measures to reduce local GHG emissions, improve air quality, and enhance urban livability and sustainability. Subsequently, the City of New Rochelle introduced its first long-term 20-year sustainability plan over the year 2010-2030 for a sustainable and resilient city, GreeNR. The plan includes energy and GHG emissions reduction goals, specific initiatives that can result in emission reductions, and initiatives aimed at adapting to future climate change impacts.

The City of New Rochelle has begun implementing several initiatives to achieve the GHG reduction goals—targeting municipal energy consumption, sustainable mobility, and smart growth. Through technology improvements, introduction of ride-sharing programs (including both bicycle and vehicles), and increased renewable energy options the City has diligently pursued its GHG reduction goals. The City has continued to encourage smart and sustainable growth to ensure that future developments will be consistent with these goals and policies.

In order to quantify the cost-effectiveness of current and future initiatives, a citywide GHG inventory for 2020 has been prepared for the Residential/Commercial/Municipal Energy Consumption, Transportation, and Waste sectors. The inventory includes the ability to incorporate specific metrics driving GHG emissions (i.e. energy consumption, vehicle miles traveled, and wastewater generation) for future tracking in order to assess the effectiveness of potential initiatives.

The inventory was calculated using two accounting methods—direct and indirect emissions. Direct emissions occur at the source of emissions (e.g., exhaust stack, tailpipe, treatment plant)—also known as Scope 1 emissions consistent with New York State Energy Research & Development Authority (NYSERDA) guidance.¹ This accounting method enables clear identification of sources, is well suited for estimating total emissions, and avoids double-counting, and is therefore often used in regulatory settings and for emissions trading purposes. Indirect emissions include a consumption-based approach (i.e. the use of electricity in any household or business will be associated with indirect emissions even though the power is not produced within the City) as well as lifecycle emissions (emissions associated with upstream activity, including fuel extraction or production, processing and transport). These two categories of emissions are

¹ NYSERDA. *New York Community and Regional GHG Inventory Guidance: Methods and Data Sources for Community-wide (Geospatial) GHG Emissions Inventories*, Version 1.0. September 2015

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also known as Scope 2 and Scope 3 emissions, respectively. Indirect emissions are important components of potential mitigation analyses, enabling the comparison of the full emissions benefits associated with potential initiatives focused on consumption or activity (particularly in the electricity, transportation, and waste management sectors).

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The City of New Rochelle is estimated to result in the direct emissions of 430,072 metric tons of carbon dioxide equivalent (CO₂e) emissions in 2020, or approximately 5.4 metric tons of CO₂e per year per resident. This is comparable to the per capita emissions of similarly-sized municipalities within the Northeastern Region, and below the statewide per capita emissions for New York State (approximately 19.3 metric tons of CO₂e per year per resident based on the estimate of statewide emissions in 2019.)² When accounting for all indirect and upstream emissions, the City of New Rochelle is estimated to result in emissions of 654,987 metric tons of CO₂e in 2020—approximately 1.6 times as much as emission from within the City.

As shown in **Table 1** and **Figure 1**, direct emissions were primarily associated with Residential/Commercial/Municipal Energy Use and Transportation Sectors. Emissions associated with the Residential/Commercial/Municipal Energy Use and Transportation Sectors accounted for 38 and 58 percent of annual emissions, respectively. The Waste Sector accounted for only 4 percent of citywide emissions.

Table 1
Summary of 2020 Annual GHG Direct Emissions
(metric tons)

Sector	CO ₂ e (GWP-100)
Residential/Commercial/Municipal Energy Use	
<i>Residential</i>	102,788
<i>Commercial</i>	60,859
<i>Municipal</i>	799
Total	164,446
Transportation	248,934
Waste	16,693
Total	430,072
Notes:	
Totals may not sum due to rounding.	
Emissions presented using the 100-year horizon global warming potentials to estimate carbon dioxide equivalents.	

Within the citywide emissions, City-owned properties (including buildings, streetlights, and related infrastructure) account for only 799 metric tons and reflect the emission reduction initiatives that the City has already implemented such as installation of 100 percent LED street lighting, increased vehicle fleet fuel efficiency, and electric vehicle lease program. These High Impact Actions also gain New Rochelle points and grant funding opportunities under both the NYSERDA Clean Energy Communities and NYSDEC Climate Smart Communities program.

