# City of Jersey City

## 2016 Inventory of Communitywide Greenhouse Gas Emissions

**Produced by the Jersey City Office of Sustainability**

**August 2019**

With the assistance of Montclair State University's PSEG Institute for Sustainability Studies and ICLEI - Local Governments for Sustainability USA

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# INTRODUCTION

The City of Jersey City recognizes the intergenerational risks that a changing climate poses to its residents. Increased air pollution, sea level rise, coastal flooding, more frequent and intense storms, severe storm surges, combined sewer overflow events, and the exacerbation of the urban heat island effect are a few of the many climate-related risks future generations will inherit. Jersey City has already experienced these local effects first hand in the forms of Hurricanes Irene and Sandy, severe snowstorms, and nor'easters. These events caused power outages, severe flooding, and property damage resulting in millions of dollars in losses to the city's local economy. The impacts of these climate risks are only projected to increase as more greenhouse gases (GHG) are emitted.

> The goals of this GHG inventory are to measure community emissions so that we can build more effective emissions reduction strategies, set measurable and ambitious emission reduction goals, and accurately track our progress.

When joining the Covenant of Mayors in 2017, Jersey City became a leader in addressing the global climate crisis by committing to take local action. In order for the City to achieve tangible GHG emission reductions, a citywide community emissions inventory was conducted using 2016 emissions data. The emissions inventory presented in this report created the baseline of GHG emission levels, while identifying key emission sources in Jersey City, necessary to accurately track progress over time. Key findings from this inventory will help Jersey City adopt commonsense strategies intended to dramatically reduce GHG emissions and stay on target to meet its climate commitments.

# CLIMATE CHANGE BACKGROUND

## What are Greenhouse Gases?

Greenhouse gases (GHGs), such as carbon dioxide, are gases in our atmosphere that absorb and trap heat. Heat from the sun that is usually radiated back to space is instead trapped by GHGs and kept near the Earth's surface. This is called the greenhouse effect. Overwhelming evidence shows that human activities are increasing the concentration of greenhouse gases and thereby changing the global climate. The most significant contributor is the burning of fossil fuels for transportation, electricity generation and other purposes, which introduces large amounts of carbon dioxide and other greenhouse gases into the atmosphere. Collectively, these gases intensify the earth's natural greenhouse effect, causing global average surface and lower atmospheric temperatures to increase.

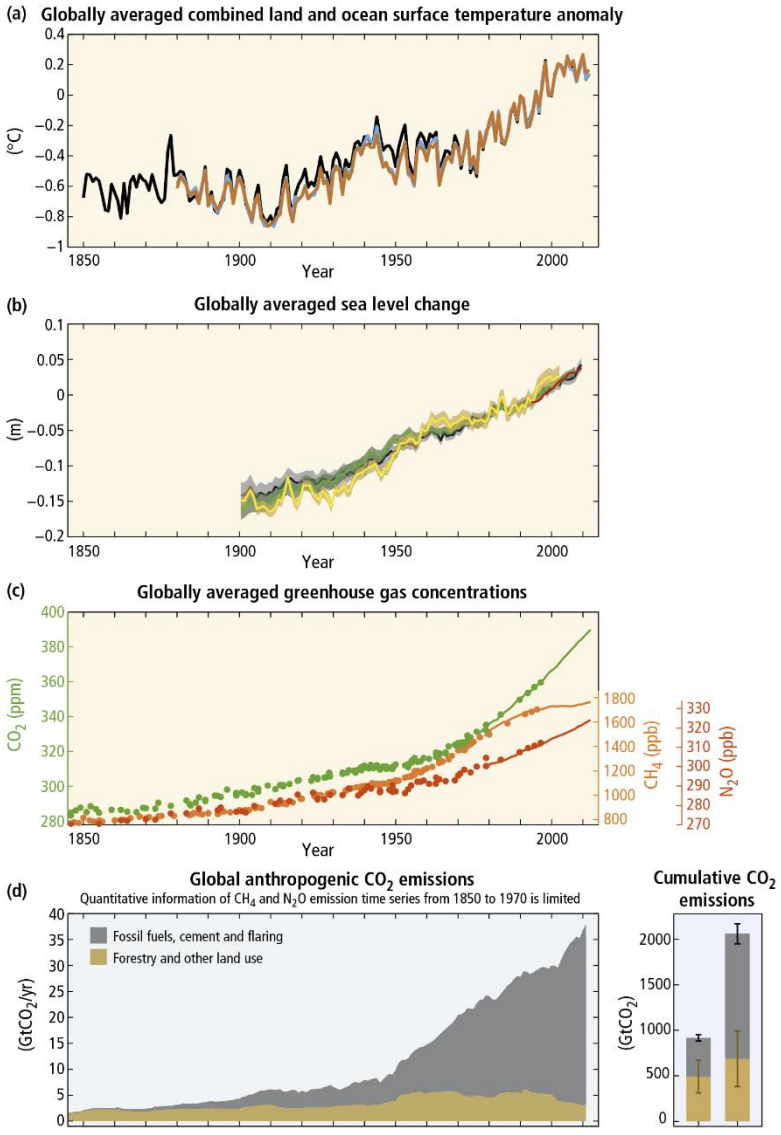


**Figure 1:** Graphs from the IPCC's Fifth Assessment

Increased levels of greenhouse gases in the earth's atmosphere have led to changes in weather patterns, temperatures, sea levels, and regional climates. The Intergovernmental Panel on Climate Change (IPCC), the global scientific body charged with bringing together the work of thousands of climate scientists, stated in its Fifth Assessment Report that "[i]n recent decades, changes in climate have caused impacts on natural and human systems on all continents and across the oceans."[1] The report continues to warn that "continued emission of greenhouse gases will cause further warming and long-lasting changes in all components of the climate system, increasing the likelihood of severe, pervasive and irreversible impacts for people and ecosystems. Limiting climate change would require substantial and sustained reductions in greenhouse gas emissions which, together with adaptation, can limit climate change risks."[2]

In a subsequent report on the impacts of global warming and related global GHG emission pathways, the IPCC stated that "limiting global warming to 1.5°C (2.7˚F) compared to 2°C (3.6˚F) is projected to reduce increases in ocean temperature as well as associated increases in ocean acidity and decreases in ocean oxygen levels."[3] Limiting global warming to 1.5°C (2.7˚F) would therefore "reduce risks to marine biodiversity, fisheries, and ecosystems." To remain within a 1.5°C (2.7˚F) global warming scenario by the

