Greenhouse Gas Emissions And Climate Change

Chapter 18

Increased greenhouse gas (GHG) emissions are changing the global climate, which is predicted to lead to wide-ranging effects on the environment, including rising sea levels, increases in temperature, and changes in precipitation levels and intensity. Although this is occurring on a global scale, the environmental effects of climate change are also likely to be felt at the local level. In New York City, increased temperatures may lead to an increase in summertime electricity demand due to greater usage of air conditioning, which in turn may result in more frequent power outages. Increases in precipitation levels and intensity may lead to more street and sewer flooding, while extended droughts and increased water demand may strain the City's water supply system. Rising sea levels may lead to increased risks of coastal flooding, as well as damage to infrastructure not designed to withstand saltwater exposure.

Through PlaNYC, New York City's long-term sustainability program, the City advances sustainability initiatives and goals for both greatly reducing GHG emissions and increasing the City's resilience to the effects of climate change. The City's goal of reducing GHG emissions 30% below 2005 levels by 2030 was developed as part of PlaNYC for the purpose of planning for an increase in population of almost one million residents while achieving significant greenhouse gas reductions, and was codified by the New York City Climate Protection Act (Local Law 22 of 2008). See §24-803 of the Administrative Code of the City of New York. Seeking to expand its codified goal of reducing GHG emissions by 30% by 2030, the City is considering potential strategies to reduce its GHG emissions by more than 80% by 2050. To reach its aggressive sustainability goals, the City has already launched initiatives and implemented various local laws aimed at energy efficiency measures and reduction of GHG emissions:

- At the request of the City, the Urban Green Council (New York Chapter of the U.S. Green Building Council) convened a Green Codes Task Force, consisting of over 150 building and design professionals, to strengthen the City's energy and building codes and address the impacts of climate change. On February 1, 2010, the Task Force released a report of 111 code improvement recommendations to the City, roughly half of which focus on reduction of GHG emissions. Three years after the release of the report, 43 of the 111 recommendations had been enacted.

- The Greener, Greater Building Plan, which targets energy efficiency in large existing buildings, consists of four local laws requiring that large buildings annually benchmark their energy consumption (Local Law 84 of 2009); a local energy code be adopted (Local Law 85 of 2009); every 10 years these buildings conduct an energy audit and retro-commissioning (Local Law 87 of 2009); and by 2025, the lighting in non-residential spaces be upgraded to meet code and large commercial tenants be provided with sub-meters (Local Law 88 of 2009). These laws will reduce GHG emissions by almost five percent.

- Local Law 86 of 2005 requires new buildings, additions, and substantial building reconstruction work in capital projects that receive City funds to be built in accordance with the rigorous standards of the Leadership in Energy and Environmental Design (LEED®) green building rating systems developed by the U.S. Green Building Council (USGBC). It also requires that most of this work, as well as larger lighting, boiler, HVAC controls, and plumbing upgrade work, be designed to reduce the use of both energy and potable water well beyond that required by the current NYC building code.

The City has determined that consideration of GHG emissions is appropriate under CEQR for at least certain projects for several reasons: (1) greenhouse gas emission levels may be directly affected by a project's effect on energy use; (2) the

U.S. Supreme Court has upheld the determination that carbon dioxide, one of the main greenhouse gases, is an air pollutant, subject to regulation as defined by the Clean Air Act and the U.S. Environmental Protection Agency has begun regulating mobile and stationary sources; and (3) Local Law 22 of 2008 codified PlaNYC's Citywide GHG emissions reduction goal of 30 percent below 2005 levels by 2030 (the "GHG reduction goal"). The guidance for determining the appropriateness of a GHG emissions assessment for a project and conducting analysis of a project's GHG emissions is presented in this chapter. Although the contribution of a proposed project's GHG emissions to global GHG emissions is likely to be considered insignificant when measured against the scale and magnitude of global climate change, certain projects' contribution of GHG emissions still should be analyzed to determine their consistency with the City's Citywide GHG reduction goal, which is currently the most appropriate standard by which to analyze a project under CEQR.

In addition to policies aimed at addressing GHG emissions, the City is also engaged in several initiatives related to assessing potential local impacts of global climate change and developing strategies to make existing and proposed infrastructure and development more resilient to the effects of climate change. These initiatives include the following:

- In 2008, the City launched the Climate Change Adaptation Task Force to develop strategies to secure the City's critical infrastructure against potential threats from rising seas, higher temperatures, and changing precipitation patterns projected to result from climate change. The Task Force is composed of 40 City, state, and federal agencies, public authorities, and private companies that operate, regulate, or maintain critical infrastructure in New York City. The Task Force identified more than 100 types of infrastructure that climate change could impact. The Task Force will use this initial assessment to develop coordinated strategies to increase the resilience of the region's infrastructure.

- The City convened the New York City Panel on Climate Change (NPCC) to develop climate change projections for New York City. The 2009 *Climate Risk Information* report released by the NPCC was prepared as part of PlaNYC to advise the Mayor and the New York City Climate Change Adaptation Task Force on issues related to potential impacts on infrastructure due to climate change (*i.e.*, temperature, precipitation, rising sea levels, and extreme events). The NPCC developed projections using the Intergovernmental Panel on Climate Change (IPCC)-based methods to generate model-based probabilities for temperature, precipitation, sea level rise, and extreme events including coastal flooding (including the 1-in-100 year flood) in the 2020s, 2050s, and 2080s. These projections were developed using 16 global climate model (GCM) simulations and three GHG emission scenarios developed by the IPCC. The NPCC released *Climate Change Adaptation in New York City: Building a Risk Management Response* in 2010 to lay the foundation for climate change adaptation in the City. In June 2013, the NPCC released a report titled *Climate Risk Information 2013: Observations, Climate Change Projections, and Maps*. This report outlines the most recent NPCC future climate projections. These reports and other work produced by the NPCC will be used to guide the City's policymaking process. The NPCC will continue to regularly assess climate change projections and establish a process to update its climate projections regularly.