² NYSEC. 2022 Statewide GHG Emissions Report: Summary Report. December 2022

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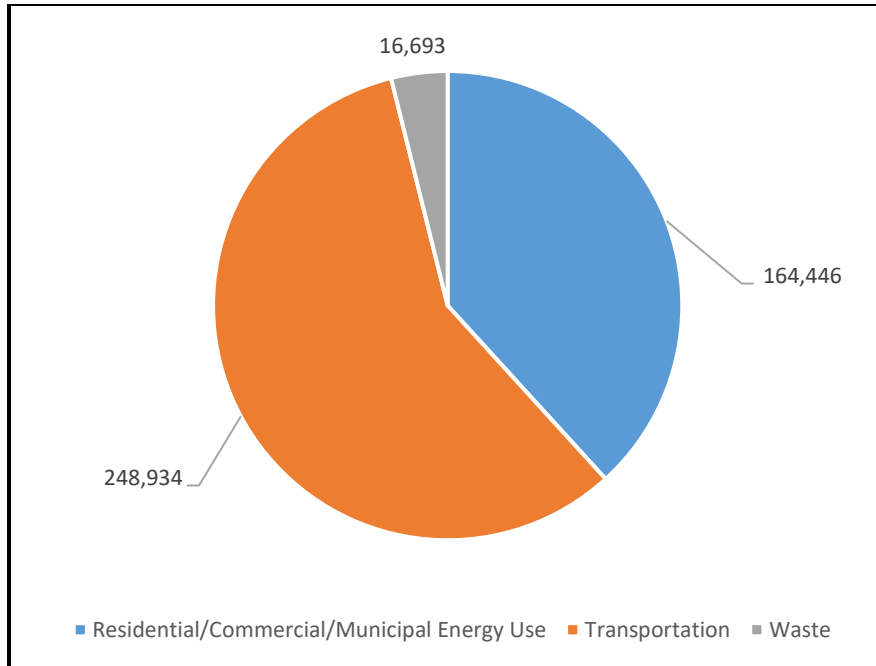


Figure 1
Summary of 2020 Annual GHG Direct Emissions
(metric tons)

When accounting for indirect and upstream emissions (see **Table 2** and **Figure 2**), the Residential/Commercial/Municipal Energy Use Sector represents the majority of citywide emissions (60 percent) due to the inclusion of emissions associated with grid electricity consumption from generation sources outside of the City as well as lifecycle emissions from fuel consumption. In order to minimize emissions from electricity generation sources, the City of New Rochelle enacted implemented the Community Choice Aggregation Energy Program in 2015. The program is estimated to result in shifting approximately 97 Gigawatt-hours of electricity consumption for residential buildings to renewable energy in 2020 and an associated reduction to GHG emissions of 29,523 metric tons of CO₂e per year.

Table 2
Summary of 2020 Annual GHG Indirect Emissions
(metric tons)

Sector	CO ₂ e
Residential/Commercial/Municipal Energy Use	
<i>Residential</i>	181,732
<i>Commercial</i>	181,117
<i>Municipal</i>	5,617
Total	371,465
Transportation	264,187
Waste	19,355
Total	654,987

Notes:
 Totals may not sum due to rounding.
 Emissions presented using the 100-year horizon global warming potentials to estimate carbon dioxide equivalents.