[1] IPCC, 2014: *Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland, 151 pp.
[2] Ibid.
[3] IPCC, 2018: Summary for Policymakers. In: *Global Warming Of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty* [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield (eds.)]. *World Meteorological Organization, Geneva, Switzerland, 32 pp.*

end of the century, a 45 percent reduction of global human-induced GHG emissions of 2010 levels by 2030, reaching net zero near 2050, is required.[4]

## Regional and Local Impacts

As reported in a paper published by the Sustainable Jersey Climate Change Adaptation Task Force, New Jersey has witnessed a 1.2°F increase in average annual temperatures since 1970, and the total number of days over 90˚F have increased by roughly 36 percent since 1949. Average precipitation has increased across the state, but especially in Northern New Jersey where above-average precipitation has increased 5 inches since the 1970's.[5] In the past 100 years, coastal New Jersey has seen sea level rise of 12-16 inches, approximately 4-8 inches more than global averages.[6]

By the 2050s, it is projected that climate change will result in an increased statewide baseline temperature of 3°F to 5°F and an increase in the annual number and duration of heat wave events (increasing from 2 to 5 events and from 4 to 5 days in length).[7] The average annual precipitation is projected to increase up to 10% by 2050, and sea levels in New Jersey are projected to rise by over 3 feet by the end of the century.[8] As a dense coastal City, Jersey City is especially vulnerable to the existing and projected effects of climate change. An increase in extreme storm events, combined with sea level rise, means more inland flooding and potential disruption and damage to infrastructure, like the electricity grid and transportation systems.

Urban areas experience elevated temperatures relative to the surrounding rural areas in an effect known as the urban heat island (UHI). Without open land and vegetation, city landscapes and urban building materials trap heat with implications for the environment and human health. Urban heat islands contribute to an increase in the electricity demand, elevate greenhouse gas emissions, reduce air and water quality, and threaten public health.[9] Dense urban areas like Jersey City will be especially prone to an increase in excessive heat events.

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[4] Ibid.
[5] Sustainable Jersey Climate Change Adaptation Task Force. "Climate Action Plans, Climate Change Trends and Projections Summary." Sustainable Jersey, 2011. Accessed July 12, 2019. http://www.sustainablejersey.com/about/action-development-task-forces/task-forces/climate-adaptation/
[6] Ibid.
[7] Ibid.
[8] Ibid.
[9] U.S. Environmental Protection Agency. "Urban Heat Island Basics." US EPA, 2008. Accessed August 16, 2019. https://www.epa.gov/heat-islands/heat-island-compendium

## Global Efforts

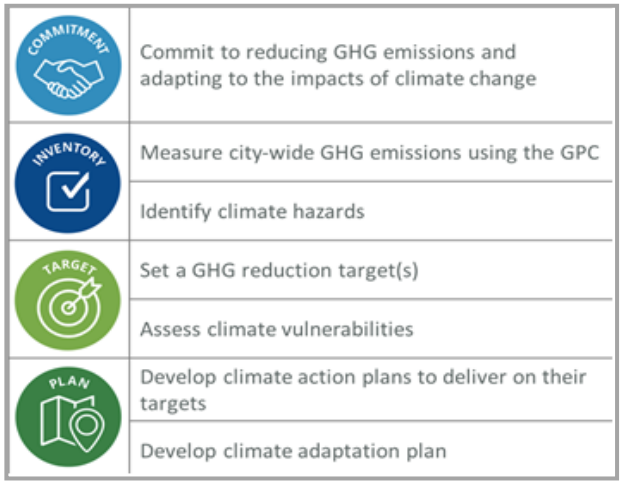
In response to the problem of climate change, many communities like Jersey City are taking responsibility by addressing emissions at the local level. Since many of the major sources of greenhouse gas emissions are directly or indirectly controlled through local policies, local governments have a strong role to play in reducing greenhouse gas emissions within their boundaries. Through proactive measures around land use patterns, transportation demand management, energy efficiency, green building, waste diversion, and more, local governments can dramatically reduce emissions in their communities. In addition, local governments at the city and county level are primarily responsible for the provision of emergency services and the mitigation of natural disaster impacts.

At the 2015 United Nations climate conference, 197 countries, including the United States, adopted the Paris Climate Agreement and agreed to limit global temperature rise to 2˚C (3.6˚F) or less, beginning in 2020. In additional to efforts at the national level, many individual cities around the world have taken on this commitment. To help cities and other communities achieve their climate goals, a framework called the Global Covenant of Mayors for Climate & Energy (Global Covenant of Mayors) was created. The Global Covenant of Mayors was developed through collaboration between a variety of organizations, including UN-Habitat, C40 Cities Climate Leadership Group (C40), and the International Council for Local Environmental Initiatives (ICLEI).

The Global Covenant of Mayors provides a methodology for local governments to identify and reduce greenhouse gas emissions. Participating cities take part in a three-year, four-stage process involving an initial commitment to the process, the collection and reporting of relevant data, the development of GHG reduction targets, and the creation of an action plan to meet these targets (see Figure 2). This effort is divided into mitigation actions aimed at reducing GHG emissions, and adaptation actions aimed at coping with expected or current climate impacts and improving resiliency. All actions taken under the Global Covenant of Mayors must utilize established global protocol and be reported on a public reporting platforms.

This inventory, combined with the Hudson County Vulnerability Assessment and the Jersey City Resiliency and Adaptation Master Plans, represents the completion of the Global Covenant Step 2, and provides a foundation for future work to reduce greenhouse gas emissions in Jersey City.

**Figure 2:** Steps for complying with the Global Covenant of Mayors for Climate & Energy



## Sustainability & Climate Change Mitigation Activities in Jersey City

Reducing greenhouse gas emissions in Jersey City can have many ancillary benefits to the community. More efficient use of energy decreases utility and transportation costs for residents and businesses, and retrofitting homes and businesses to be more efficient creates local jobs. Furthermore, money not spent on energy is more likely to be spent at local businesses, stimulating the local economy. Reducing fossil fuel use improves air quality and can increase opportunities for walking and bicycling, benefiting residents' health.

