New York Institute of Technology

School of Engineering and Computing Sciences

LONG ISLAND CARBON FOOTPRINT PROJECT

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2005-2010 COMPARISON

JANUARY 2013

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New York Institute of Technology (NYIT)

Institutional Background

NYIT offers 90 degree programs including undergraduate, graduate, and professional degrees in more than 50 fields of study. These include architecture and design, arts and sciences, education, engineering and computing sciences, health professions, management, and osteopathic medicine. A non-profit independent, private institution of higher education, NYIT has 14,000 students attending campuses on Long Island and Manhattan, online, and at its global campuses.

NYIT has been a pioneer in the areas of sustainability and green initiatives in the academic and research worlds. The M.S. degree in Energy Management is one of the nation's oldest and most unique programs. The program has been preparing students to work in major energy companies, power plant, and renewable energy start-ups for more than 25 years. The M.S. degree in Environmental Technology has been offered since 1992 and incorporates the teaching of carbon footprint measurement throughout its coursework, as does the Energy Management degree program.

The Graduate Center for Metropolitan Sustainability, an interdisciplinary and collaborative effort between different NYIT schools, embraces both academic and physical initiatives that demonstrate NYIT's commitment to sustainability. The initial focus is to reduce on-campus greenhouse gas emissions and improve educational outreach. By implementing energy conservation measures, pursuing research opportunities in alternative energy technologies, and sharing those practices and applications through teaching and conferences, NYIT leads by example and provides the public with valuable career oriented experience, training and technology.

Purpose of the Long Island Carbon Footprint Project

In 2010, through the support of the Rauch foundation, NYIT was commissioned to update and improve a 2005 carbon footprint study on Long Island done by the International Council for Local Environmental Initiatives (ICLEI), also named Local Governments for Sustainability, and to develop and standardize a local community greenhouse gas inventory and accounting process going forward. Energy use and resultant greenhouse gas (GHG) emissions on Long Island for the year 2010 were established and were compared to the 2005 baseline year. Through this process, some comparisons between 2005 and 2010 were found to conflict; such as in the case of commercial fuel oil, or impossible such as in the case of transmission and distribution losses, due to different data sources and/or data unavailability. This will be explained later in the respective sectors. Through this project, NYIT will update and enhance the measurement and presentation of the Long Island Carbon Footprint in conjunction with various organizations and institutions on Long Island. NYIT is uniquely positioned to provide this comparison of GHG emission studies for the Long Island community. At the same time, this project is at the forefront of its kind in comparing collective carbon emissions on a local and regional level, not bound by common jurisdictional boundaries.

The regional inventory serves as a rallying point for governments, businesses, organizations and residents to coordinate climate initiatives across Long Island. It is intended to provide local

communities with baseline and progress measurements of GHG emission data, and maximize the collective efforts of local and regional entities to begin charting a course for emission reduction throughout the region.

Project Description

According to the 2010 census from the U.S. Census Bureau, the population of Nassau County is 1,339,532 and Suffolk County is 1,492,364 with combined total of 2,831,896[1]. In 2005, the population of Long Island was 2,831,753[2](Suffolk and Nassau combined).

This project encompassed two counties, 13 towns and two cities. Data sources were identified and activity data[3] was collected from various organizations, agencies, and utilities at the state, local and regional levels. One of the goals of the project was to coordinate climate initiatives across local communities on Long Island, hence allocating emissions by towns and cities are essential. In order to do that, various models and programs were used. For example, Geographic Information System (ArcGIS 10®) was used to allocate natural gas, transportation and land cover data. Where data was not available as in the case of fuel oil, statistics were used analyzed and allocated down to town and city level. Protocols and guidelines were used where appropriate and depending on the sector and source, emission and conversion factors were identified and used to compute carbon footprint. Following the latest available science and protocols on GHG emissions and for comparison purposes, all 2005 data were revised and updated.

This year, NYIT is also proud to be part of the New York State Energy Research and Development Authority's (NYSERDA) GHG Working Group[4] to refine emission protocols for the nation's first statewide community inventory at a regional level.

Greenhouse Gas Emission

Greenhouse gas is a gas in the atmosphere that absorbs and emits radiation within a thermal infrared range. This process is the fundamental cause of the greenhouse effect. Carbon footprint is measured in the universal unit of metric tons of carbon dioxide equivalent (MT CO_2e), for comparing emissions of different greenhouse gases, such as carbon dioxide, methane and nitrous oxide, expressed in terms of the global warming potential in equivalent units of carbon dioxide.

[1] 2010 U.S. Census
[2] 2005 LIPA Population Survey
[3] Activity data is data on the magnitude of a human activity resulting in emissions taking place during a given period of time. For example, energy use, fuel use, and vehicle miles traveled are some of examples of activity data that might be used to compute GHG emissions.
[4] As part of a collective effort with Cameron Engineering & Associates LLP, consulting Climate Smart Communities Program on Long Island region.

Outcomes: Long Island Greenhouse Gas (GHG) Emissions

In order to demonstrate GHG emissions, we have separated the results into sectors and sources.

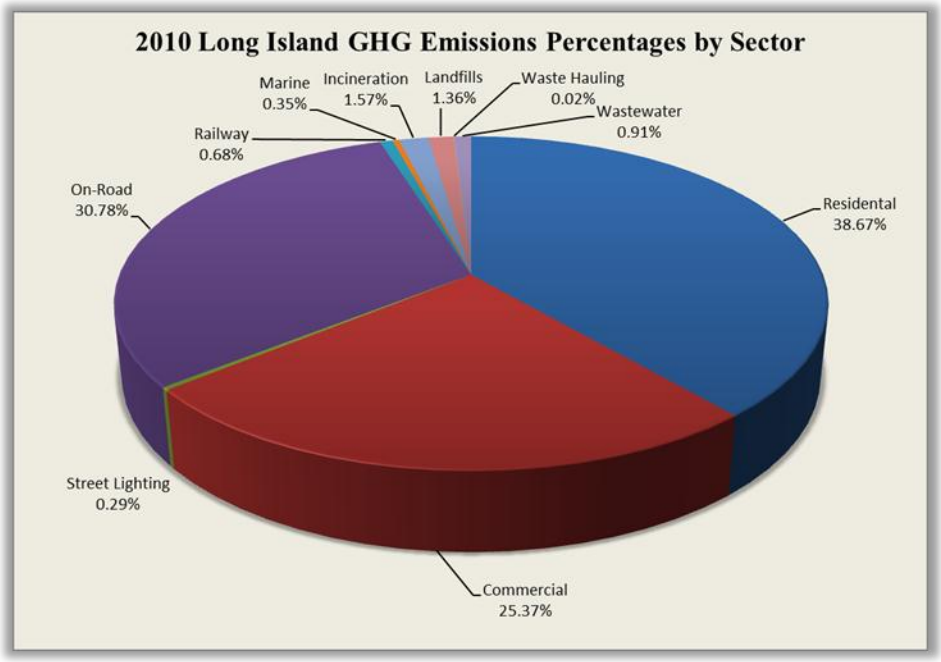
A "sector" is a way to classify human activities that generate greenhouse gas (GHG) emissions, such as residential, commercial and industrial use of energy, modes of transportation, and forms of waste management. In 2010, there were seven categories, broken into 16 sectors, as described later in the report, which produced GHG emissions on Long Island: the built environment, transportation, waste management, agriculture, land use change and forestry, stationary energy generation, and transmission and distribution losses.

A "source" is an alternative way of classifying how GHG emissions are generated, such as the use of fuels or the process and fugitive emissions generated due to certain processes. The sources in this project include electricity, natural gas, fuel oil, gasoline and diesel.