- The City established an interagency group to work with the Federal Emergency Management Agency (FEMA) to revise the Flood Insurance Rate Maps (FIRMs) for the City, which set the flood elevations that are the triggers for the City building code's flood protection requirements. The FIRMs had been revised to reflect current shorelines and elevations. Future development within the flood zone will reflect any changes to the floodplain elevations. In early December 2013, FEMA released the Preliminary FIRMs for New York City. FEMA developed a preliminary flood hazard data search tool (https://hazards.fema.gov/femaportal/prelimdownload/), and the New York City Preliminary FIRM Data Viewer (https://fema.maps.arcgis.com/apps/webappviewer/index.html?id=e7a7dc3ebd7f4ad39bb8e485bb64ce44). On October 17, 2016 FEMA announced New York City had won its appeal of FEMA's 2015 Preliminary Flood Insurance Rate Maps (FIRMs) and agreed to revise New York City's flood maps. It should be noted that until the new flood maps are issued, flood insurance rates in New York City will continue to be based on the 2007 Effective FIRMs saving coastal households tens of millions of dollars per year; the city's Building Code will continue to reflect the 2015 Preliminary FIRMs.

- An emergency executive order, Executive Order 230 of 2013, suspended height and certain other zoning restrictions so that buildings can meet new flood elevation standards based on the ABFE maps. The City also adopted a rule in 2013 to increase the required minimum flood proofing elevation so that substantially damaged buildings and other new construction are built to withstand greater flood risk. The measures also should help New Yorkers limit the cost of future Federal flood insurance premiums linked to FEMA FIRMs by better protecting properties in flood-prone areas from risk and damage.

- To best prepare the City for extreme climate events, the City has developed a number of plans, including the Natural Hazard Mitigation Plan, Coastal Storm Plan, Heat Emergency Plan, Debris Management Plan, Power Disruption Plan, Winter Weather Emergency Plan, and Flash Flood Emergency Plan. To continue to prepare for and respond to climate-related emergencies as effectively as possible, the City plans to integrate climate change projections into its emergency management and preparedness plans and procedures and include climate change as a hazard assessed under the Natural Hazard Mitigation Plan, which was updated in 2019 here.

- The New York City Department of Environmental Protection (DEP) is in the process of evaluating and implementing adaptive strategies for its infrastructure. In May 2008, DEP issued its Climate Change Assessment and Action Plan to establish near-, medium-, and long-term actions that it will undertake to address this critical issue. The City has also developed a *New York City Green Infrastructure Plan* (September 2010) and a *Sustainable Stormwater Management Plan* (December 2008).

- In October 2013, DEP issued a comprehensive NYC Wastewater Resiliency Plan, presenting an assessment of wastewater treatment plants and pumping stations identified as at-risk for flooding, potential costs of future damages, and suggested protective measures, such as elevating and waterproofing critical equipment to reduce the risk of damage and loss of services.

- The Department of City Planning has proposed a series of revisions to the New York City Waterfront Revitalization Program (WRP), the City's principal coastal zone management tool that establishes the City's policies for development and use of the waterfront. The proposed changes to the WRP will not take effect until they are approved by the New York State Department of State with the concurrence of the United States Department of Commerce. The proposed revisions proactively advance the long-term goals laid out in Vision 2020: The New York City Comprehensive Waterfront Plan, released in 2011 and address climate change considerations. Chapter 4, "Land Use, Zoning and Public Policy" discusses assessments of consistency with the current WRP that should be conducted for CEQR projects located in the City's Coastal Zones. If and when the proposed revisions to the WRP are approved by the state and federal government, projects in the City's Coastal Zone will have to demonstrate consistency with polices such as increasing resilience to future conditions created by climate change.

- In June 2013, two reports were released featuring extensive recommendations for improving New York City's resiliency in the wake of Hurricane Sandy: (1) Special Initiative for Rebuilding and Resiliency (SIRR) Report, "A Stronger, More Resilient New York;" and (2) a report of recommendations of the Building Resiliency Task Force. The SIRR Report builds on PlaNYC's sustainability goals to present more than 250 specific recommendations to fortify the City against future climate events.

As detailed above, the City is studying and preparing for the likely consequences of climate change Citywide. Federal, state, and local standards are still evolving to address and account for changing environmental conditions and it is anticipated that the City's infrastructure design criteria, building codes, and other laws and regulations will be further updated to incorporate measures related to a project's resilience to climate change.

It is expected that this guidance will be revised with respect to GHG emissions and climate change as regulatory standards evolve and analytic tools are developed and refined over time. As with each technical area assessed under CEQR, it is important for an applicant to work closely with the lead agency throughout the review process. As appropriate, the lead agency should consult with the Mayor's Office of Environmental Coordination (MOEC) about the GHG emissions and

climate change assessments described below. It is recommended that MOEC be contacted as early as possible in the environmental review process. Section 700 further outlines appropriate coordination.

100. DEFINITIONS

110. GREENHOUSE GAS EMISSIONS

111. Sources of Greenhouse Gas Emissions

OPERATIONS EMISSIONS

a. Direct Emissions—emissions from on-site boilers used for heat and hot water, on-site electricity generation, including co-generation/tri-generation, electricity generation (from power plants), industrial processes, and fugitive emissions.

b. Indirect Emissions—emissions from purchased electricity and/or steam generated off-site and consumed on-site during a project's operation.

c. Indirect Emissions from Solid Waste Generation—emissions resulting from a project's generation, transportation, treatment, and disposal of solid waste (this should be estimated for certain projects affecting the City's solid waste management system, discussed below).