Jersey City has taken a number of actions since 2015 to mitigate GHG emissions and make the City more resilient. Some of the most noteworthy recent accomplishments are:

1. Integration of electric vehicles into municipal fleet and installation of public electric vehicle chargers;
2. Encouraging bicycling and walking through "complete streets" transportation planning and the Vision Zero Action Plan;
3. Installation the City's first-ever on-street protected bike lanes;
4. Launch of a bike share program in partnership with Citi Bike;
5. Installation of photovoltaic array on the roof of the municipal public works building;
6. Creation of a Green Business Certification Program;
7. Creation of a backyard and community gardening composting program;
8. Energy efficiency and general sustainability education for residents and businesses;
9. Adoption of Forestry Standards and more stringent tree planting requirements for new development; and
10. Implementation of green infrastructure within City parks and streetscapes.

An abbreviated timeline of Jersey City, state, and global initiatives related to sustainability and climate action can be seen on the next page. As the City develops its climate targets and develops an Action Plan for meeting those targets, additional policies and initiatives will be added to those that are currently underway.

# City, State, and Global Climate Actions

**2015**

### Resolution to Fight Climate Change

**Resolution 15-485**

Jersey City commits to achieve an 80% GHG emissions reduction by 2050, a goal recommended by the United Nations Framework Convention on Climate Change

**2015-2016**

### The Paris Climate Agreement

196 nations set nationally determined contributions intended to limit the increase of global average temperature well below 2°C above pre-industrial levels by 2100, and further pursue a 1.5°C global warming scenario

**2017**

### Jersey City Joins Climate Mayors

The day after President Trump announced the United States' withdrawal from the Paris Agreement, Mayor Steven Fulop signed the Mayors Climate Commitment to uphold the goals set by the Paris Climate Accord

**2017**

### Resolution Affirming the Paris Climate Agreement

**Resolution 17-517**

Jersey City officially reaffirms its commitment to environmental sustainability and combating the climate crisis

**2018**

### New Jersey passes the Renewable Energy Bill

**NJ A3723**

Requires 21% of the energy sold in NJ to be from Class I renewable energy sources by 2020, 35% by 2025, and 50% by 2030

**2018**

### Jersey City Joins Global Covenant of Mayors for Climate and Energy

Jersey City commits to aggressive, measurable action to address the climate crisis by: conducting a city-wide GHG inventory for 2016, developing public emissions targets and a roadmap of actions to achieve the targets

**2018**

### New Jersey Reenters RGGI

**NJ Executive Order 7**

New Jersey reenters the Regional Greenhouse Gas Initiative, a cooperative effort among nine Mid-Atlantic states to reduce greenhouse gas emissions through a carbon dioxide budget trading program

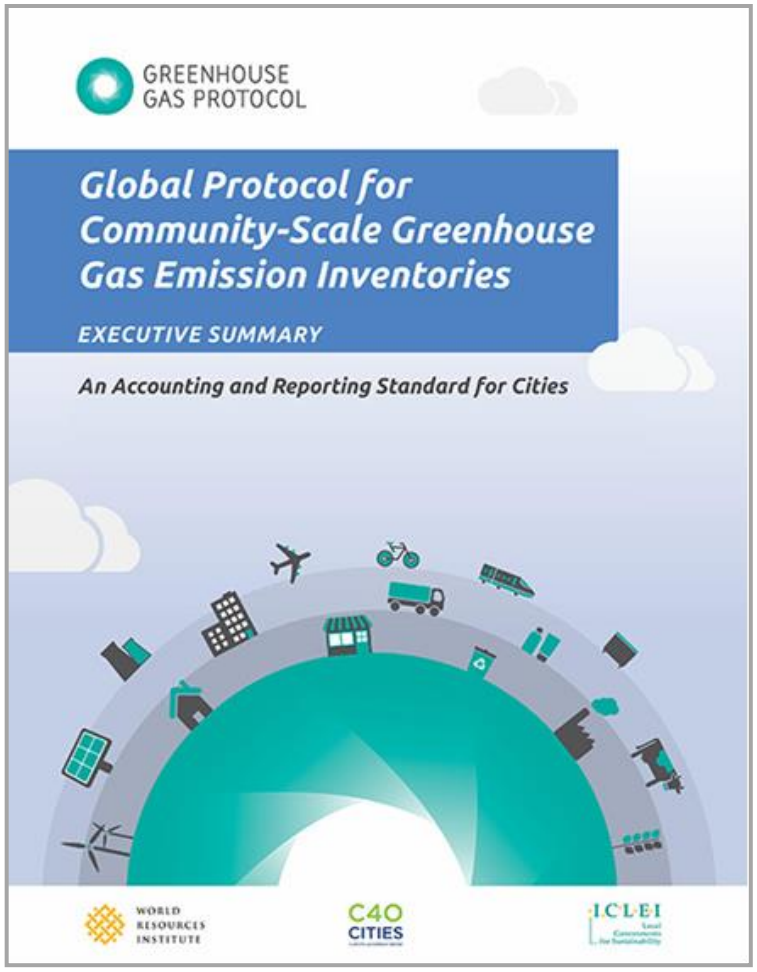
# GHG INVENTORY METHODOLOGY

## Understanding a Greenhouse Gas Emission Inventory

The first step toward achieving tangible greenhouse gas emission reductions is to identify baseline emissions levels and sources and activities generating emissions in Jersey City. This report presents emissions from the City of Jersey City as a whole.