The total GHG emission on Long Island in 2010 was 35,262,459 MT CO_2e, marking a reduction of an overall 9.75% compared to 39,072,513 MT CO_2e in 2005. The emissions include the following sectors: residential, commercial, street lighting, on-road transportation, railway, incineration, landfills, waste haulage outside of Long Island, wastewater and marine. Due to the lack of appropriate data and data unavailability whether in 2005 or 2010, the following sectors were not added into the overall emissions for comparisons, but they served as informational items: agriculture, land use change and forestry, stationary energy generation, and transmission and distribution losses.

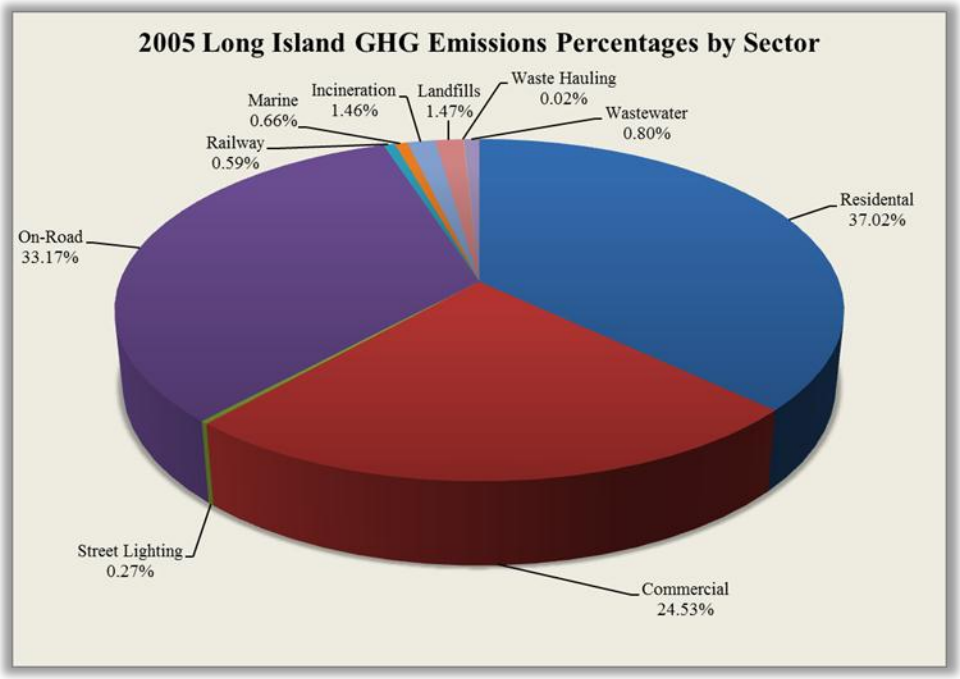
The GHG emissions on Long Island, as shown in Figure 1 and 2 below for year 2010 and 2005 respectively, are represented in percentages by sector. It is clear that the residential sector is still the most prominent and largest sector throughout these two years, followed by on-road transportation and commercial sectors.

Figure 1: 2010 Long Island GHG Emission Percentages by Sector



Source: Calculations completed by New York Institute of Technology

Figure 2: 2005 Long Island GHG Emission Percentages by Sector



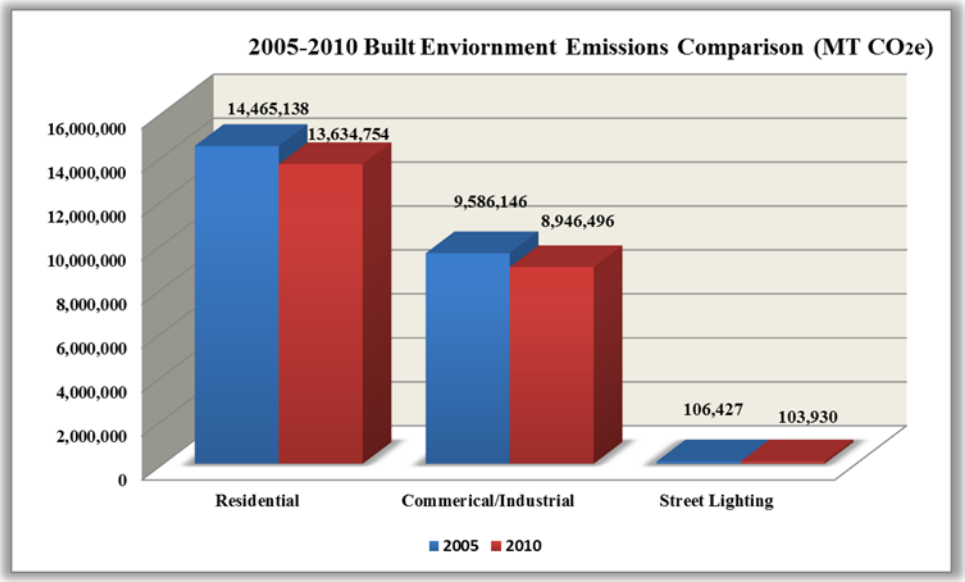
Source: Calculations completed by New York Institute of Technology

1. Built Environment

The built environment encompasses all human activities which constitutes the major emissions category for this project. This category is comprised of residential energy, commercial/industrial energy and street lighting. In this project, the sources used to generate energy for the built environment on Long Island are electricity, fuel oil and natural gas.

The following graph represents a comparison of 2005-2010 GHG emissions from residential, commercial/industrial and street lighting in the built environment. Residential energy emissions are the largest contributor followed by commercial/industrial and street lighting. These categories are comprised of emissions by the sources mentioned above. As will be presented later in this category, electricity is the biggest contributor in overall GHG emissions. However, on a per capita level, it is important to note that after taking into account the population change, the carbon intensity indicator showed an almost 1% overall emission reduction for each Long Islander in the use of built environment electricity, from 4.3 MT CO_2e in 2005 to 4.26 MT CO_2e per person in 2010. This is most likely because of local efforts in retrofitting existing buildings and housing units to be more energy efficient. This includes improvements in HVAC (Heating, Ventilation and Air Conditioning) technology.

Figure 3: 2005-2010 Built Environment Emissions Comparison (MT CO_2e)



Source: Calculations completed by New York Institute of Technology

As shown in Figure 3, there is an overall drop in GHG emissions in year 2010 when compared to 2005. This drop is due to several reasons, which are unique to each sector and will be explained later.

a) Residential Energy

In 2010, Long Island emitted a total of 13,634,754 MT CO_2e from the residential energy compared to 14,465,138 MT CO_2e in 2005, resulting in a net decrease of 5.74%. As seen in Figure 1, emissions from residential energy contributed to 38.67% of the total emissions; the largest emission contributor in 2010. The residential data in 2010 includes single-family housings and multi-families as well as apartment buildings and complexes.