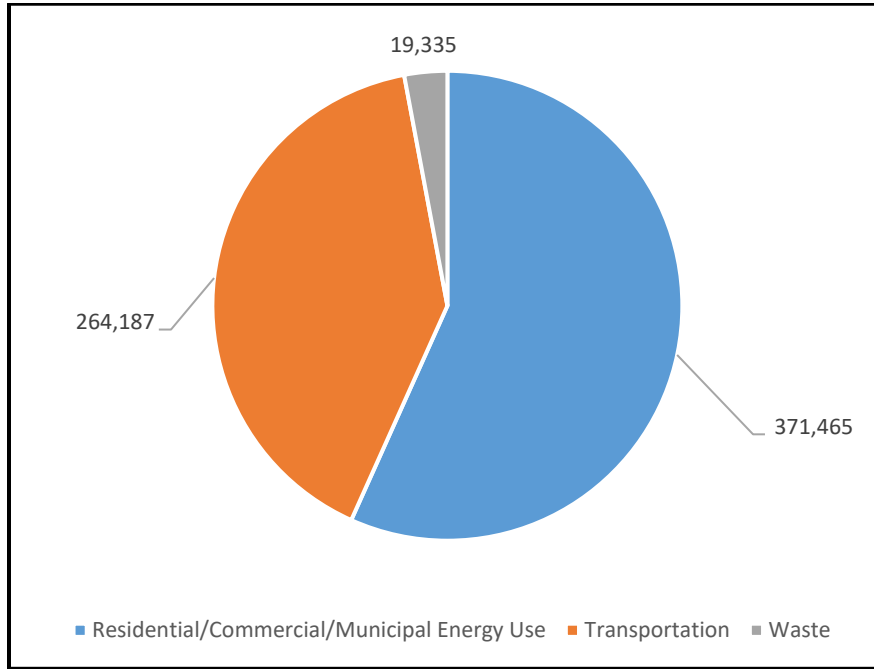


Figure 2
Summary of 2020 Annual GHG Indirect Emissions
(metric tons)

B. NEW YORK STATE STATEWIDE GHG EMISSIONS REPORT AND EMISSION LIMITS

In July of 2019, New York State enacted the Climate Leadership and Community Protection Act (CLCPA). As part of the adopted 6 NYCRR Part 496 in 2020, NYSERDA developed the 1990 baseline GHG emissions for New York State consistent with the calculation requirements specified under the CLCPA. The statewide inventory was separated into four sectors across the state and included:

1. Energy Sector—This sector includes direct fuel combustion within the state (associated with building fuel usage, vehicle travel, and electricity generation), fugitive emissions within the state (associated with emission released during production and transportation of fuels), electricity transmission (associated with the leakage of GHGs during the manufacture, use, and disposal of equipment used in the transmission and distribution of electricity), fuels imported into the state (associated with emissions from out of state industrial production and transportation), and electricity imported into the state (associated with emissions from generation and transmission).
2. Industrial Processes and Product Use—This sector includes emissions from the manufacturing process or from a manufactured product and are separate from the combustion of fossil fuels by industries, which is accounted for in the Energy sector.

3. Agriculture Forestry and Other Land Use—This sector includes emission sources associated with land management relating to livestock, land use, and other aggregated sources.
4. Waste—This sector includes emissions associated with solid waste disposal, biological treatment of solid waste, waste combustion, and wastewater treatment.

The GHG inventory performed by NYSEDA determined a statewide 1990 annual baseline emission total of 409.78 million metric tons (MMT) of CO₂e.³ Subsequently, this established the statewide annual CO₂e emission limits for 2030 and 2050 as 245.87 MMT and 61.47 MMT, respectively.

C. GREENHOUSE GAS EMISSIONS METHODOLOGY

POLLUTANTS OF CONCERN

GHGs are those gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and emit radiation at specific wavelengths within the spectrum of infrared radiation emitted by the Earth's surface, the atmosphere, and clouds. This phenomenon causes the general warming of the Earth's atmosphere, or the "greenhouse effect." Water vapor, carbon dioxide (CO₂), nitrous oxide (N₂O), methane, and ozone are the primary GHGs in the Earth's atmosphere.

CO₂ is the primary pollutant of concern from anthropogenic sources. Although not the GHG with the strongest effect per molecule, CO₂ is by far the most abundant and, therefore, the most influential GHG. CO₂ is emitted from any combustion process (both natural and anthropogenic); from some industrial processes such as the manufacture of cement, mineral production, metal production, and the use of petroleum-based products; from volcanic eruptions; and from the decay of organic matter. CO₂ is removed ("sequestered") from the lower atmosphere by natural processes such as photosynthesis and uptake by the oceans. CO₂ is included in any estimate of GHG emissions.

Methane and N₂O also play an important role since the removal processes for these compounds are limited and because they have a relatively high impact on global climate change as compared with an equal quantity of CO₂. Emissions of these compounds, therefore, are included in GHG emissions estimates when the potential for substantial emission of these gases exists.