## Community Emissions Protocol

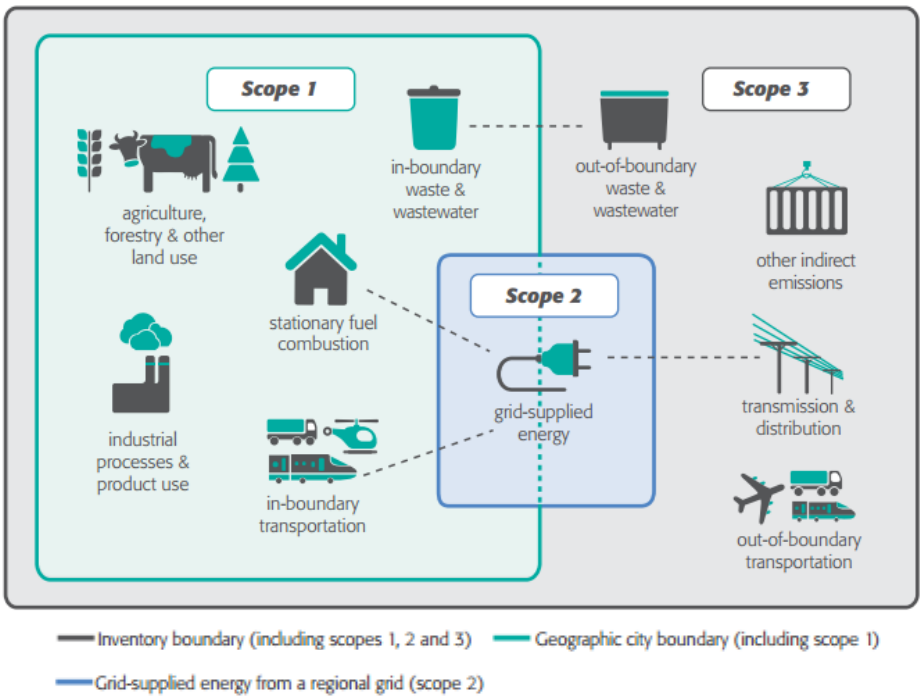
This GHG emissions inventory was conducted and reported in accordance with the *Global Protocol for Community-Scale Greenhouse Gas Emission Inventories* (referred to hereafter as GPC). The GPC was created by the World Resources Institute, C40 Cities Climate Leadership Group and ICLEI – Local Governments for Sustainability to provide a global standard in guidance for local governments to develop effective and consistent community GHG emission inventories. The GPC is used throughout the world by cities who have, like Jersey City, committed to the Global Covenant of Mayors.



## Quantifying Greenhouse Gas Emissions

Following the GPC BASIC level of reporting, the inventory organizes emissions into scopes and sectors. The **scopes**, which are conceptually summarized in Figure 3, identify how and where the emissions were created in relation to a jurisdiction's boundaries.

**Figure 3:** Sources and boundaries of a community's GHG emissions




**Scope 1** – GHG emissions from sources located within a city's jurisdictional boundary. Includes emissions from stationary energy, transportation, and waste.

**Scope 2** – GHG emissions occurring as a consequence of the use of grid-supplied electricity, heat, steam and/or cooling within the city boundary. Includes emissions from stationary energy sources.

**Scope 3** – All other GHG emissions that occur outside the city boundary as a result of activities taking place within the city boundary. Includes emissions from solid waste generated in the city but disposed in landfills outside the city.

The **sectors** identify what type of activity generated the emissions – such as buildings, transportation, waste, agriculture and industry. Jersey City's inventory accounts for GHG emissions from the following sectors:

- **Stationary energy**: emissions generated by electricity consumption, natural gas, # 2 heating fuel oil, and liquefied petroleum gas (LPG) from commercial, residential, and industrial buildings within Jersey City's jurisdictional boundary.
- **Transportation:** on-road emissions of freight vehicles, gasoline and diesel-powered passenger vehicles, and PATH emissions; all within the city.
- **Waste:** emissions generated in the city from wastewater treatment and emissions from solid waste disposed of outside city limits.

**Sectors not included**: Agriculture, aviation, and waterborne GHG emissions were not inventoried.

The inventory process requires the selection of a base year with which to compare future emissions. 2016 was chosen as Jersey City's base year due to the availability of data. Future inventories will be compared to this 2016 data to measure the City's progress in reducing its emissions over time. Jersey City's 2016 emissions data was provided by several organizations, including the utility PSE&G, the North Jersey Transportation Authority (NJTPA), the New Jersey Board of Public Utilities (NJBPU), the Hudson County Improvement Authority (HCIA), and the Jersey City Municipal Utilities Authority (JCMUA).

## Quantification Methods

Greenhouse gas emissions can be quantified in two ways:

1. Measurement-based methodologies refer to the direct measurement of greenhouse gas emissions (from a monitoring system) emitted from a flue of a power plant, a wastewater treatment plant, landfill, or industrial facility; or
2. Calculation-based methodologies calculate emissions using activity data and emission factors. To calculate emissions this way the following basic equation is used: Activity Data x Emission Factor = Emissions.

All emissions sources in this inventory are quantified using calculation-based methodologies. Activity data refer to the relevant measurement of energy use or other greenhouse gas-generating processes such as fuel consumption by fuel type, metered annual electricity consumption, and annual vehicle miles traveled. Known emission factors are used to convert energy usage or other activity data into associated quantities of emissions. Emissions factors are usually expressed in terms of emissions per unit of activity data (e.g. lbs CO2/kWh of electricity).

The Clear Path tool provided by ICLEI – Local Governments for Sustainability, a global network of over 1,750 local and regional governments committed to sustainable urban development, was used to produce the final emissions calculations and projections. Please see appendices for a detailed listing of the activity data used and assumptions made in creating this inventory.

# 2016 CITYWIDE GHG INVENTORY

In 2016, Jersey City emitted a total of 2,897,275 metric tons of CO2 equivalent (MtCO2e). The summary table below lists all emissions. The following pages illustrate emissions by source, sector, and sub-sectors.

| GPC Scope | Sector | Units | Consumed | Mt CO2e | Source MMBtu |
|---|---|---|---|---|---|
| | **Buildings/Stationary** | | | **1,948,123** | **27,291,963** |
| | Commercial | | | 1,211,647 | 15,774,932 |
| 1 & 2 | Electricity | kWh | 1,453,427,363 | 499,733 | 4,959,298 |
| 1 | Natural gas | GJ | 4,676,728 | 235,759 | 4,432,682 |
| 1 | #2 Fuel Oil | liters | 151,546,525 | 416,122 | 5,588,799 |
| 1 | #5 & 6 Fuel Oil | liters | 19,961,447 | 60,033 | 794,153 |
| | Residential (small and large residential) | | | 461,387 | 6,744,325 |
| 1 & 2 | Electricity | kWh | 563,720,637 | 193,824 | 1,923,494 |
| 1 | Natural gas | GJ | 4,459,272 | 224,797 | 4,226,574 |
| 1 | #2 Fuel Oil | liters | 12,425,202 | 34,118 | 458,222 |
| 1 | LPG | GJ | 143,525 | 8,648 | 136,035 |
| | Industrial | | | 275,089 | 4,772,707 |
| 1 & 2 | Electricity | kWh | 142,085,299 | 46,018 | 456,682 |
| 1 | Natural gas | GJ | 4,553,648 | 229,071 | 4,316,025 |
| | **Transportation** | | | **880,044** | **11,821,358** |
| | On-road transportation | | | 858,943 | 11,622,213 |
| 1 & 3 | Freight- diesel | VMT | 1,276,624 | 99,771 | 1,346,428 |
| 1 & 3 | Passenger- gas | VMT | 4,680,955 | 678,074 | 9,181,352 |
| 1 & 3 | Passenger- diesel | VMT | 121,583 | 81,098 | 1,094,433 |
| | Rail Transportation | | | 21,100 | 199,145 |
| 1 & 3 | Freight rail- diesel | liters | 1,199,540 | 3,247 | 43,534 |
| 1, 2, & 3 | Commuter rail (PATH) | kWh | 45,640,280 | 17,853 | 155,611 |
| | **Waste** | | | **69,109** | **17,775** |
| | Landfills | | | 67,637 | - |
| 3 | Exported solid waste- landfills | Mt | 103,550 | 67,637 | - |
| | Wastewater Treatment | | | 1,472 | 17,775 |
| 1 & 2 | Wastewater Electricity | kWh | 3,441,596 | 916 | 11,062 |
| 1 & 2 | Wastewater Nat. Gas | GJ | 7,083 | 556 | 6,713 |
| **Totals** | | | | **2,897,275** | **39,131,097** |