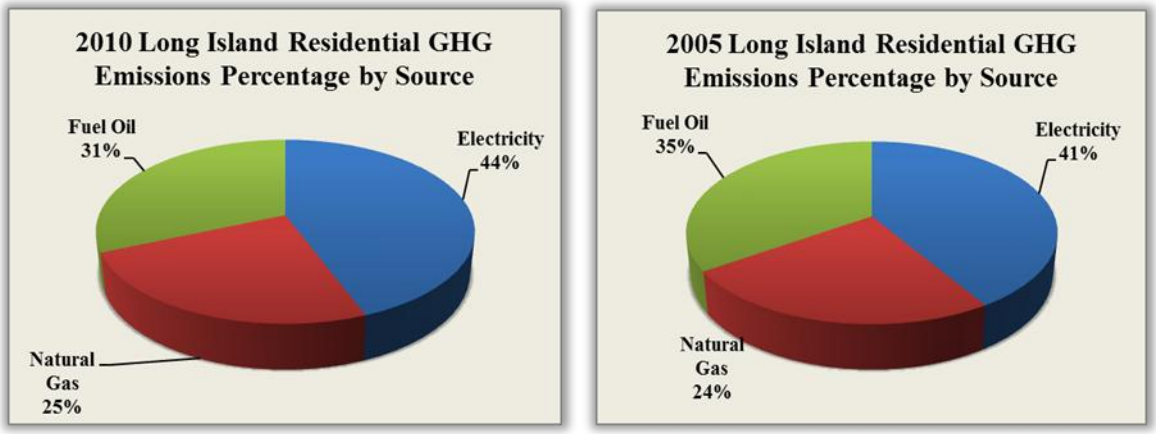
In 2010, Long Island consumed a total of 9,805,587[5] MWh[6] of residential electricity compared to 9,637,785 MWh in 2005. This represents an increase of 1.74% in the residential electricity consumption. Consequently, residential electricity emission increased from 5,958,815 MT CO_2e in 2005 to 6,021,712 MT CO_2e, by 1.06%. This slight increase is not only due to an increase of population but also from the increasing need for ventilation and air conditioning during the summer months due to a higher average temperature.

In 2010, Long Island consumed a total of 416,867,855 gallons[7] of residential fuel oil compared to 485,535,379 gallons in 2005. This represents a total decrease of 14.14%. Proportionally, GHG emissions for heating oil also decreased by 14.14%, from 4,985,459 MT CO_2e in 2005 to 4,280,384 MT CO_2e in 2010. This is not only due to higher cost of oil but better home insulation and furnace technology. Warmer winters also played a role in the decreased demand for home heating oil in 2010.

For residential natural gas in 2010, Long Island consumed a total of 49,766,423[8] MMBtu[9] compared to 52,576,883 MMBtu in 2005. This represents a total consumption decrease of 5.35% between those years while GHG emissions for residential natural gas also decreased by 5.35%, from 3,520,864 MT CO_2e in 2005 to 3,332,658 MT CO_2e in 2010.

[5] All electricity consumption data provided by Long Island Power Authority (LIPA) for this project.
[6] MWh, Mega-watt-hour equals to 1,000 kilowatt-hour (kWh), units of measuring electricity consumption.
[7] 2005 fuel oil data provided by Oil Heat Institute of Long Island (OHILI) and that of 2010 was provided by New York State Tax Department, suggested and facilitated by OHILI, These data were then aggregated into towns and cities on Long Island. See NYIT LICFP methodology for details.
[8] All natural gas consumption data provided by National Grid for this project, and then data were aggregated into towns and cities on Long Island. See NYIT LICFP methodology for details.
[9] 1 MMBtu is a decatherm equals to 10 therm, units of measuring natural gas consumption.

Figure 4: 2005-2010 Long Island Residential GHG Emission Percentages by Source



Source: Calculations completed by New York Institute of Technology

As shown in Figure 4, electricity consumption was the largest residential source of GHG emissions in both years.

b) Commercial/Industrial Energy

In 2010, Long Island emitted a total of 8,946,496 MT CO_2e from the commercial/industrial energy sector compared to 9,586,146 MT CO_2e in 2005. This represents a decrease of 6.67% between the years 2005 to 2010. As seen in Figure 1, emissions from this sector contributed to 25.37% of the total emissions, the third largest contributor in 2010. Similar to the residential sector, this commercial/industrial sector includes the use of electricity, natural gas and fuel oil.

In 2010, Long Island consumed a total of 73,806,432 gallons of fuel oil from commercial/industrial sector compared to 163,276,171 gallons in 2005. This represents a significant drop of 54.8% in 2010 fuel oil consumption compared to 2005. Subsequently, GHG emissions also dropped 54.8% from 1,676,809 MT CO_2e in 2005 to 758,096 MT CO_2e in 2010.

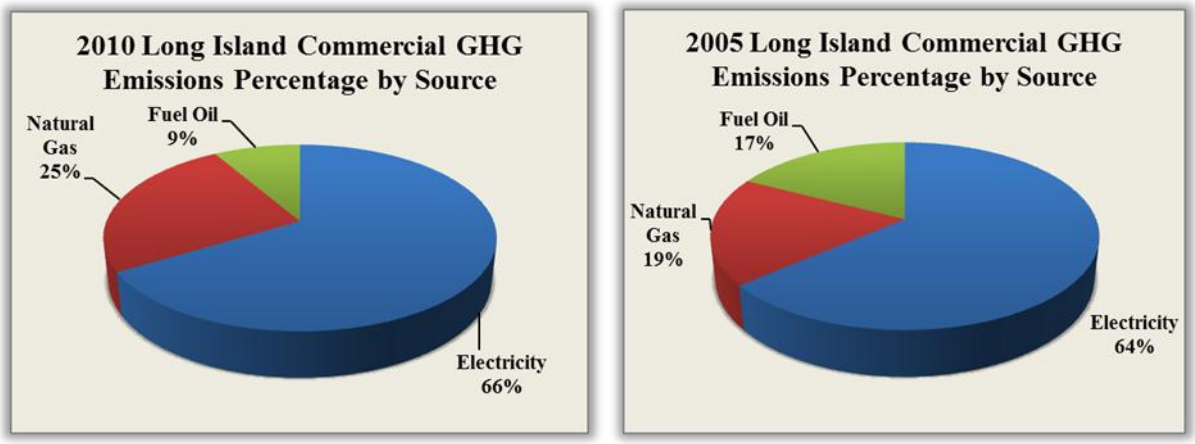
Although NYIT has included commercial fuel oil in the comparisons shown previously in Figures 3 and Figure 5, and there is a clear drop in the respective emissions from 2005 to 2010, NYIT is more confident in the recent data because the data source in 2010 is more reliable from that of 2005[10]. It is advised that future data be collected in the same manner as in 2010 to maintain data consistency and for more accurate comparisons.

In 2010, Long Island consumed a total of 9,676,207 MWh from commercial/industrial electricity compared to that of 9,866,244 MWh in 2005. This represents a decrease of 1.93%. Likewise, GHG emissions decreased by 2.9%, from 6,119,943 MT CO_2e in 2005 to 5,942,259 MT CO_2e in 2010.

[10] 2005 fuel oil data provided by Oil Heat Institute of Long Island (OHILI) while that of 2010 was provided by New York State Tax Department, suggested and facilitated by OHILI, These data were then aggregated into towns and cities on Long Island. See NYIT LICFP methodology for details.

In 2010, Long Island consumed a total of 33,541,522 MMBtu of commercial/industrial natural gas compared to that of 26,720,942 MMBtu in 2005. This represents an increase of 25.53%. Subsequently, GHG emissions jumped by 25.53% also with 2,246,142 MT CO_2e in 2010 and 1,789,395 MT CO_2e in 2005. This increase of natural gas consumption can be explained by the higher heating oil prices compared to that of natural gas in recent years and increased accessibility to supplying gas. Hence, there was an expansion in switching from fuel oil to gas among businesses and consumers from 2005 to 2010.