MOBILE SOURCE EMISSIONS

a. Direct Mobile Source Emissions—fleet vehicles owned (or leased) and operated by the applicant and associated with the project.

b. Indirect Mobile Source Emissions—emissions from vehicle trips to or from the project site during its operation that are not owned or operated by the applicant.

CONSTRUCTION EMISSIONS

a. Direct emissions resulting from the operation of construction vehicles and equipment.

b. Emissions resulting from the manufacture or transport of construction materials (generally, steel and concrete) used for the project.

112. Recognized Greenhouse Gases

There are six internationally-recognized greenhouse gases regulated under the Kyoto Protocol (an international agreement adopted in 1997 that is linked to the United Nations Framework Convention on Climate Change): carbon dioxide (CO_2), nitrous oxide (N_2O), methane (CH_4), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6). Evaluation of the emissions of each of these GHGs may potentially be included in the scope of an EIS.

All calculations of emissions should be presented in units of metric tons of carbon dioxide equivalent (CO_2e), a common measure that allows gases with different global warming potentials (the potential to trap heat in the atmosphere) to be added together and compared. According to standard GHG accounting protocols, projects should calculate emissions of all six gases, where applicable. In order to convert all six gases into units of metric tons of CO_2e, a list of global warming potentials of the six primary greenhouse gases is presented in Table 18-1.

Table 18-1
Global Warming Potential for Primary Greenhouse Gases

Greenhouse Gas	Common sources	Global Warming Potential (GWP)
CO_2 - Carbon Dioxide	Fossil fuel combustion, forest clearing, cement production	1
CH_4 - Methane	Landfills, production and distribution of natural gas and petroleum, anaerobic digestion, rice cultivation, fossil fuel combustion	21
N_2O - Nitrous Oxide	Fossil fuel combustion, fertilizers, nylon production, manure	310
HFCs - Hydrofluorocarbons	Refrigeration gases, aluminum smelting, semiconductor manufacturing	140-11,700*
PFCs - Perfluorocarbons	Aluminum production, semiconductor manufacturing	6,500-9,200*
SF_6 - Sulfur Hexafluoride	Electrical transmissions and distribution systems, circuit breakers, magnesium production	23,900

Note: Since the Second Assessment Report (SAR) was published in 1995, the IPCC has published updated GWP values in its Third Assessment Report (TAR) and Fourth Assessment Report (AR4) that reflect new information on atmospheric lifetimes of greenhouse gases and an improved calculation of the radiative forcing of CO_2. However, GWP values from the SAR are still used by international convention to maintain consistency in GHG reporting, including by the United States when reporting under the United Nations Framework Convention on Climate Change.
* The GWPs of HFCs and PFCs vary depending on the specific compound emitted. A full list of these GWPs is available in Table ES-1 of the U.S. Environmental Protection Agency's *Inventory of Greenhouse Gas Emissions and Sinks: 1990-2008*, available at: Inventory-GHG 1990-2008.

120. CLIMATE CHANGE

Climate change is expected to result in increasing temperatures, changes in precipitation patterns, rising sea levels, and more intense and frequent extreme weather events, such as heavy downpours, heat waves, droughts, and high winds. For example, the New York City Panel on Climate Change (NPCC) projects that by the 2050s, sea levels could be between 11 and 24 inches higher than they are today; the NPCC's high estimate for sea level rise is 31 inches by 2050. In addition, coastal flood and storms are projected to occur more frequently with higher associated storm surges. Table 18-2 summarizes projected changes in air temperature, precipitation, and sea level rise published by the NPCC in its 2013 Climate Risk Information Report.

Table 18-2
NPCC Baseline Climate and Mean Annual Changes [a]

Air Temperature Baseline (1971-2000) 54° F	Low-estimate (10th percentile)	Middle range (25th to 75th percentile)	High-estimate (90th percentile)
2020s	+ 1.5 ° F	+ 2.0 to 3.0° F	+ 3.0° F
2050s	+ 3.0 ° F	+ 4.0 to 5.5° F	+ 6.5° F
Precipitation Baseline (1971-2000) 50.1 inches	**Low-estimate (10th percentile)**	**Middle range (25th to 75th percentile)**	**High-estimate (90th percentile)**
2020s	- 1 percent	0 to + 10 percent	+ 15 percent
2050s	1 percent	+ 5 to + 10 percent	+15 percent
Sea Level Rise Baseline (1971-2000) 0 inches	**Low-estimate (10th percentile)**	**Middle range (25th to 75th percentile)**	**High-estimate (90th percentile)**
2020s	2 inches	4 to 8 inches	11 inches
2050s	7 inches	11 to 24 inches	31 inches

Source: NPCC Climate Risk Information 2013: Observations, Climate Change Projections, and Maps
Based on 35 GCMs (24 for sea level rise) and two Representative Concentration Pathways. Baseline data are from the National Oceanic and Atmospheric Administration (NOAA) National Climatic Data Center (NCDC) United States Historical Climatology Network (USHCN), Version 2 (Menne et al., 2009). Shown are the 10th percentile, 25th percentile, 75th percentile, and 90th percentile 30-year mean values from model-based outcomes. Temperature values are rounded to the nearest 0.5° F, precipitation values are rounded to the nearest 5 percent, and sea level rise values are rounded to the nearest inch.