## Total GHG Emissions by Energy Source

Electricity consumption accounted for 26 percent of total GHG emissions, natural gas combustion 24 percent, gasoline-powered vehicles 23.5 percent, 16 percent #2 fuel oil, diesel-powered vehicles 6 percent, 2 percent #5 & 6 fuel oil, 2 percent landfill, and 0.30 percent liquefied petroleum gas (LPG).

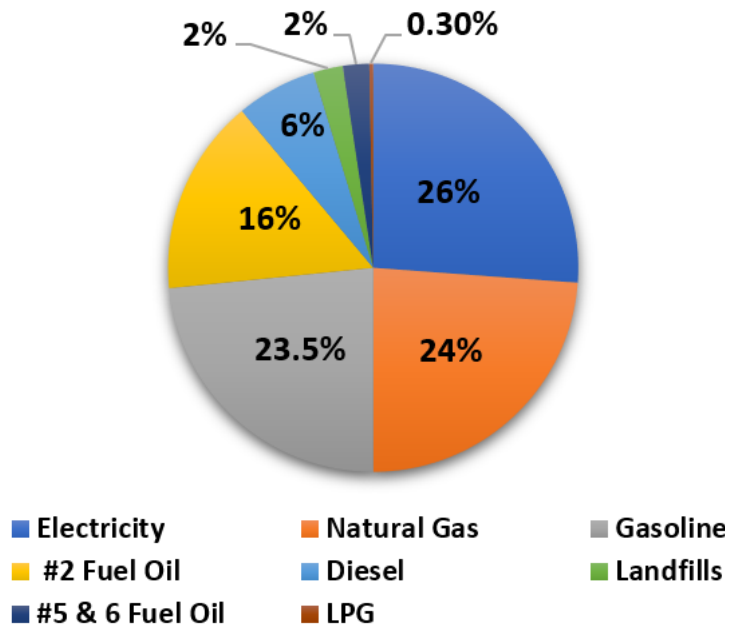



**Figure 4:** 2016 Jersey City Total GHG Emissions by Source

## Total GHG Emissions by Category

Commercial energy accounted for 42 percent of total GHG emissions, transportation 30 percent, 16 percent residential energy, 10 percent industrial energy, 2 percent water and less than 1 percent wastewater.

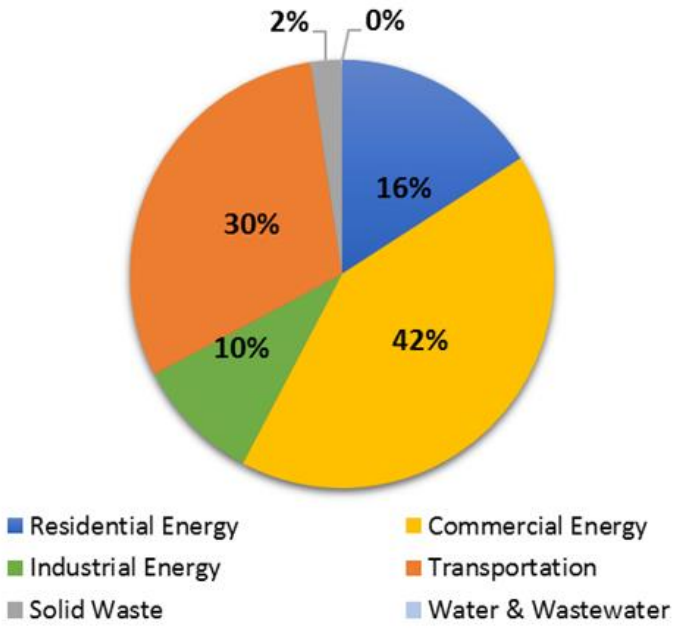



**Figure 5:** 2016 Jersey City Total GHG Emissions by Category

## Total GHG Emissions by Sector

Stationary energy (commercial, residential, and industrial energy) accounted for 67 percent (1,948,123 MtCO2e) of total emissions, transportation accounted for 30 percent (880,044 MtCO2e), and waste 3 percent (69,109 MtCO2e).

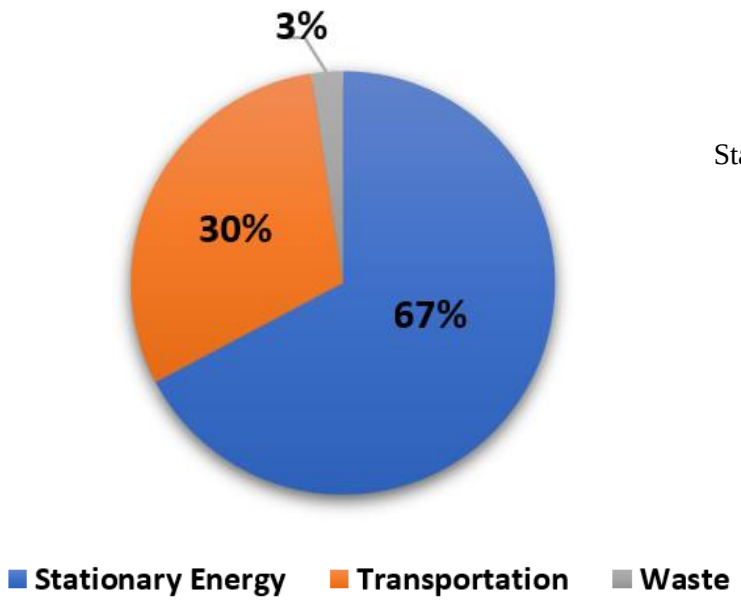



**Figure 6:** 2016 Jersey City Total GHG Emissions by Sector

## Stationary Energy GHG Emissions by Sub-Sector

Commercial energy consumption accounted for 62 percent (1,211,647 MtCO2e) of total stationary energy GHG emissions, residential 24 percent (461,387 MtCO2e), and industrial 14 percent (275,089 MtCO2e).