To present a complete inventory of all GHGs, component emissions are added together and presented as carbon dioxide equivalent (CO₂e) emissions—a unit representing the quantity of each GHG weighted by its effectiveness using CO₂ as a reference. This is achieved by multiplying the quantity of each GHG emitted by a factor called global warming potential (GWP). GWPs account for the lifetime and the radiative forcing⁴ of each chemical over a period of 100 years (e.g., CO₂ has a much shorter atmospheric lifetime than Methane, and therefore has a much lower GWP).

While the conventional approach to emission reporting for national governments has been to apply a GWP integrated over a 100-year time horizon, the CLCPA requires that the Statewide Greenhouse Gas Emissions Report apply a GWP that is integrated over a 20-year time horizon. Consequently, NYSDEC adopted 20-year GWP values from the IPCC Fifth Assessment Report

³ 6 NYCRR Part 496, Statewide Greenhouse Gas Emissions Limits. Regulatory Impact Statement

⁴ *Radiative forcing* is a measure of the influence a gas has in altering the balance of incoming and outgoing energy in the Earth-atmosphere system and is an index of the importance of the gas as a GHG.

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into the Part 496 regulation-shortening the time horizon over which the GWP is integrated increases the GWP of gases that are shorter-lived than CO₂, such as methane.

The GWPs for the main GHGs discussed here are presented in **Table 3**. This emissions inventory focuses on CO₂, nitrous oxide (N₂O), and methane (CH₄).

**Table 3
Global Warming Potential (GWP) for Major GHGs**

Greenhouse Gas	100-year Horizon GWP	20-year Horizon GWP
Carbon Dioxide (CO ₂)	1	1
Methane (CH ₄)	28	84
Nitrous Oxide (N ₂ O)	265	264

Note: The 100-year horizon GWPs presented above are based on the Intergovernmental Panel on Climate Change's (IPCC) Second Assessment Report (SAR) to maintain consistency in GHG reporting. The IPCC has since published updated GWP values that reflect new information on atmospheric lifetimes of GHGs and an improved calculation of the radiative forcing of CO₂. In some instances, if combined emission factors were used from updated modeling tools, some slightly different GWP may have been used for this study. Since the emissions of GHGs other than CO₂ represent a very minor component of the emissions, these differences are negligible.

The 20-year horizon GWPs are presented for consistency with New York State's 2022 Statewide Greenhouse Gas Emissions Report and the Statewide Greenhouse Gas Emissions Limits established by the CLCPA, 6 NYCRR Part 496

DIRECT FUEL EMISSIONS

To estimate GHG emissions from the consumption of fossil fuels within the City (associated with either the operation of buildings or from vehicles traveling on roadways), fuel quantities were multiplied by emission factors of 54.18 grams kilograms CO₂e per standard cubic feet of natural gas, 5.72 kilograms CO₂e per gallon of propane, and 10.39 kilograms CO₂e per gallon of diesel fuel (distillate fuel oil) obtained from EPA Emission Factors for Greenhouse Gas Inventories for stationary combustion.⁵

GRID ELECTRICITY EMISSIONS

Since there are no fossil fuel fired electrical generating stations within the City, emissions associated with electrical consumption were considered fully indirect for this emissions inventory. Emission factors were developed for baseload electricity consumption for the NPCC NYC/Westchester region using the EPA's Emissions & Generation Resource Integrated Database (eGRID2020) model. Furthermore, emission reductions associated with the increased renewable energy under the Community Choice Aggregation Energy Program were conservatively estimated using baseload emission factors.

UPSTREAM EMISSIONS

Upstream emissions were projected for the annual fuel consumption estimates. Upstream emission factors for fossil fuels were used consistent with those specified by NYSDEC for upstream and out-of-state emissions.⁶ Fuel deliveries may originate from either in-state or out-of-state sources;

⁵ EPA. Emission Factors for Greenhouse Gas Inventories. April 18, 2023.

⁶ NYSDEC. Appendix A of the 2021 Statewide GHG Emission Report. January 2022

therefore while emissions would be associated with the City's Residential/Commercial/Municipal, Transportation, or Waste sections, portions of the upstream emissions would correlate to either in-state fuel production emissions or as out-of-state emissions associated with the production and transport of imported fuel under New York State's GHG Emissions Report.