200. DETERMINING WHETHER A GHG EMISSIONS OR CLIMATE CHANGE ASSESSMENT IS APPROPRIATE

210. GREENHOUSE GAS EMISSIONS

Currently, the GHG consistency assessment focuses on those projects that have the greatest potential to produce GHG emissions that may result in inconsistencies with the GHG reduction goal to a degree considered significant and, correspondingly, have the greatest potential to reduce those emissions through the adoption of project measures and conditions. Over time, as data improve and as GHG emissions standards and regulations evolve, MOEC will reevaluate and, as appropriate, revise the guidance to potentially expand the applicability of the guidance or refine methodologies. The assessment is currently limited to the projects with the characteristics described below.

Generally, a GHG emissions assessment is typically conducted only for larger projects undergoing an EIS, since these projects have a greater potential to be inconsistent with the City's GHG reduction goal to a degree considered significant. However, the nature or type of certain projects may warrant consideration of the project's GHG emissions and, consequently, an analysis of consistency with City policy to reduce GHG emissions, even where preparation of an EIS is not required. This should be determined by the lead agency on a case-by-case basis. In making such determination, the lead agency should consider the following:

- For City capital projects subject to environmental review, it is often appropriate to examine the project's consistency with Executive Order 109 of 2007, which mandates formulation of a GHG reduction plan to reduce City building and operational emissions by 30 percent below Fiscal Year 2006 levels by 2017.
- A project that proposes either of the following may warrant assessment:
    - Power generation (not including emergency backup power, renewable power, or small-scale cogeneration); or

- Regulations and other actions that fundamentally change the City's solid waste management system by changing solid waste transport mode, distances, or disposal technologies.

- A project conducting an EIS that would also result in development of 350,000 square feet or greater.

Currently, the GHG consistency assessment focuses on those projects with the above characteristics. However, the need for a GHG emissions assessment is highly dependent on the nature of the project and its potential impacts and the lead agency should evaluate, on a case-by-case basis, whether an assessment of consistency with the City's GHG reduction goals should be conducted for other projects undergoing an EIS. For example, if a project would result in the construction of a building that is particularly energy-intense, such as a data processing center or health care facility, a GHG emissions assessment may be warranted, even if the project would be smaller than 350,000 square feet.

220. CLIMATE CHANGE

MOEC should be consulted about the need for and scope of climate change analyses in CEQR reviews. Although significant climate change impacts are unlikely to occur in the analysis year for most projects, depending on a project's sensitivity, location, and useful life, it may be appropriate to provide a qualitative discussion of the potential effects of climate change on a proposed project in environmental review. Such a discussion should focus on early integration of climate change considerations into the project and may include proposals to increase climate resilience and adaptive management strategies to allow for uncertainties in environmental conditions resulting from climate change.

Rising sea levels and increases in storm surge and coastal flooding are the most immediate threats in New York City for which site-specific conditions can be assessed. If an analysis of climate change is deemed warranted for projects at sites located within the 100- or 500-year flood zone, (i) projections for the future sea level rise and, to the extent available, likely future flood zone boundaries projected for the area of the site for different years within the expected life of the development should be provided (*e.g.*, the 2020s 100-year and 2020s 500-year floodplain shape files, and the 2050s 100-year and 2050s 500-year floodplain shape files on NYC Open Data); and (ii) any city, state, or federal initiatives to improve coastal resilience, such as those set forth in the Special Initiative for Rebuilding and Resiliency (SIRR) Report, "A Stronger, More Resilient New York," should be discussed if they have the potential to affect the project site.

The New York City Waterfront Revitalization Program, November 2018 Revisions (the "Revised WRP"), will not be effective as the local Coastal Zone Management Program until it is approved by the New York State Department of State and the United States Department of Commerce. However, the Revised WRP has been approved by the City Planning Commission and City Council pursuant to Section 197-a of the New York City Charter and reflects the long-term goals relating to sustainability and climate resilience. Accordingly, for site-specific development plans, an analysis of consistency with Policy 6.2 of the Revised WRP may provide sufficient information to assess the potential effects of sea level rise, storm surge and coastal flooding.

300. ASSESSMENT METHODS

310. GHG ASSESSMENT

GHG emissions are a consequence of global growth and the technologies employed in the global economy. At the local level, the City's GHG emissions are a function of its growth, its technologies, and its distribution of economic activity. New York City growth and development may contribute to lower per capita GHG emissions over the business-as-usual case by redirecting economic activity to, and capturing development within, higher-density urban areas that may otherwise locate in lower-density, suburban and rural areas, and by doing so in a more energy-efficient and transit-oriented fashion. In general, New York City residents consume less energy per capita for transportation purposes than other U.S. citizens because they use mass transit and non-motorized transportation (*e.g.*,

walking) at far higher rates, and New York City's buildings require less energy per capita than those in comparable climates because they are configured more vertically, house more people and businesses per square foot, and have shared walls and heating and cooling systems. As a result, the average New York City resident is responsible for the emission of 5.9 metric tons of CO_2e per year, compared to a U.S. average of 19.0 metric tons per capita (excluding agriculture and non-local processes). Despite this, the sheer size of the City means that it produces nearly one-sixth of one percent of the world's total greenhouse gas emissions. Therefore, even though other regions that are less efficient today may present proportionally greater opportunities for GHG emissions reductions, reducing New York City's GHG emissions would make an appreciable contribution toward global goals, and the City has committed to doing so with its GHG reduction goal.