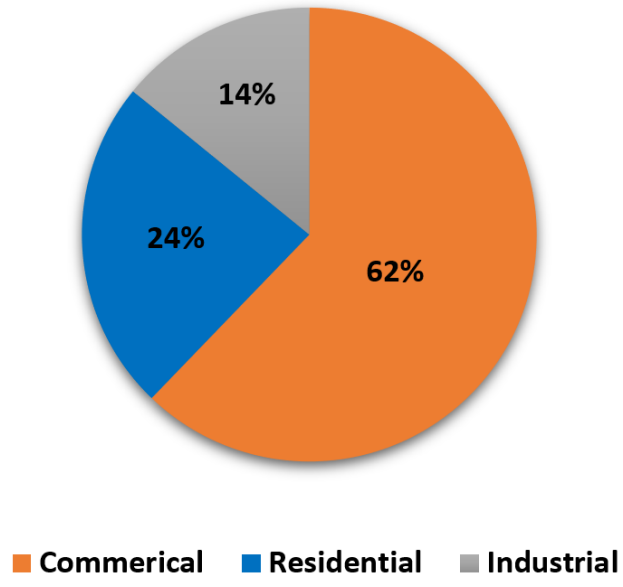



**Figure 7:** 2016 Jersey City Stationary Energy GHG Emissions by Sub-Sector

## Transportation GHG Emissions by Sub-Sector

On-road transportation accounted for 97.6 percent (858,943 MtCO2e) of total mobile GHG emissions and rail transportation accounted for 2.4 percent (21,100 MtCO2e). 77 percent of on-road vehicles were gasoline powered and 20.6 percent were diesel. 2 percent of the railways emissions were generated from commuter rail (PATH) and 0.4 percent from freight rail.

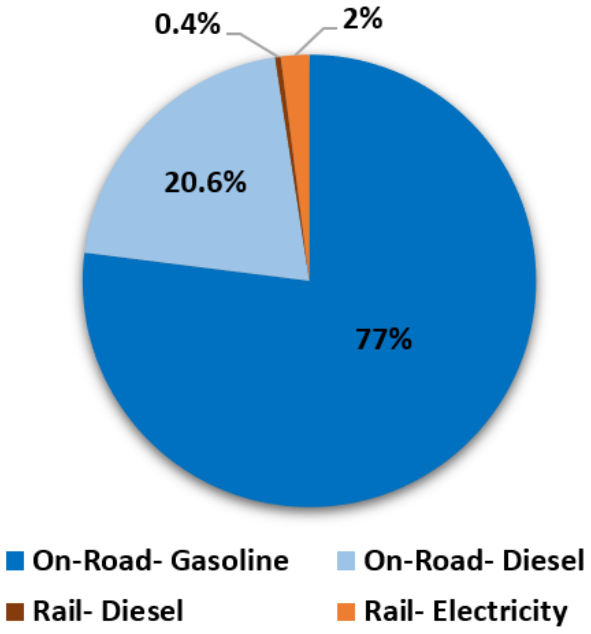



**Figure 8:** 2016 Jersey City Transportation GHG Emissions by Sub-Sector

## Waste GHG Emissions by Sub-Sector

Landfill emissions accounted for 98 percent (67,637 MtCO2e) of total waste GHG emissions and wastewater treatment accounted for 2 percent (1,472 MtCO2e).

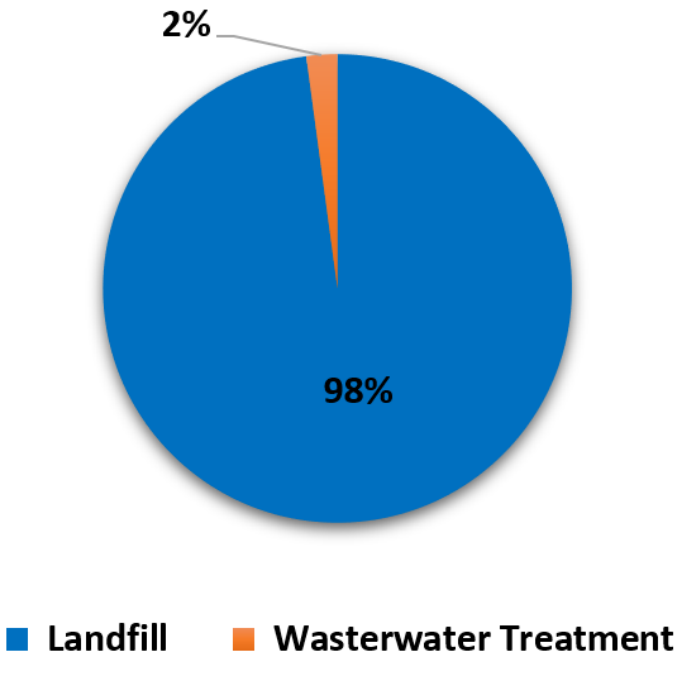



**Figure 9:** 2016 Jersey City Waste GHG Emissions by Sub-Sector

## Emissions Per Capita

For 2016, the City of Jersey City had an estimated population of 261,666[10]. Therefore, Jersey City's estimated per capita emissions for 2016 was 11.1 MtCO2e per capita. This estimate allows us to benchmark our baseline GHG emissions with similar cities (Figure 10).

These per capita calculations were based on information available from the Carbon Disclosure Project and will change over time as the cities shown update their inventories.