Figure 5: 2005-2010 Long Island Commercial/Industrial GHG Emission Percentages by Source



Source: Calculations completed by New York Institute of Technology

As shown in Figure 5 and similar to the residential sector, electricity consumption was still the largest commercial/industrial source of GHG emissions. A 2% increase among fuel sources in 2010. There was a significant expansion of natural gas usage in this sector, increasing by 6% in 2010.

c) Street Lighting

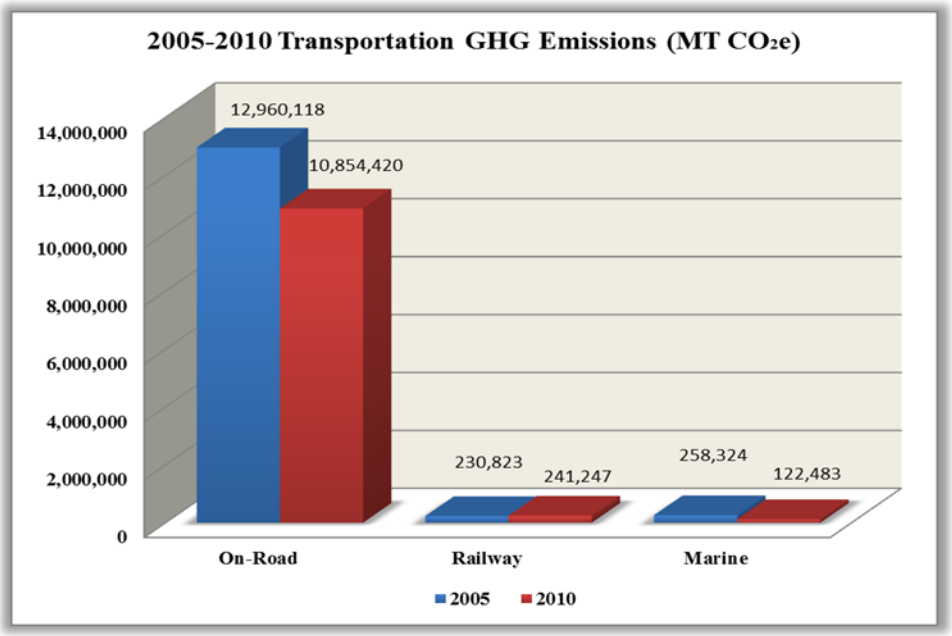
Streetlights are owned and maintained by local governments (town, city or county governments) on Long Island. In 2010, street lighting emitted a total of 103,930 MT CO_2e compared to that of 106,427 MT CO_2e, slightly dropped by 2.35%. This only includes emissions from electricity use by streetlights.

The factors that account for this decrease were the implementation of LED streetlights and signal lights. There will be further decreases in the usage as these new-age streetlights are implemented in all towns and cities on Long Island. This sector provides a good basis to measure actual temporal reduction in GHG emissions due to energy efficient technologies. Rather than continuing to install less efficient street lighting, replacement with energy efficient technologies such as LED would reduce energy use and subsequently reduce GHG emissions over time, as seen in the trend of 2005-2010.

2. Transportation

Transportation is another major category in measuring regional GHG emissions in addition to the built environment. This category is comprised of on-road transportation, railway, marine, and aviation sectors. There are multiple forms of public transportation on Long Island which are easily accessible to the public. Yet three out of every four Long Island workers drive to work alone; only one in ten take public transit[11]. The average person in Nassau travels 35 miles per day for each vehicle he or she owns, compared to 40 miles per day in Suffolk[11]. Percent change in transit for the LIRR from year 2008 to 2010 was a drop of 1.18%. The Metropolitan Transportation Council (MTA) provided bus service for Nassau County, while Suffolk Transit and Huntington Area Rapid Transit provide bus service in Suffolk County. Long Island has one major interstate highway (I-495) and multiple smaller state highways.

Figure 6: 2005-2010 Transportation GHG Emissions (MT CO_2e)



Source: Calculations completed by New York Institute of Technology

Figure 6 shows the comparison of 2005 to 2010 emissions in this category, breaking down transportation emissions by sector. On-road transportation emitted the maximum emissions while that of railways and marine are considerably low. These sectors are comprised of emissions from fuel sources such as gasoline, diesel and electricity. Overall emissions have dropped in 2010 compared to 2005 because of several reasons which are explained later.

[11] Long Island Index 2009

a) On-Road Transportation

For this sector, Vehicle Miles Traveled (VMT) is generally used as the universal unit in measuring the consumption of automobile transportation. The number of miles traveled by cars, trucks and other motor vehicles is a major factor in determining the congestion on our roads and highways and by extension, the amount of automobile related GHG emissions. As previously shown in Figure 1, on-road transportation is the second highest sector in the GHG emissions inventory profile and contributed 30.78% of the total emissions on Long Island in 2010.

In 2010, Long Island vehicles produced a total emission of 10,854,420 MT CO_2e, a reduction of 16.25% compared to 12,960,118 MT CO_2e in 2005. With that said, all vehicles (cars, trucks and transit buses) traveled 20,544 million miles in 2010[12], 2.85% more than the 19,974 million miles recorded in 2005. Although Long Islanders have driven slightly more in 2010 compared to 2005 based on VMT data, the total on-road transportation emissions have decreased due to the use of more efficient vehicles, and less polluting fuels because of the implementation of stricter regulations on vehicles' air emissions in the New York Region.

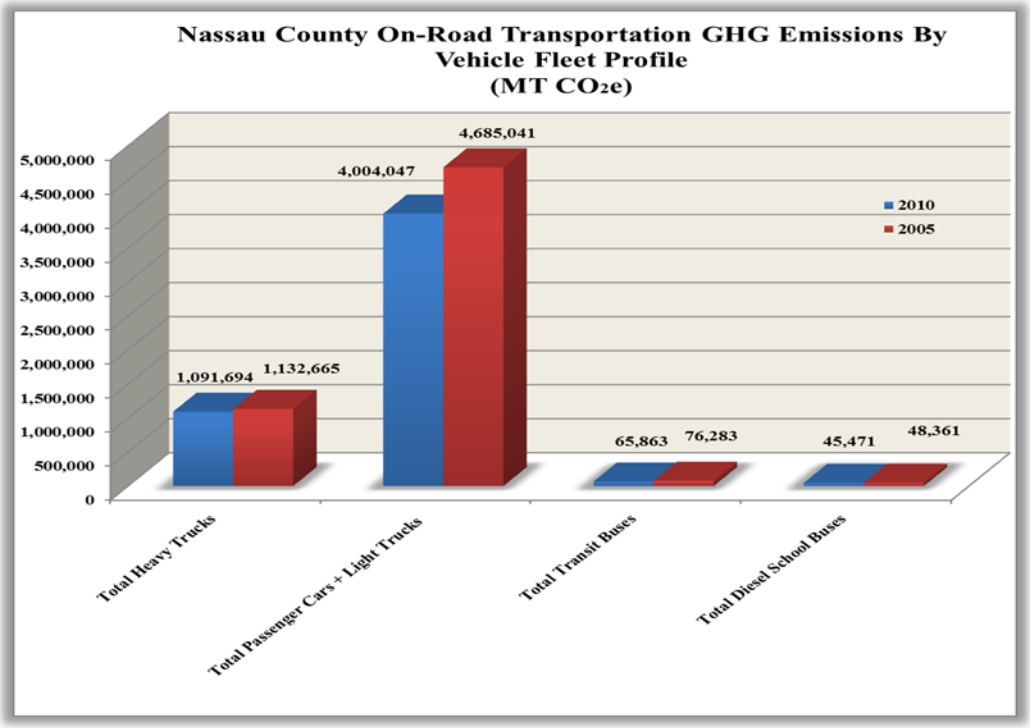
For 2010, GHG on-road vehicle emissions, gasoline accounted for 84% of the emissions while the remaining16% was from diesel fuel. There was a decrease of 21% in gasoline consumption and emission from 2005 to 2010, compared to a 12% increase in diesel consumption and emission at the same time. These emissions are from private passenger cars[13], transit buses (including school buses), light and heavy trucks.