D. SECTOR EMISSIONS

RESIDENTIAL/COMMERCIAL/MUNICIPAL ENERGY CONSUMPTION

The direct emissions associated with residential, commercial, and municipal energy consumption in 2020 is estimated to be 164,446 metric tons of CO₂e. Annual emissions for residential and commercial properties were estimated based on natural gas and electricity consumption data as reported by Con Edison for 2020. Additionally, annual consumption of fuel oil and propane was estimated based on the 2020 population of the City of New Rochelle and estimated energy intensities for the region. Annual fuel consumption was approximately 2.2 billion cubic feet of natural gas, 3.6 million gallons of fuel oil, and 1.2 million gallons of propane. While municipal energy consumption was included in the Con Edison estimates for commercial properties, direct estimates of municipal emissions were based on annual reported fuel consumption at City-owned properties of approximately 15 million cubic feet of natural gas.

When accounting for grid electricity emissions and fuel lifecycle emissions, annual indirect emissions are estimated to be 371,465 metric tons of CO₂e. When calculating emissions associated with electricity consumption, reductions associated with on-site solar generation as well as increased renewable grid electricity associated with the Community Choice Aggregation Energy Program through the Westchester Power, a renewable energy electricity purchasing program to move all residents of New Rochelle to 100 percent renewables as the default provider, would reduce electricity emissions by up to 57 percent.

Due to the City's implementation of emission reduction initiatives at City-owned properties (such as the replacement of all public streetlights with efficient LED street lighting), the City of New Rochelle is estimated to result in direct emissions of only 799 metric tons of CO₂e and indirect emissions of 4,355 metric tons of CO₂e. This accounts for less than 2 percent of the total sector's emissions.

Since there would be no significant sources of refrigerant usage within the City, this inventory does not include estimated emissions associated with refrigerant usage or fugitive emissions. However, the City may begin tracking refrigerant usage at municipal buildings to estimate potential emissions in future inventories.

TRANSPORTATION

The direct emissions associated with the Transportation Sector in 2020 is estimated to be 248,934 metric tons of CO₂e. Annual emissions are based on estimated annual vehicle miles traveled (VMT) on roadways within the City of New Rochelle and vehicle emission factors using EPA's MOVES emission model to obtain an estimate of car and truck GHG emission factors. Since annual estimates of VMT were not explicitly developed for the City of New Rochelle, county level estimates of annual VMT for Westchester County for local roadways and highways were scaled down to the City level. VMT on local roadways were scaled based on population, and VMT on highways were scaled based on the length of highways within the City.

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Annual VMT was further split between VMT associated with the downtown area of New Rochelle, and other portions of the City. Recent traffic improvement studies were used to characterize traffic conditions, vehicle occupancy, and trip length for the City overall as well as within the downtown area.

The City of New Rochelle has implemented several initiatives to reduce GHG emissions by shifting VMT from personal auto trips to more sustainable modes of travel through City-sponsored bike-share and scooter-share programs and higher occupancy electric vehicles through the newly introduced Circuit Ride Share program. Operation of the Circuit Ride Share program began in 2019. In 2020 the program was anticipated to result in a reduction of 32,186 VMT.

The City has also implemented increased fuel efficiency and electric vehicle use within the City's automobile fleet. VMT associated with the City's vehicle fleet were estimated using reported odometer readings in 2022. Each vehicle's average annual VMT was calculated based on this odometer reading and the vehicle's overall time it has been in service. Future estimates of the City's vehicle activity would be performed through regular annual reporting of odometer readings, or through direct fuel purchasing records. Subsequently, emissions associated with the City-owned fleet would account for less than 1 percent of citywide emissions.

When lifecycle emissions are accounted for, the Transportation Sector is estimated to result in 264,204 metric tons of CO₂e.

WASTE

The direct emissions associated with the Waste Sector in 2020 is estimated to be 16,693 metric tons of CO₂e. Emissions are associated with the process emissions at the New Rochelle Wastewater Treatment Plant and are estimated using the tributary population reported for the plant. Currently, the plant is operated in an overloaded condition due to increased water influent from groundwater infiltration into the wastewater collection systems. Improvement projects are underway to reduce process water flow below the plant's design process flow.

Indirect emissions were calculated based on the City's total population and would occur at several nearby wastewater treatment plants within Westchester County. Total indirect emissions is estimated to be 19,335 metric tons of CO₂e.

Since there are no landfill sites within the City, this inventory focuses on the direct and indirect emission associated with wastewater treatment and does not include emissions associated with solid waste.

*