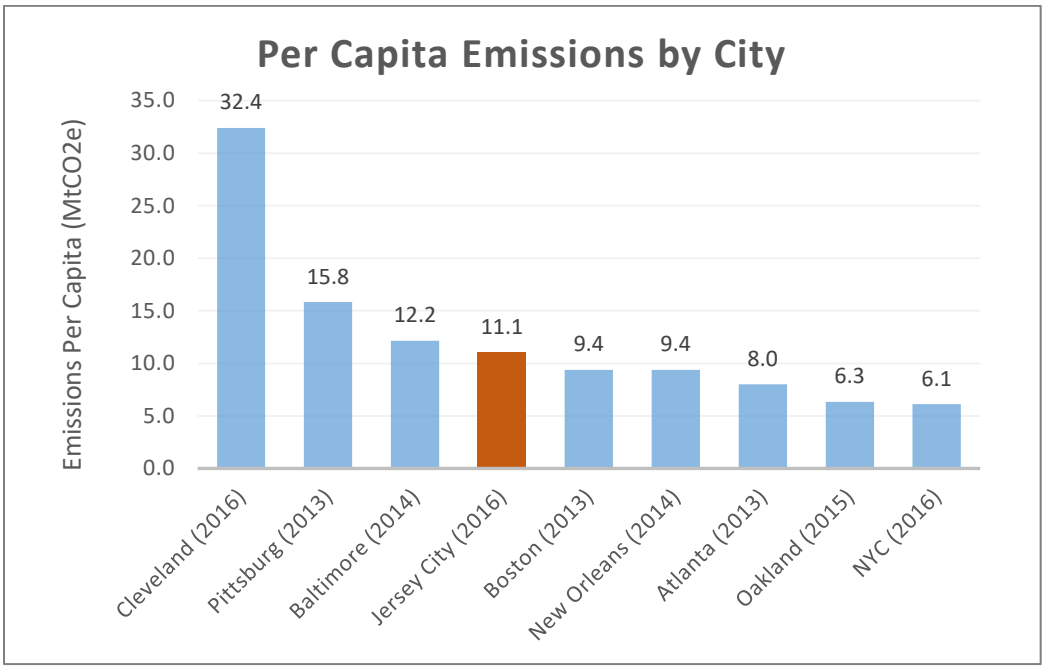



**Figure 10:** GHG Emissions Per Capita Comparison

[10] U.S. Census Bureau, "2016 Population Estimates 2016 – Jersey City, NJ," *2012-2016 American Community Survey 5-Year Estimates* (Table DP05), American FactFinder, accessed August 19, 2019, https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=bkmk

# CITYWIDE GHG EMISSIONS PROJECTIONS

In 2016, Jersey City emitted 2,897,275 metric tons of CO2e. Based on current energy use and expected population increases, Jersey City's community-wide greenhouse gas emissions could increase by 15 percent by 2030 (to 3,332,472 metric tons of CO2e), and 30 percent by 2050 (to 4,207,861 metric tons of CO2e) if no actions towards reducing emissions are taken,. This is called as a "business as usual', or BAU, scenario.

The graph below shows the "business as usual" scenario alongside possible pathways for Jersey City to tackle its greenhouse gas emissions. The red line indicates "business as usual." The other two lines show potential decarbonization pathways for meeting different reduction targets. The 80 percent reduction by 2050 target, which the City has already committed to, is in line with the Paris Climate Agreement's 2˚C (3.6˚F) global warming scenario. The yellow line illustrates a more aggressive reduction target or net zero by 2050, which is in line with the most recent climate science for a 1.5°C (2.7˚F) global warming scenario.

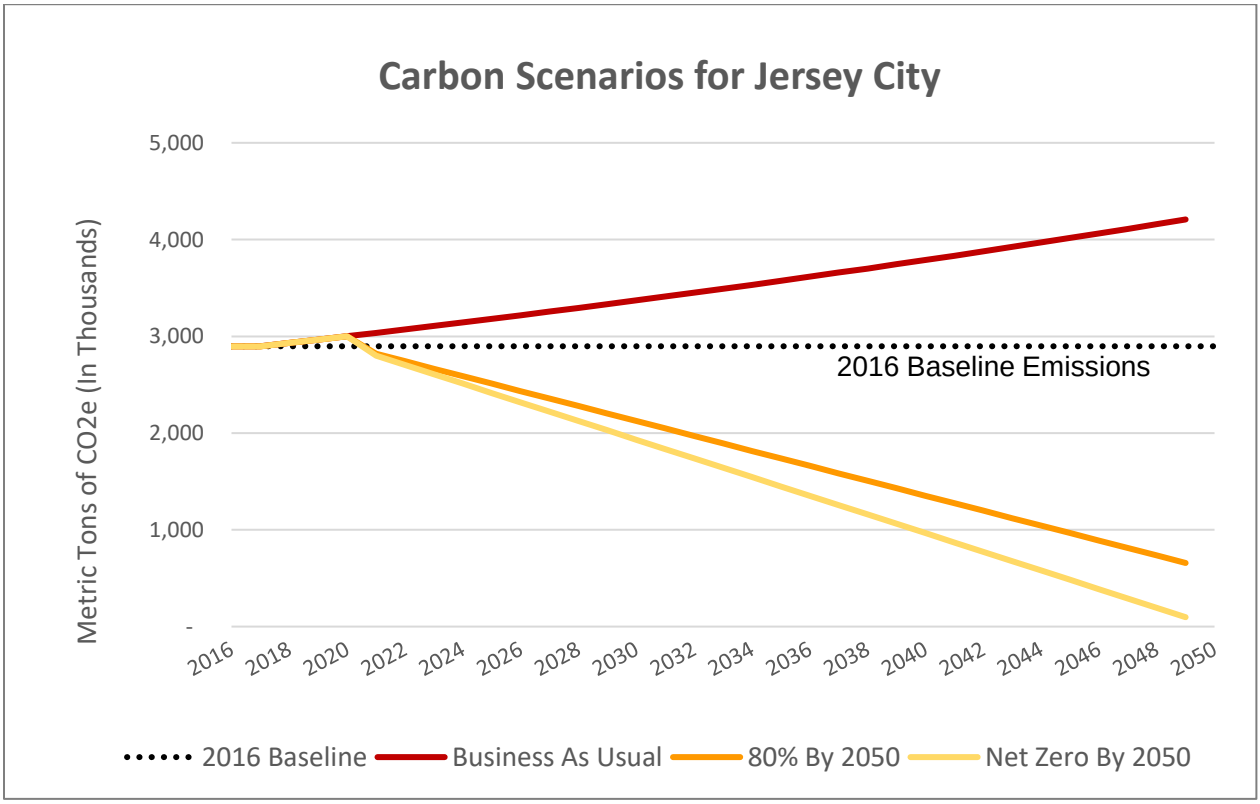



**Figure 11:** Citywide GHG Emissions Projection

The next step of the process is to confirm the City's reduction targets and create a Climate Action Plan to identify the actions that need to be taken to achieve that goal. Although Jersey City Council committed in 2015 to an 80 percent reduction in GHG emissions by 2050, it is important to reevaluate this target now that a comprehensive GHG inventory has been completed and the City has a better understanding of what that target means, both locally and as part of a global solution to climate change. Jersey City's Climate Action Plan will guide City policies such as energy efficiency requirements for new construction, municipal energy purchasing, transit investments, and waste management.

