

City Of New Rochelle
2018
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, are participating 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 comprehensive plan over the year 2010-2030 for a sustainable and resilient city, GreenNR. 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 2018 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). 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). 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).

CITY OF NEW ROCHELLE 2018 ANNUAL GHG EMISSIONS

The City of New Rochelle is estimated to result in the direct emissions of 545,943 metric tons of carbon dioxide equivalent (CO₂e) emissions in 2018, or approximately 6.9 metric tons of CO₂e

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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.)¹ When accounting for all indirect and upstream emissions, the City of New Rochelle is estimated to result in emissions of 971,811 metric tons of CO₂e in 2018—approximately twice 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 42 and 54 percent of annual emissions, respectively. The Waste Sector accounted for only 3 percent of citywide emissions.

Table 1
Summary of 2018 Annual GHG Direct Emissions
(metric tons)

Sector	CO₂e
Residential/Commercial/Municipal Energy Use	231,869
<i>Residential</i>	61,960
<i>Commercial</i>	169,110
<i>Municipal</i>	799
Transportation	295,812
Waste	18,262
Total	545,943

Note: Totals may not sum due to rounding.

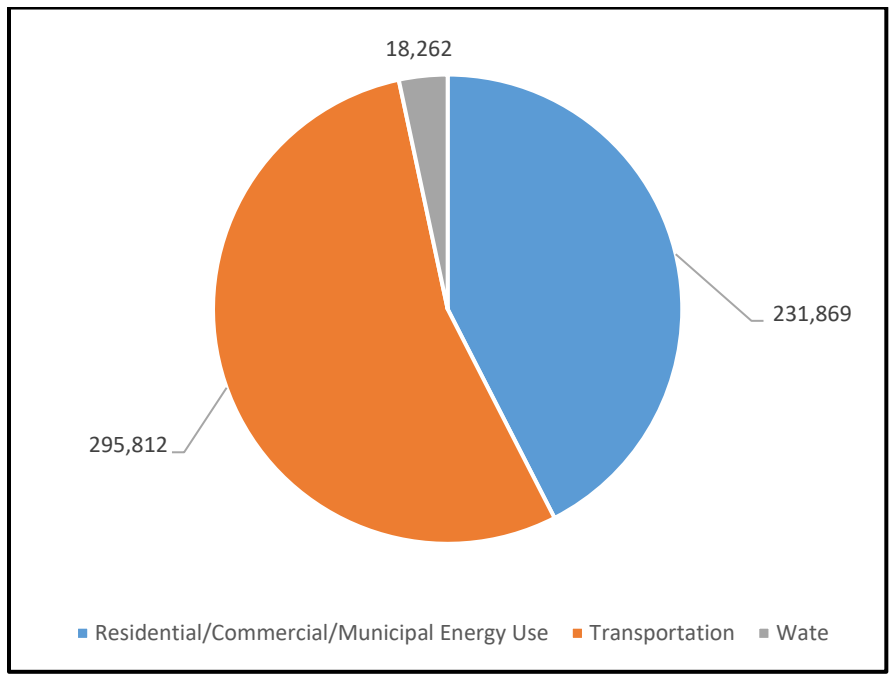


Figure 1

¹ NYSEC. 2022 Statewide GHG Emissions Report: Summary Report. December 2022

**Summary of 2018 Annual GHG Direct Emissions
(metric tons)**

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.

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 (75 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.

**Table 2
Summary of 2018 Annual GHG Indirect Emissions
(metric tons)**

Sector	CO₂e
Residential/Commercial/Municipal Energy Use	
<i>Residential</i>	86,257
<i>Commercial</i>	548,346
<i>Municipal</i>	14,035
<i>Total</i>	648,638
Transportation	302,356
Waste	20,817
Total	971,811

Note: Totals may not sum due to rounding.

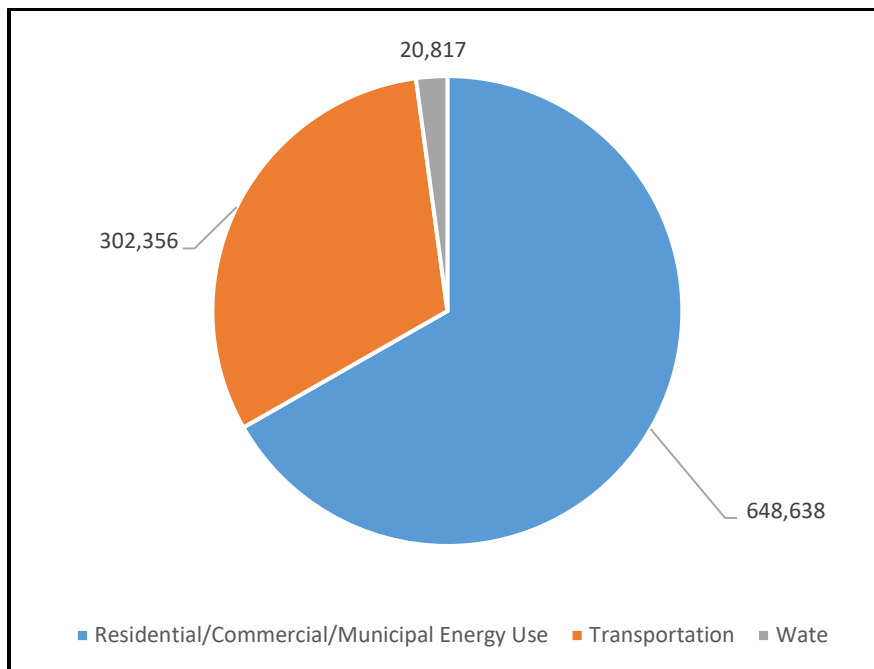


Figure 2

Summary of 2018 Annual GHG Indirect Emissions (metric tons)

B. GREENHOUSE GAS EMISSIONS

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 forcing² 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). 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).

² *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.

Table 3
Global Warming Potential (GWP) for Major GHGs

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

Note: The 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.

C. SECTOR EMISSIONS

RESIDENTIAL/COMMERCIAL/MUNICIPAL ENERGY CONSUMPTION

The direct emissions associated with residential, commercial, and municipal energy consumption in 2018 is estimated to be 231,869 metric tons of CO₂e. Annual emissions for residential and commercial properties were estimated based on the 2018 population of the City of New Rochelle and estimated energy intensities for the region. Annual fuel consumption is estimated to be approximately 3.2 billion cubic feet of natural gas, and 5 million gallons of fuel oil. 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 648,638 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 program through the Westchester Power, a renewable energy electricity purchasing program to move all residents of New Rochelle to 100 percent wind power as the default provider, would reduce electricity emissions by up to 66 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 14,767 metric tons of CO₂e. This accounts for less than 2 percent of the total sector's emissions.

TRANSPORTATION

The direct emissions associated with the Transportation Sector in 2018 is estimated to be 295,812 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 bicycle through a City-sponsored bike-share program and higher occupancy electric vehicles through the newly introduced Circuit Ride Share program. While these programs were not in full operation in 2018, the partial effects were accounted for in the 2018 emissions estimate. Furthermore, the City has implemented increased fuel efficiency and electric vehicle use within the City's automobile fleet. Therefore, emissions associated with the City-owned fleet would account for less than 1 percent of citywide emissions.

When lifecycle emissions are accounted for, the Transpiration Sector is estimated to result in 302,356 metric tons of CO₂e.

WASTE

The direct emissions associated with the Waste Sector in 2018 is estimated to be 18,262 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 20,817 metric tons of CO₂e.

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