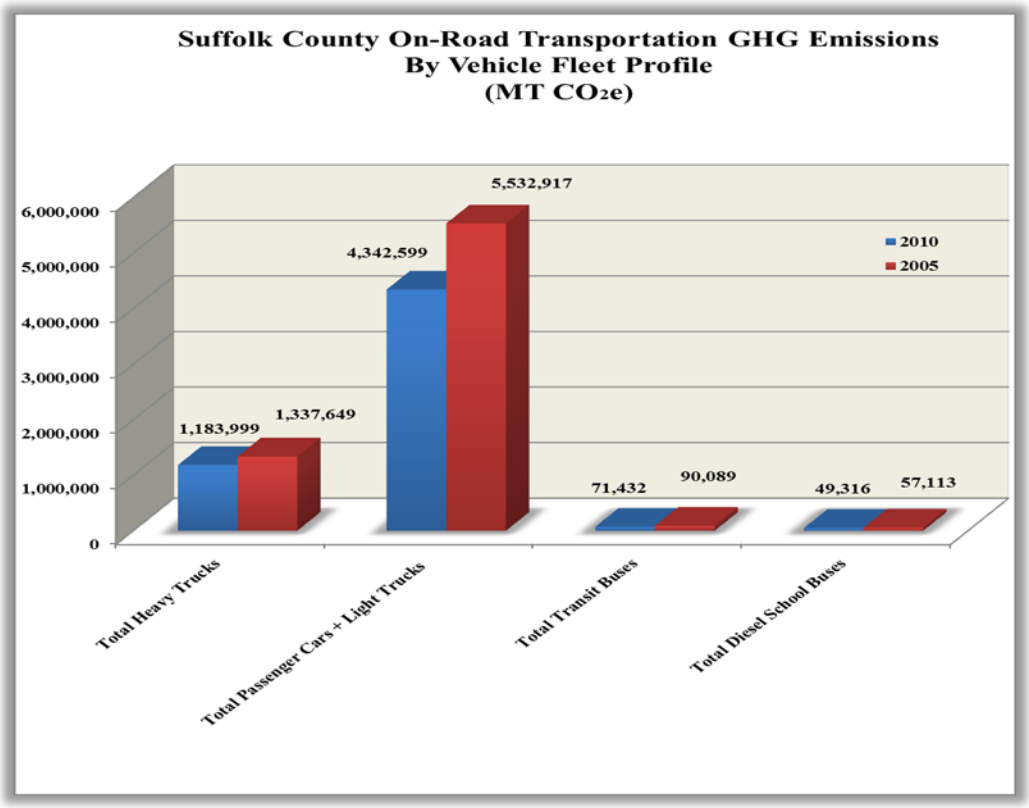
A breakdown of on-road transportation GHG emissions by vehicle types and by county is shown in Figure 7. It shows that private passenger cars and light trucks (excluding heavy trucks) are the largest emission contributor. Generally, most of these vehicles are owned by households on Long Island for residential/personal use, and most of the residents' travels were also local. Of all the vehicle miles traveled (VMTs) on Long Island, 37% were within Nassau County and 44% were within Suffolk County, which means both the origin and destinations of these trips were within the county boundaries.

[12] All VMT and county-to-county travel trips data provided by New York Metropolitan Transportation Council (NYMTC) for this project, and then data were aggregated into towns and cities on Long Island. See NYIT LICFP methodology for details.

[13] Motorcycles are also included in here.

Figure 7: 2005-2010 On-Road Transportation GHG Emissions by Vehicle Types and County (MT CO_2e)





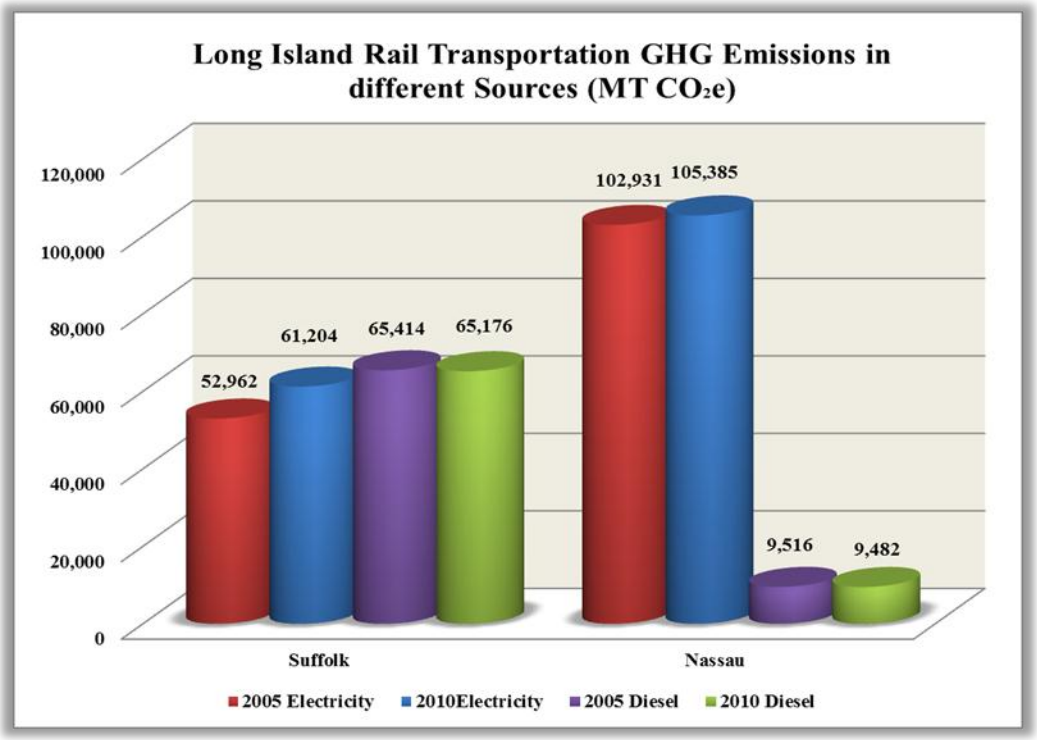
Source: Calculations completed by New York Institute of Technology

b) Railway

The Long Island Rail Road (LIRR), a Metropolitan Transportation Authority (MTA) commuter rail service has multiple lines in both Suffolk and Nassau County and provides service to New York City. In 2010, LIRR consumed 271,266 MWh of electricity[14], a 6.85% increase from 253,853 MWh in 2005. Proportionally, the LIRR electricity emissions were also increased by 6.86% from 155,893 MT CO_2e in 2005 to 166,589 MT CO_2e in 2010. On the contrast, LIRR consumed 7,243,128 gallons of diesel in 2010[15], a 0.36% decrease from the 7,269,512 gallons in 2005. Subsequently, the diesel emissions were also decreased by the same percentage from 74,930 MT CO_2e in 2005 to 74,658 MT CO_2e in 2010. It represents that the LIRR is slowly switching its fuel usage from diesel to electricity.

The absolute emissions for LIRR usage of electricity and diesel combined were 241,247 MT CO_2e, in 2010, an increase of 4.5% compared to 230,823 MT CO_2e in 2005. For the NYIT LICFP study, methodology has improved for 2010 to allocate electricity and diesel fuel into each town and city on long island, which was not possible previously[16].