# CONCLUSION

Understanding Jersey City's highest emitting sectors and subsectors helps us identify where we should be focusing our emissions-reductions efforts to have the most impact. Of the 2,897,275 metric tons of CO2e emitted community-wide by Jersey City in 2016, 67 percent (1,948,123 MtCO2e) came from stationary energy. Of this sector, commercial buildings' energy use accounted for 62 percent of emissions, residential 24 percent, and industrial 14 percent. The second highest emitting sector was transportation with 30 percent of total GHG emissions (880,044 MtCO2e). Of this sector, on-road transportation accounted for 97.6 percent of total emissions and rail transportation accounted for 2.4 percent. The least emitting sector was waste, which accounted for 3 percent (69,109 MtCO2e) of total GHG emissions, 98 percent of which was emitted from solid waste generated in Jersey City and transported to landfills outside of city limits. 2 percent of total waste GHG emissions were generated from the treatment of wastewater. Based on the results of the inventory it is clear we need to focus our efforts on reducing the energy use of buildings, in particular commercial and residential buildings, and reducing on-road emissions caused by personal vehicles, trucks, and buses.

If a 'business as usual' approach to energy consumption and production is taken in the future Jersey City's emissions are projected to increase 30 percent by 2050 (from 2,897,275 to 4,207,861 metric tons of CO2e). Significant changes are required to cut our community emissions to the levels needed to meet our climate commitments. The City of Jersey City has begun these efforts through its ongoing sustainability initiatives but more action is needed. This GHG inventory is an important step; it should ideally be updated every five years in order to monitor progress. Jersey City has tremendous potential as a mid-sized city and a regional leader to address the intergenerational concerns that the global climate crisis poses. The next step for the City is the development of a comprehensive roadmap of strategic high impact reduction strategies to meet our community emissions reduction targets.

# APPENDIX: INVENTORY DETAILS

This section provides a detailed listing of the activity data used and assumptions made in creating this inventory.

**Stationary Energy**

*Residential Energy*

- Electricity: PSE&G provided the estimated electricity transmitted to Jersey City's infrastructure.
- Natural Gas: This number was derived from 2017 New Jersey residential natural gas usage estimates from the American Gas Association[11].
- #2 Fuel Oil and LPG: U.S. Census American Community Survey 5-Year Estimates for 2012-2016 were used to find the estimated number of households in Jersey City and the percent energy consumption of households by fuel type.

*Commercial Energy*

- Electricity: PSE&G provided the estimated electricity transmitted to Jersey City's infrastructure.
- Natural Gas: PSE&G provided the estimated natural gas consumed.
- # 2, 5, and 6 Fuel Oil: Calculations were done using the Commercial/Institutional Energy Consumption guidance on pages 19-22 of NYSERDA's New York Community and Regional GHG Inventory Guidance.[12]
- Missing Data**:** LPG, no data was available to estimate at the time of this inventory.

*Industrial Energy*

- Electricity: PSE&G provided the estimated electricity transmitted to Jersey City's infrastructure.
- Natural Gas: PSE&G provided the estimated natural gas consumed.
- Missing Data**:** LPG and fuel oil, no data was available to estimate at the time of this inventory.

**Transportation**

*On-Road Passenger Vehicle- Gasoline*

- NJTPA provided GHG emissions estimate for passenger vehicles using gasoline in Jersey City.

*On-Road Passenger Vehicle- Diesel*

- NJTPA provided the GHG emissions estimate for passenger vehicles using diesel in Jersey City. These vehicles were mainly buses.

*On-Road Freight Vehicle- Diesel*

- NJTPA provided the GHG emissions estimate from the 2017 Moves model for freight vehicles using diesel in Jersey City.

[11] American Gas Association, "Residential Natural Gas Consumption by State – 2017", accessed August 19, 2019 from https://www.aga.org/research/data/energy-consumption.

[12] NYSERDA Communities Team, *New York Community and Regional GHG Inventory Guidance: Methods and Data Sources for Community-Wide (Geospatial) GHG Emissions Inventories*, NYSERDA, 2015.

*Commuter Rail*

- PATH reported the 2016 GHG emissions estimate and assumed that 46 percent of all electricity consumption from PATH's operations occurred in Jersey City's jurisdictional boundary.

*Freight Rail*

- Length of rail track of CSX in Jersey City was estimated based on Google maps and aerial imagery. Total GHG emissions was reported in CSX's sustainability report. CSX's report was used to extrapolate the amount of diesel used in 2016.

*Missing Data for Overall Transportation Emissions***:** Waterborne and aviation GHG emissions.

**Waste**

*Solid Waste*

- Assumed that landfill methane collection was typical and moisture content was national average.
- Assumed the waste exported out of the city was 100 percent mixed solid waste.

*Wastewater Treatment*

- Electricity and Natural Gas: JCMUA provided the 2016 consumption estimates of electricity and natural gas consumed in all the city's wastewater treatment plants.
- Calculated GHG emissions by source by estimating ratio of one million British Thermal Units (MMBTU) energy equivalent produced for both natural gas and electricity, and divided by the total estimated CO2e emitted.

**Citywide GHG Emissions Projection**

Projections of citywide GHG emissions for the years 2017-2050 were calculated using existing energy usage rates and future population estimates for Jersey City from NJTPA's Plan 2045.[13] This follows the recommended forecasting methodology for a Community Aggregate Business As Usual Forecast, as stated in ICLEI's *Quick Start Guide for Setting a Greenhouse Gas Reduction Target*[14]

[13] North Jersey Transportation Planning Authority (NJTPA), "Appendix A – 2045 Demographic Projections," in*: Plan 2045: Connecting North Jersey*. (2017). https://www.njtpa.org/Planning/Plans-Guidance/Plan-2045.aspx

[14] Statewide Energy Efficiency Collaborative (SEEC), *Quick Start Guide for Setting a Greenhouse Gas Reduction Target*, ICLEI, 2010.