To illustrate, a highly-dense, transit-oriented project within New York City may not initially appear consistent with the GHG reduction goal due to the large number of total GHG emissions attributed to the development. However, the density of the project and its location in a transit-rich, rather than auto-dependent, area of the City, facilitates a lower automobile mode share and ensures that the GHG emissions per person would be lower than that of a development for the same number of people on a site not well-served by transit. Dense, mixed-use, transit-oriented development should be encouraged as an important aspect of achieving the GHG reduction goal; however, a project's location alone does not make it consistent (or inconsistent) with the GHG reduction goal. By the same token, a project in a more auto-dependent area of the City may be able to offset a higher mode share of vehicles by constructing an energy efficient building and using less carbon intense fuels for building operation. For these reasons, the focus of a GHG emissions assessment described in the CEQR Technical Manual is not to ascribe environmental significance to a specified level of GHG emissions, but instead to consider GHG emission sources and practicable means to reduce their output in the context of the project's location, consistent with the City's GHG reduction goal. It should be noted that, in the future, federal, state, or city regulations may mandate both specific GHG emissions reduction targets and the means by which to achieve them. If this occurs, it is possible that compliance with such regulations may constitute consistency with the GHG reduction goal.

The local laws, policies, and building codes that are anticipated to be enacted in furtherance of the City's GHG reduction goal will apply to projects irrespective of whether they are subject to environmental review, and the City's GHG emissions reductions largely will be achieved through such measures. Because the overall GHG reduction goal will be achieved through a variety of measures and the relative potential for each measure to contribute toward achievement of the goal will vary, a GHG emissions assessment cannot measure consistency with the City's GHG reduction goal based on a quantitative measure linked to the project's contribution toward achieving the overall 30 percent reduction. Instead, the lead agency should generally assess whether the nature, setting, and features of the proposed project are consistent with the goals and benchmarks outlined to achieve the City's GHG reduction goal. Of particular relevance to projects undergoing this consistency assessment are the city's goals to reduce GHG emissions, including constructing new resource- and energy-efficient buildings and improving the energy efficiency of existing buildings; providing clean, renewable power through replacement of inefficient power plants with state-of-the-art technology and expanding the use of clean distributed power generation; encouraging transit-oriented development; and encouraging sustainable transportation by improving public transit, improving the efficiency of private vehicles, and decreasing the carbon intensity of fuels.

311. Assessment

Typically, impact significance for technical areas analyzed pursuant to CEQR is determined by the potential for localized impacts. For instance, under a traditional air quality analysis conducted pursuant to CEQR, the National Ambient Air Quality Standards ("NAAQS"), developed with localized health-based standards in mind, establish numeric thresholds that assist an agency in determining impact significance. However, because GHG emissions impact the global climate, a project's associated GHG emissions cannot be assessed for a potential discernible localized impact. The global nature of GHG emissions and the current absence of similarly established numeric standards for these emissions support the emerging consensus that a numerical threshold for determining significance should not be established for the purposes of environmental review. Therefore, the fact that a proposed project generates

GHG emissions does not, in and of itself, suggest the possibility of a significant adverse impact. Consequently, developing a study area, measuring the relative increment of a project's GHG emissions as compared to a No-Action scenario, and then comparing that increment to a quantitative threshold is not appropriate; rather, the lead agency should assess the project's consistency with the GHG reduction goal by calculating the total GHG emissions associated with a project and examining the project's contribution in relation to qualitative goals for reducing GHG emissions.

There are three types of projects in which the assessment outlined below applies: (1) those where the project site is under the control of the applicant, whether private or the City; (2) those where the proposed project would result in construction on sites that are not under the control of the applicant (such as a rezoning of multiple sites); and (3) those where the project would result in development both on sites controlled by the applicant and sites not controlled by the applicant. If a project would not fit within one of these frameworks, the lead agency should consult with MOEC to determine the appropriate level and type of analysis.

For any project where development would result on sites controlled by the applicant (project category (1) or (3) above), the applicant should conduct the analysis below to determine whether its project is consistent with GHG reduction goal.

If project category (2) or (3) applies, a GHG emissions assessment of emissions associated with sites not controlled by the applicant is unlikely to be meaningful because promotion of the GHG reduction goal through improved efficiency of site-specific building systems and similar measures cannot be achieved within the scope of the project. Therefore, the guidance below does not apply. Instead, in quantifying (calculated using Table 18-3 below), disclosing, and discussing the GHG emissions resulting from this type of project, the lead agency should qualitatively discuss the benefits or drawbacks of the project in relation to the achievement of the City's GHG reduction goal through encouragement of mixed-use, sustainable transportation-oriented development and/or GHG emissions avoided in the City as a result of the project.

311.1 Conducting an Assessment

A project's GHG emissions may generally be assessed in two steps: estimate the emissions for the sources discussed below and examine the project in terms of the qualitative goals for reducing GHG emissions. After the project's GHG emissions have been examined in terms of such goals, the project's consistency with the City's GHG reduction goal may be assessed.

It is recommended that the project's emissions be estimated with respect to the following main emissions sources: operations emissions (direct and indirect); mobile source emissions (direct and indirect); and, when applicable, construction emissions and emissions from solid waste management (both defined in Section 100, above). Then, the source of GHG emissions should be examined in terms of goals for reducing GHG emissions using qualitative considerations. Guidance on estimating the project's GHG emissions and comparing them to qualitative goals for GHG emissions reduction for each emission source is presented next.

OPERATIONS EMISSIONS

Step 1: Estimate Project Energy Usage

To quantify the GHG emissions for the operation of a building, including direct and indirect emissions from stationary sources, the lead agency should reasonably estimate energy usage from the proposed stationary sources included in the project design. If a proposed project would result in the construction of a building, a lead agency should calculate each building's emissions for heating, cooling, power, and lighting. The energy use estimated for the project in Chapter 15, "Energy," should be used to calculate a project's estimated energy consumption. To convert this energy consumption to annual GHG emissions, the following conversion factors may be used:

Table 18-3
CO_2e Conversion Factors

Energy source	kg CO_2e/MMBtu
Electricity	35.902
Natural gas	53.196
Distillate oil	73.567
Residual oil	79.217
Steam	64.306

Source: New York City Office of Long-Term Planning and Sustainability

For projects, such as a rezoning, where the whole building energy use was estimated using Table 15-1 in Chapter 15, "Energy," the specific fuel type to be used is likely unknown. Therefore, Table 18-4, which provides the carbon intensity (GHG emissions per gross square foot of floor area, based on all energy sources used) for different building types in New York City, should be used to calculate the project's overall annual GHG emissions.