Figure 8: 2005-2010 LIRR GHG Emissions by Different Sources and County (MT CO_2e)



Source: Calculations completed by New York Institute of Technology

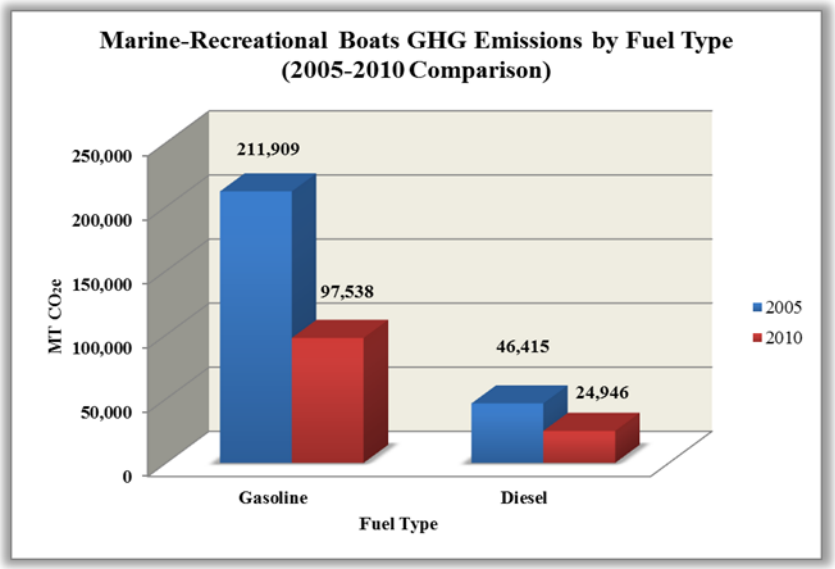
[14] All electricity consumption data provided by Long Island Power Authority (LIPA) for this project, including LIRR per town/city.
[15] LIRR diesel consumption data provided by LIRR.
[16] Refer to NYIT LICFP methodology for more details.

c) Marine (Recreational Boats Only)

Long Island is a popular destination for recreational boating. There are more than 600 marinas on Long Island for both residents and tourists. In 2010, there were 93,394[17] boats used on Long Island, which emitted a total of 122,483 MT CO_2e, a sharp drop of 53% compared to that of 258,324 MT CO_2e in 2005 with 189,000 recreational boats on Long Island (as shown in Figure 9), It is possible that the recession played a large role, significantly reducing+ the number of boats between the years.

In 2010, gasoline accounted for 80% of the marine emissions and diesel 20%. In 2010, recreational boats on Long Island used 13,427,185 gallons of fuel with diesel and gasoline combined, compared to 28,416,699 gallons of these fuels. In this study, marine sector is not allocated for each town and city; it is the only sector in the transportation category that is allocated to the entire Long Island region.

Figure 9: 2005-2010 Marine Recreational Boats GHG Emissions by Fuel Type



Source: Calculations were completed by New York Institute of Technology

d) Aviation

There are five airports on Long Island: New York John F. Kennedy (JFK) International Airport, New York LaGuardia Airport, Long Island Republic Airport (FRG), Long Island MacArthur Airport (ISP), and East Hampton Airport. The last three are the airports within Nassau and Suf-

[17] Regional number of boats on Long Island provided by Empire State Marine Trades Association

folk county boundaries. At this time, even though a simple methodology[18] has been identified for evaluating the aviation emissions, NYIT decided not to include it in this report. Further research is required to obtain the appropriate data to keep the consistency of accuracy and integrity of this project.

3. Waste Management

Most human activities involve resource use that produces some by-products called waste over. The integrated process of treatment, disposal, recycling and/or recovery of these wastes are known as waste management. The waste management portion of this project is made up of Municipal Solid Waste (MSW) and Wastewater treatment sectors. The MSW sector of this project is a combination of the emissions from waste incineration and landfill processes while also noting the emission impact of waste hauling outside of the study area[19]. The wastewater treatment sector includes emissions from centralized wastewater treatment plants and decentralized system of septic tanks.

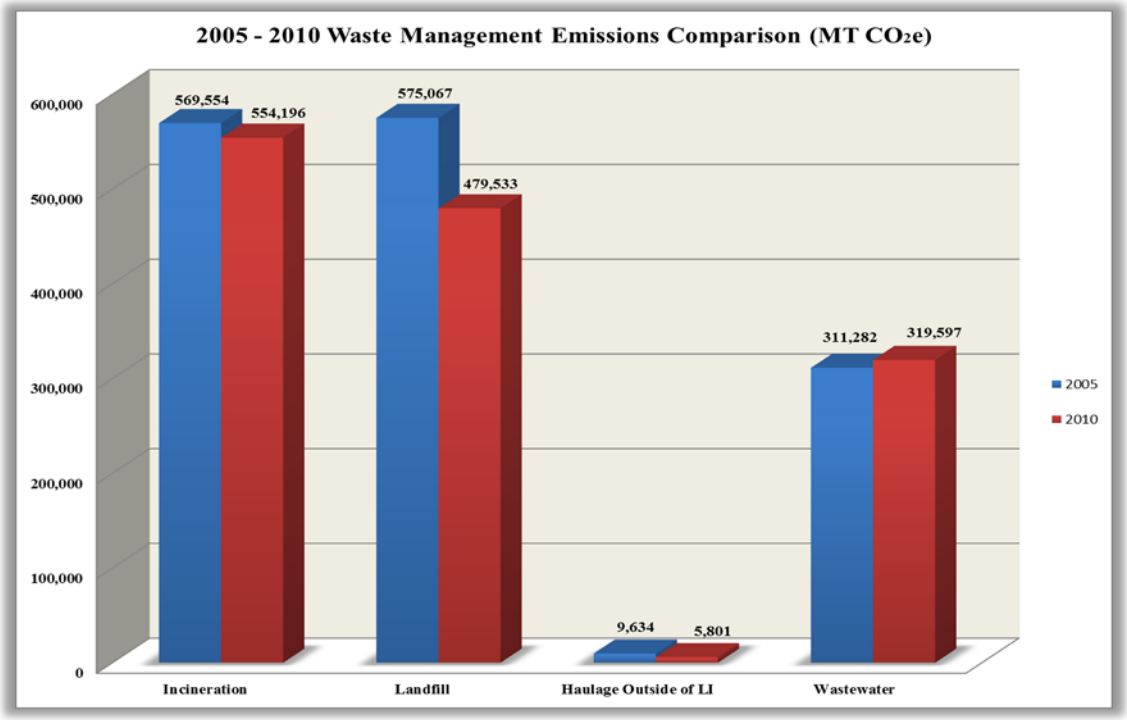
Between 2005 and 2010, there was a 9.69% decrease in total emissions from the MSW sector. Specifically, total fugitive emissions from landfill decay processes decreased by 16.61% while total emissions from incineration processes reduced by 2.7%. Waste hauling off Long Island recorded a decrease of 39.79% in total emissions. The MSW emission per capita for both Nassau and Suffolk counties combined was 0.36 MT CO_2e per person. The MSW emissions include data from incinerated and landfill disposal methods used on Long Island.

Figure 10 represents 2005-2010 waste management emissions including incineration, landfills, waste hauling and wastewater. Emissions have dropped in 2010 compared to 2005 because of several reasons. Major among the causes of reduced emissions is the reduction in volume of waste disposed, changes in emissions factors and increased waste recovery, recycling and reuse. In essence, improved resource recovery led to reduced waste and by extension, less land filled and incinerated materials, translating into reduced absolute emissions in most cases.

[18] The simplest methodology in GHG inventory is a Tier 1 approach using nationwide statistics. However, since NYIT has been using Tier 2 and 3 approaches for all other sectors, with more complex and detailed local database, further research is required to obtain the appropriate data to keep consistency and integrity of the project.