Table 18-4
Carbon Intensity of New York City Buildings

Building Type	kg CO_2e/sq ft
Commercial	9.42
Industrial	23.18
Institutional	11.42
Large Residential (>4 family)	6.59
Small Residential (1-4 family)	4.52

Note: This calculation includes the total annual GHG emissions from all energy sources for each building sector in 2008, as reported in the City's *Inventory of New York City Greenhouse Gas Emissions: September 2009*, divided by the total gross square feet of building area for each building sector in 2008.

Along with total operational GHG emissions, the carbon intensity, or the GHG emissions per square foot should be disclosed.

For certain projects subject to a GHG assessment, such as constructing a power plant, the lead agency should quantify emissions using a protocol developed for quantifying GHG emissions for these types of projects, such as the World Resources Institute/World Business Council for Sustainable Development's (WRI/WBCSD) Greenhouse Gas Protocol. The lead agency should consult with MOEC before using any such protocol. For the purposes of this section, the following guidance focuses on the "typical" project resulting in one or more buildings.

Step 2: Assessing a Project in Terms of Qualitative Goals to Reduce GHG Emissions

To evaluate a project's consistency with the GHG reduction goal and to analyze the effect a project may have with regard to GHG emissions, the lead agency should assess a project in terms of the goals for GHG emissions reduction by examining measures that may reduce this carbon intensity. See Section 330, "Assessment of Consistency," below for further guidance in completing this assessment.

MOBILE SOURCE EMISSIONS

Step 1: Estimate mobile source emissions

A project's mobile source emissions may be estimated using the following steps:

- Obtain the "trip generation" numbers for the number of car, truck, and other trips estimated in Chapter 16, "Transportation."
- Calculate the Vehicle Miles Traveled (VMT) for each vehicle mode (trucks, cars, and other trips) using reasonable assumptions about distances traveled, based on existing community patterns. For certain projects, such as distribution centers, more refined data may be known about the VMTs for each vehicle mode that indicates a greater likelihood of longer regional trips to and from the proposed site and, therefore, should be used instead of the recommended VMTs per vehicle mode listed below.
    - To calculate the VMT for trucks, it is recommended that 38 miles per one-way truck trip be assigned. This assumption of truck VMTs is based on academic research on local truck trips within New York City and is corroborated by using the Best Practices Model (BMP) developed by the New York Metropolitan Transportation Council (NYMTC) for weekday truck commercial trips for the region. While the BPM shows a slightly lower number for truck mileage in the city, it is appropriate at this time to use the more conservative 38 miles per one-way trip. As data on trucks in New York City improve, the number will be refined as necessary.
    - To calculate the VMT for cars and taxis, please consult Tables 18-5, 18-6, and 18-7 below. If more specific data regarding the VMT assignment are known about a project, those data should be used.

Table 18-5
Average One-Way Trip Distance for Personal Vehicles (Miles)

	VMT		
Manhattan	***Residential***	***Office***	***Retail***
Weekday	5	5	3
Weekend	3	5	3
Other NYC	***Residential***	***Office***	***Retail***
Weekday	8	8	4
Weekend	4	8	4

Sources: *NYMTC/NJTPA Regional Travel–Household Interview Survey General Final Report (Feb. 2000)* and the *NYMTC Best Practices Model General Final Report (Jan. 2005).*

Table 18-6
Average One-Way Taxi Trip Lengths (Miles)

		Destination		
		Manhattan	*Other NYC*	*Unknown Destination*
Origin	***Manhattan***	2	9	2.32
	Other NYC	11	6	7.88
	Unknown Origin	2.32	7.88	N/A

Source: 2009 annual Taxi GPS data from the New Yock City Taxi and Limousine Commission.

- Assign the VMTs to arterials, local roads, or interstates/expressways using the following percentages. If more specific data regarding the VMT assignment is known about a project, those data should be used.

Table 18-7
Percentages of Daily Vehicle-Mile-Travel (VMT) by Facility Type

Facility	Manhattan	Other NYC
Freeways	30%	39%
Arterials	48%	41%
Locals	22%	20%

Source: NYMTC's Transportation Conformity Determination Draft Report-March 2010
Note: The above percentages may need to be adjusted based on the location of the proposed project and its distribution and assignments.

- Using the attached mobile GHG emissions calculator, enter the project's projected build year and VMT per arterial, local road, or interstate/expressway to obtain the total estimated mobile source GHG emissions attributable to the project.

Step 2: Assessing a Project in Terms of Qualitative Goals to Reduce GHG Emissions

Mobile source GHG emissions constitute approximately 22 percent of the City's total GHG emissions. Therefore, a proposed project's induced mobile GHG emissions should be calculated using the above methodology. Currently, a qualitative analysis that assesses the proposed project's mobile source GHG emissions in terms of goals for reducing mobile source GHG emissions, such as reducing the motor vehicle portion of the project's predicted modal split by pursuing transit-oriented development and encouraging alternative modes of transportation, provides the qualitative information for the decision maker to determine a project's consistency with the GHG reduction goal. As noted above, both direct and indirect mobile sources should be considered.

To conduct the qualitative assessment, the following should be considered:

- Does the proposed project take advantage of opportunities for transit-oriented development?
  - Describe anticipated modal splits and potential for a greater share for non-automobile modes, including any such potential created by features of the project.
  - Describe nearby transit facilities or services and/or bicycle facilities nearby or included in the project.
  - What are the types of transit near the project? What is the distance (in miles and walking minutes) of the project from the transit service?