[19] For the MSW sector, the most up to date data available for 2010 was actually 2009 figures obtained from the Stony Brooks University (Tonje's) report for year 2009

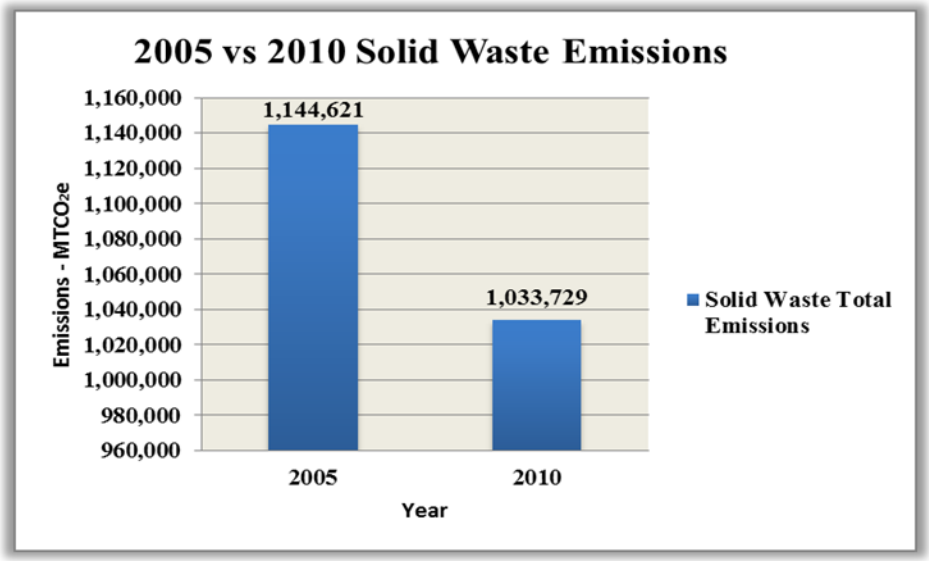
Figure 10: 2005-2010 Waste Management Emissions (MT CO_2e)



Source: Calculations were completed by New York Institute of Technology

As shown in Figure 11, Long Island emitted 1,033,729 MT CO_2e from the solid waste sector in 2010 compared to a total of 1,144,621 MT CO_2e in 2005. This change represents approximately 10% decrease from the 2005 total emissions.

Figure 11: 2005-2010 Waste Management Emissions (MT CO_2e)



Source: Calculations were completed by New York Institute of Technology

a) Incineration

The total emissions from incinerated waste disposal in 2010 were 554,196 MT CO_2e compared to 564,554 MT CO_2e in 2005, representing a 1.83% decrease in 2010 emissions compared to 2005.

b) Landfills

As of February 2012, there were five landfills operating on Long Island, two of which were ash monofills. In 2010, the Long Island Landfills disposed of approximately 1.8 million tons of waste, including 425,000 tons of municipal waste combustor ash to the ash monofills.[20] Each new landfill or expansion located outside the deep flow recharge area can accept material that is the product of resource recovery, incineration, or composting and downtime waste, and untreatable waste. The locations for landfills and waste hauling inside Long Island include Yaphank, West Babylon, Hauppauge and Kings Park[21]. Long Island does not have any open landfills receiving municipal solid waste.

In 2010, Long Island emissions from landfills were 479,533 MT CO_2e; while in 2005 emissions from landfills were 575,067 MT CO_2e. This represents 16.6% decrease.

c) Waste Hauling Outside Long Island

Non-incinerated waste was transported off Long Island via truck to landfills in New York State, New Jersey, and Pennsylvania. The total MSW transported outside LI in 2010 was estimated to be 385,298 tons[22]. In 2010, the emissions from waste hauling outside Long Island were 5,801 MT CO_2e including both counties, while 2005 emissions were 9,634 MT CO_2e. This represents a 39.78% decrease in waste haulage emissions.

d) Wastewater (Sewage) Treatment

Each of us pours or flushes an average 100 gallons of water per day down household drains. This water, plus water discharged to sewers by commercial and industrial enterprises, is called wastewater. In areas serviced by sewers, wastewater flows to a local treatment facility, or sewage treatment plant (STP). Currently 44 such facilities discharge over 1 billion gallons of treated effluent into Long Island Sound every day[23]. The types of wastewater treatment plants on Long Island are lagoons, wastewater treatment plants (WWTP) with and without nitrification, incomplete combustion of digester gas, septic tanks and direct effluent discharge into waterways.

[20] http://www.dec.ny.gov/chemical/23698.html

[21] Active Long Island Landfills, NYS Department of Environmental Conservation, Division of Material Management Solid Waste Management facilities

[22] Municipal Solid Waste Assessment Nassau and Suffolk Counties, Long Island, New York, 2006, by David Tonjes, Stony Brook University & Consolidation Analysis and Implementation Plan: Solid Waste, Nassau County, Office of the County Executive, 2008

[23] http://longislandsoundstudy.net/2010/03/wastewater-treatment/

About 75% of Suffolk county residents use only septic tanks for wastewater treatment, a situation which is not present in Nassau County.

In 2010, Long Island emitted a total of 319,597 MT CO_2e from the wastewater sector, while in 2005 a total of 311,282 MTCO_2e were emitted. This includes fugitive emissions from septic systems, treatment lagoons and effluent discharge to waterways and tertiary treatment of wastewater, and the incomplete combustion of digester gas. There was a 2.67% increase in emissions when compared to 2005. The wastewater per capita emissions for 2010 are 0.1129 MT CO_2e per person compared to 0.1099 MT CO_2e per person in 2005.

4. Agriculture

According to the 2007 US census of Agriculture, Long Island has 35,692 acres of farmland. **S**imilar data for 2005 was not available. Land cover characteristics of each town/city were identified[24] It was determined that most farmlands and cultivated croplands are located in Suffolk County; predominantly the five east end towns (East Hampton, Riverhead, Shelter Island, Southampton, and Southold).

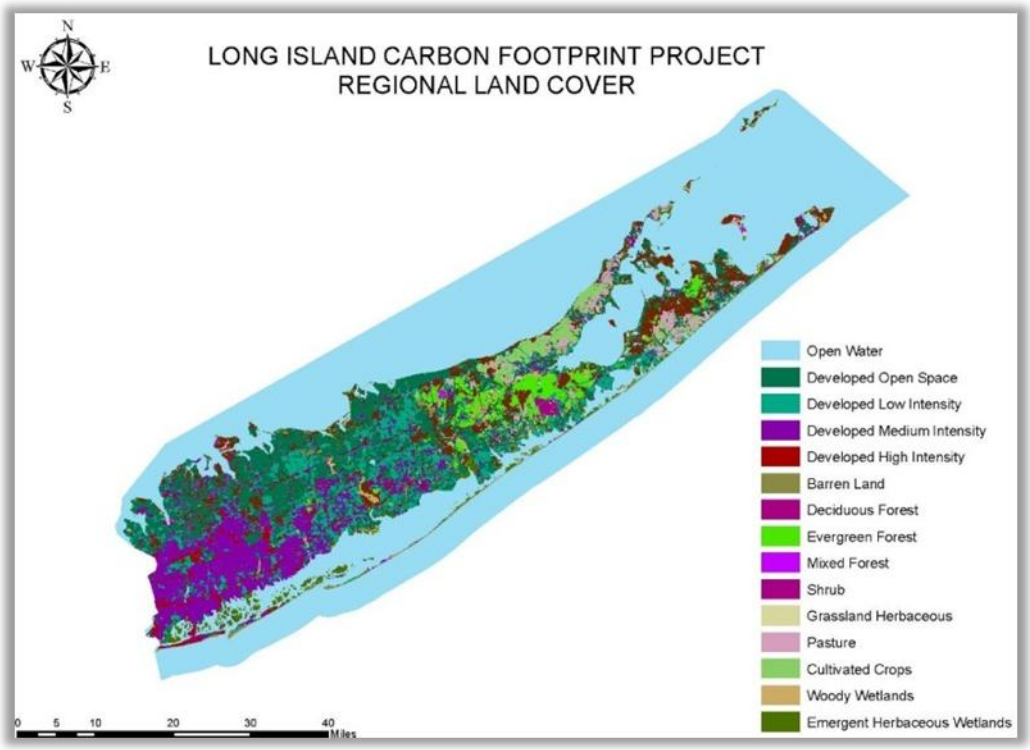
The agriculture GHG emissions have not been computed for 2010 due to lack of appropriate data. The State Inventory Tool (SIT) Agriculture Module used by ICLEI for 2005 was based on United States Department of Agriculture (USDA)'s 2007 Census of Agriculture, which updates only every five to seven years. The next release of the data for 2012 is not yet available. With that said, SIT is a Tier I approach[18], which includes animal farms in New York State, but since Long Island does not have animal farms, more local measurement is required for a more robust and in-depth study. The majority of GHG production by agriculture sector on Long Island is the use of fertilizer containing nitrogen. Since Long Island is predominantly crop farming, the amount of fertilizer has not yet been determined. The areas which rely on fertilizers most heavily are crop farming, sod farming (grass), golf courses, and general landscaping.

5. Land Use Change & Forestry

As shown Figure 12, the complete Long Island regional land cover[24], most farmlands and cultivated croplands are grown in Suffolk County, predominantly the five east end towns (East Hampton, Riverhead, Shelter Island, Southampton, and Southold). For the remainder of Long Island, land cover is mostly developed open space and developed medium intensity spaces such as residential and commercial areas.

[24] By using ArcGIS 10® and data from the National Land Cover Database (NLCD 2006). See NYIT LICFP methodology for more details.

Figure 12: Long Island Regional Land Cover



Source: New York Institute of Technology

Similar to aviation and agriculture sectors, even though a simple methodology[18] has been identified for evaluating the land use change and forestry emissions, NYIT decided not to include it in this report. Further research is required to obtain the appropriate data to keep the consistency of accuracy and integrity of this project. However, using available spatial and attributes data from USGS National Land Cover Database (NLCD 2006), this project has developed a database to produce a land use model consistent with the NLCD land cover classification scheme. Within this framework and continual gathering of additional data, it is anticipated that future versions of this project would be able to develop robust methodologies to quantify emissions from this sector[25].

6. Stationary Energy Generation and Supply[26]

Electricity on Long Island was supplied by Long Island Power Authority (LIPA). In 2010, over half of the electricity generated on Long Island was from natural gas **(**77.3%), 13% generated from petroleum oil, 5.1% from non-hydro renewable such as waste-to-energy (WTE) and landfill gases (LFG), and the rest from "Purchases Energy"[27] (imported).

[25] http://www.mrlc.gov/nlcd2006.php

[26] Due to data unavailability in 2005, this sector was not added into the overall emissions for comparisons, but it served as information item for future comparisons and studies.

[27] http://www.epa.gov/cleanenergy/energy-and-you/how-clean.html

In 2010 there were only 25 reported non LIPA stationary energy generation and supply facilities on Long Island[28] because the Mandatory Reporting Rule (MRR) to the Environmental Protection Agency (EPA)'s GHG Reporting Program (GHGRP) was not implemented until after 2010. Among these 25 reported facilities, there were five landfills (LFG), six WTE facilities and 14 electricity generation facilities using natural gas and petroleum oil. The total GHG emissions from all these reported facilities were 7,191,677 MT CO_2e. It was unclear which facilities were generating utility energy that supplies power to the grid and which ones were commercial or industrial not supplying power to the grid. Hence, to avoid double counting GHG emissions from LIPA and due to lack of data in 2005, this sector is only considered as an information item and is not added to the total Long Island emission. Further research is needed for comparison purposes in the future.

7. Transmissions and Distribution (T/D) Losses[26]

a) Electricity T/D Loss

Electric power transmission and distribution losses include losses in transmission between sources of supply and points of distribution, and in the distribution to consumers, including pilferage[29]. The 2010 electricity T/D loss on Long Island was 1,375,572 MWh[30] with an emission of 844,753 MT CO_2e.

b) Loss and Unaccounted For Gas (LAUF)

Loss and unaccounted for gas (LAUF) is the difference between the amount of natural gas purchased and the quantity of natural gas sold, whether it is more or less, in the form of methane (CH_4). There are two categories of unaccounted for gas; one is through leaks and the other is through gas measurements. When the gas escapes to the atmosphere at a given rate at an unknown location, it is said to be a "leak". Gas lost through measurements or lack of measurement is a substantial cause of unaccounted gas and it is very difficult to detect. Loss can also occur due to the temperature. In winter, there might be more loss in the volume of the gas compared to summer[31]. The loss and unaccounted for gas in 2010 was 2,340,953 MMBtu[32] with a pure methane emission of 246 MT CO_2e.

[28] Data from U.S. Environmental Protection Agency (EPA) MRR GHGRP database. See NYIT LICFP methodology for details.
[29] http://data.worldbank.org/indicator/EG.ELC.LOSS.KH
[30] Calculated from LIPA electricity data with a T/D loss of 7% for year 2010. See NYIT LICFP methodology for details.
[31] Pipeline and Hazardous Materials Safety Administration (PHMSA) www.phmsa.dot.gov
[32] Calculated from National Grid natural gas data with a LAUF of 2.81% for year 2010, given by National Grid. See NYIT LICFP methodology for details.

Conclusions & Recommendations

The Long Island Carbon Footprint Project 2005 by ICLEI provided a benchmark against which this project; 2005 – 2010 comparison is measured. Even though the 2005 results were normalized in compliance with improved emission protocols, the importance of that local ‘‘watershed effort’’ in carbon footprint inventory cannot be overemphasized.

- This project, comparing baseline GHG emissions in 2005 to similar values in 2010, has confirmed among other things, positive performance of existing climate protection activities on Long Island.
- At the policy level, this finding also supports the expansion of performing environmental programs while continuing the implementation of more innovative GHG emissions reduction activities in the region.
- One advantage of this regional effort is that it could promote some form of healthy competition in GHG reduction among municipalities on Long Island. A uniform measureable index such as per capital GHG emissions of each municipality is a possibility.
- These projects (2005 and 2010) have identified that some municipalities perform better than other in specific sectors which can provide important lessons for other localities.
- With the 2005 baseline measurements and this 2010 comparison, the basis for setting GHG emissions reduction targets for each municipality, sources and/or sector is on the horizon. Now that a starting point has been established, a per capita, local and regional reduction target can be developed and assessed possibly every few years.
- As in the 2005 report, this study also confirms that additional data are required for more robust emissions quantification. Therefore, it is suggested that an inventory and methodology for obtaining these data should be developed and incorporated into similar future projects.
- In the long run, achievement of climate protection successes comes down to stakeholders; importantly, individual and household practices. Conservation in energy and material resource use inevitably leads to reduced GHG emissions. Therefore, more energy efficient and waste reduction practices in all sectors are very crucial to achieving reduced carbon footprints on Long Island’s environment.

Our Associates

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For more information about Long Island Carbon Footprint Project visit us at
http://iris.nyit.edu/carbonfootprint/