- What types of trips associated with the project may be served by this transit?
- What is the quality and type of bicycle facilities connecting the project site to other origins and destinations? How would bicycles using these facilities access the project?
- Would there be transit services or amenities incorporated into the project (ferry landing, shuttle services, bus shelter)?

- Would the project facilitate the co-location of uses complementary to one another or to other uses within walking distance of the project? For instance, does the project introduce residences within walking distance of a local retail street, or introduce retail that would serve nearby residents?
- If there would be on-site transportation, what type would it be?

CONSTRUCTION EMISSIONS

Step 1: When to quantify construction emissions

For projects subject to a GHG assessment, the lead agency should discuss construction, extraction or production of materials or fuels qualitatively by considering the types of construction materials and equipment proposed for use on the project and the opportunities for alternative approaches (*e.g.*, different forms of concrete production) that may serve to reduce GHG emissions associated with construction. For those projects where the construction phase or the extraction or production of materials or fuels is likely to be a significant part of total project emissions, the lead agency, in its discretion, may quantify the emissions resulting from construction activity and construction materials.

Step 2: Assessing a Project in Terms of Qualitative Goals to Reduce GHG Emissions

There are construction measures that may help achieve relatively low GHG emissions and may be considered a "best practices" benchmark, thereby achieving the goals of environmental disclosure as well as identifying avenues by which a project's contribution of GHG emissions may be minimized. For instance, fly ash (a byproduct of coal-fired power generation) or slag (a byproduct of iron production) may be used in concrete as inexpensive replacements for Portland cement—the production of which results in substantial GHG emissions. Depending on the fly ash or slag content, an applicant's commitment to use this type of concrete may reduce the associated GHG emissions. By utilizing a different form of concrete production, a project may use 30 to 40 percent less cement while maintaining the same strength. The Building for Environmental and Economic Sustainability (BEES) software here and the Buildings Energy Data Book published by the U.S. Department of Energy here, may be helpful when comparing several design and construction choices.

EMISSIONS FROM SOLID WASTE MANAGEMENT

Step 1: When to quantify emissions from solid waste management

For those projects that may fundamentally change the City's solid waste management system, the GHG emissions from solid waste generation, transportation, treatment, and disposal should be presented. For guidance on conducting a solid waste GHG emissions assessment, the lead agency should contact MOEC. Several tools are available to measure these emissions. Pursuant to guidance provided by New York State Department of Environmental Conservation (DEC) in its *Guide for Assessing Energy Use and Greenhouse Gas Emissions in an Environmental Impact Statement* for DEC staff reviewing an EIS pursuant to the State Environmental Quality Review Act, applicants should refer to one or more of the following three tools:

- The U.S. EPA's Waste Reduction Model (WARM) web-based calculator (https://www.epa.gov/warm/individual-waste-reduction-model-iwarm-tool); or WARM.

- The Municipal Solid Waste Decision Support Tool (MSW-DST) developed by the U.S. EPA's Office of Research and Development and Research Triangle Institute (available at https://mswdst.rti.org/resources.htm).

These models enable applicants to derive the GHG emissions implications of different levels of solid waste generation and differing solid waste management practices.

Step 2: Comparing Project to a baseline

If it is appropriate for a project to quantify the GHG emissions from solid waste management, the baseline to be used for such an assessment is often the existing condition of the solid waste management facilities, waste transportation modes, and associated disposal facilities. Because this assessment is not common, guidance regarding the analysis of GHG emissions from solid waste generation is not specifically detailed below. Therefore, the lead agency should consult with MOEC for further guidance in quantifying and assessing GHG emissions from the management of solid waste.

312. Assessment of Consistency with the GHG Reduction Goal

This assessment considers the following question:

Is the project consistent with the goal of reducing GHG emissions, specifically the attainment of the City's established GHG reduction goal of reducing City-wide GHG emissions by 30 percent below 2005 levels by 2030?

To determine the consistency with the City's overall GHG reduction goal, an applicant should assess consistency with the following goals, as relevant to the project:

- Pursue transit-oriented development;

- Generate clean, renewable power through replacement of inefficient power plants with state-of-the-art technology and expanding the use of clean distributed generation;

- Construct new resource- and energy-efficient buildings (including the use of sustainable construction materials and practices) and improve the efficiency of existing buildings; and

- Encourage sustainable transportation through improving public transit, improving the efficiency of private vehicles, and decreasing the carbon intensity of fuels.

For example, for a proposed project a number of the following characteristics would be considered consistent with the GHG reduction goal: the applicant demonstrates that (or commits to) each building would be built to Energy Star levels; even though the development is not considered "transit-oriented development," it reduces the auto share or auto trips in a neighborhood by providing services previously unavailable to the area; the development uses co-generation, tri-generation, or other forms of renewable energy; the fuels used in the building operation produce low-GHG emissions, alternative modes of transportation are accessible and encouraged; the development commits to using fly-ash concrete to the greatest extent practicable; and low-GHG emission construction equipment and vehicles would be used for the duration of the construction. It should be noted that project may differ and specific measures that make a project consistent with the GHG reduction goal may vary. The applicant should contact MOEC if it needs further guidance on reducing its GHG emissions.

312.1. Assessment

In order to assess consistency with the reduction goal, the lead agency should examine how a project would reduce its carbon intensity based upon its density, fuel choices, geographic setting, avoided GHG emissions, building efficiency, *etc.* In making this determination, the lead agency should examine the analysis for operations emissions, mobile source emissions, and construction emissions, and weigh it against the considerations below.

GOAL: BUILD EFFICIENT BUILDINGS

In general, for a project to support this goal, an applicant should examine measures to reduce a building's carbon intensity insofar as feasible given the use for which the building is intended. This examination should be conducted qualitatively by considering whether a project would:

- Commit to pursuing an EPA Energy Star® rating; or
- Incorporate any of these sustainability and efficiency measures for "Building Design and Operation Measures and Site Selection and Design Measures" that would reduce the project's carbon intensity.

GOAL: USE CLEAN POWER

In general, for a project to support this goal, consider whether a project would:

- Incorporate elements that would reduce purchased electricity from non-renewable sources.
- Generate on-site power from low-carbon, renewable sources.
- Incorporate a co-generation or tri-generation system.
- Replace inefficient and more GHG-intense power generation systems or heating, cooling, and hot water systems with more efficient and less GHG-intense systems.
- Use fuel from renewable sources or less-GHG intense fuels, such as natural gas.
- Incorporate any of the following sustainability and efficiency measures for "On-Site GHG Sources" that would reduce the project's carbon intensity.

GOALS: TRANSIT-ORIENTED DEVELOPMENT AND SUSTAINABLE TRANSPORTATION

In general, for a project to support this goal, consider whether the project would:

- Be considered "transit-oriented development," *i.e.*, is it accessible to public transit and designed to take advantage of this access.
- Incorporate measures to encourage the use of public transportation or alternative modes of transportation, such as walking or bicycling.
- Facilitate avoided GHG emissions. For instance, a shopping center being built in an area that is underserved by retail, but not highly transit-accessible may promote GHG reduction by encouraging residents to shop nearby instead of driving longer distances to suburban locations.
- Require on-site low-emission vehicles to be used.
- Incorporate any of the following sustainability and efficiency measures for "Transportation" to reduce the project's mobile GHG emissions.

GOAL: REDUCE CONSTRUCTION OPERATION EMISSIONS

In general, for a project to support this goal, consider whether the project would:

- Use low-emission construction vehicles and equipment.
- Incorporate any of the following measures to reduce the project's construction GHG emissions.
    - Diesel particulate filters;
    - Diesel oxidation catalysts;
    - Alternate low-carbon fuels; or
    - Other technologies that reduce construction operation GHG emissions.

GOAL: USE BUILDING MATERIALS WITH LOW CARBON INTENSITY

In general, for a project to support this goal, consider whether the project would:

- Replace traditional concrete/steel/materials with less carbon-intensive materials, while still maintaining appropriate building strength and compliance with applicable building and fire codes.
- Utilize a design that would result in the use of less carbon-intensive concrete and steel.

LEED® CERTIFICATION OR ENERGY STAR®

A commitment by the applicant to seek LEED® Silver certification or an EPA Energy Star® rating for the project does not automatically make a project "consistent" with the GHG reduction goal; however, it is a vehicle for helping to ensure consistency. In the event that the applicant commits to seek LEED® Silver certification, the lead agency should examine what types of credits or points an applicant plans to achieve in order to obtain LEED® Silver certification. In general, consistency with the GHG reduction goal is most likely to be achieved where the applicant commits to achieve a substantial proportion of its points in the following general areas of sustainability: energy efficiency, transit-oriented development and alternative transportation, and renewable energy.

LOCAL LAW 86 OF 2005

Like seeking LEED® Silver certification or an EPA Energy Star® rating, compliance with Local Law 86 of 2005 (LL86) does not automatically make a project "consistent" with the GHG reduction goal; however, it is a vehicle for helping to ensure consistency. The requirements of LL86 can apply to projects where construction is managed through City agencies as well as to projects where construction is managed through non-City entities, such as cultural organizations, state agencies, and private developers. The trigger for LL86 is City funding. In order for a project managed by a non-City entity to be subject to any of the law's requirements, the project must receive $10 million or more in City funds, or, in cases where a project will receive less than $10 million of City funding, the City funding contribution must be greater than or equal to 50% of the project cost. Where LL86 applies, new buildings, additions, and substantial reconstruction of buildings must be built in accordance with the standards of the LEED® green building rating systems. It also requires that most of this work, as well as larger lighting, boiler, HVAC controls, and plumbing upgrade work, be designed to reduce the use of both energy and potable water well beyond that required by the current NYC building code.

400. DETERMINING IMPACT SIGNIFICANCE

A proposed project may or may not be consistent with the City's GHG emission reduction goal and this potential inconsistency may be a significant impact. The above goals for reducing GHG emissions should be considered together to determine consistency with the GHG reduction goal. Consistency with the GHG reduction goal should not be measured by a project's consistency or inconsistency in any one category.

A projects' consistency or inconsistency with the City's GHG reduction goal should be stated clearly in the analysis. If a project is initially found inconsistent with the GHG reduction goal, reasonable alternatives or efficiency measures should be considered so that the project achieves consistency.

500. MITIGATION

If a project's inconsistency with the GHG reduction goal is considered significant, the lead agency should use suggested mitigation measures as guidance for minimizing the inconsistency to the greatest extent practicable. A list of potential mitigation measures is located here.

600. ALTERNATIVES

Sometimes, a proposed project's inconsistency with the GHG reduction goal and/or vulnerabilities to climate change may be avoided through an alternative to the project. Such changes may include alternative uses, technologies, sites, scale, or designs. The development of such alternatives should take into account the objectives and capabilities of the project sponsor, consistent with the guidance in Chapter 23, "Alternatives."

700. APPLICABLE COORDINATION

The lead agency should contact MOEC with any questions regarding applicability of the analysis, methodologies, or the consistency assessment. If appropriate, MOEC will direct the lead agency to one of the City's expert agencies.