Cleaner Greener Long Island Regional Sustainability Plan

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Prepared for
Cleaner Greener Consortium of Long Island
Town of North Hempstead, Lead Municipality

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AECOM
Regional Plan Association

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Table of Contents

1 Executive Summary 5

Introduction . . . 5
Planning Process . . . 6
Public Engagement . . . 8
Regional Vision . . . 8
GHG Emissions on Long Island . . . 9
Greenhouse Gas Emissions Reduction Potential . . . 10
Summary of Goals and Strategies by Subject Area . 10
Adaptation to Climate Change . . . 17
How to Use this Report . . . 19

2 Methodology & Stakeholder Engagement 21

Planning Process . . . 21
Cleaner Greener Long Island Organization . . . 22
Planning Team and Working Group Process . . . 22
Municipal and Public Outreach and Engagement . . . 24
Public Meetings . . . 24
Conclusion . . . 25

3 Greenhouse Gas Emissions 27

2010 GHG Emissions on Long Island . . . 27
2020 Greenhouse Gas Emissions Projections . . . 28
Greenhouse Gas Emissions Reduction Potential . . . 29

4 Introduction to Organization of Goals & Strategies 33

5 Economic Development & Workforce Housing 35

Snapshot of the Region Today . . . 35
Trends and Issues . . . 35
Active Programs . . . 37
Sustainability Indicators . . . 38
Goals and Strategies . . . 40

6 Energy 51

Trends and Issues . . . 51
Existing Initiatives and Plans . . . 52
Sustainability Indicators . . . 55
Goals and Strategies . . . 56

7 Transportation 75

Trends and Issues . . . 75
Sustainability Indicators . . . 77
Goals and Strategies . . . 78

8 Land Use & Livable Communities 85

Trends and Issues . . . 85
Sustainability Indicators . . . 86
Goals and Strategies . . . 87
Related CGLI Strategies . . . 93

9 Waste Management 95

Trends and Issues . . . 95
Sustainability Indicators . . . 96
Goals and Strategies . . . 97

10 Water Management 105

Trends and Issues 105

Sustainability Indicators 106

Goals and Strategies 107

Related CGLI Strategies 116

11 Governance & Implementation 117

Trends and Issues 117

Sustainability Indicators 118

Goals and Strategies 118

Related CGLI Strategies 120

12 Adaptation to Climate Change 121

Projected climate change in Long Island 121

Anticipated Impacts of Climate Change 122

Ongoing Adaptation to Impacts of Climate Change 124

CGLI Plan Strategies with Adaptation Benefits 125

Sustainability Indicators 126

Potential Adaptation Strategies for Long Island . . 127

Vulnerable Area Prioritization Tool 130

13 Conclusion 133

References

Sustainability Indicators and Targets 134

CGLI Goals and Strategies 140

List of Figures 145

List of Tables 146

Acronyms 147

Acknowledgements 149

Appendix (see separate document)

- Long Island Carbon Footprint Project (Summary of GHG Inventory)
- Review of GHG Inventory and Business As Usual Projections
- Energy Subject Area Baseline -Compendium of Plans Reviewed
- Land Use Baseline – Summary and Compendium of Plans Reviewed
- Economic Development and Housing – Compendium of Plans Reviewed
- Sustainability Indicator Memo & Inventory
- List of Potential Strategies for Future Consideration
- Public Participation Summary
- List of Stakeholders

1 Executive Summary

Introduction

The Cleaner Greener Long Island Regional Sustainability Plan (hereinafter CGLI Plan) represents an ambitious undertaking by the Cleaner Greener Consortium of Long Island (hereinafter Consortium) to articulate a community-based vision for a more sustainable future. Comprised of municipalities, non-governmental organizations, and the planning consultant team, the Consortium and its partners have established goals and strategies for a regional framework through which to pursue the standards of sustainability: economic prosperity, social responsibility, and environmental health and well-being.

The challenges that Long Island has faced in the past decades of growth and development have been well documented (in efforts such as Long Island 2035 Plan).[1] High taxpayer burden has made the region an increasingly unaffordable place to live, the attractive but predominantly low-density pattern of suburban land development is more challenging to service, and the congested transportation networks threaten environmental health and well-being. The Great Recession of the early 21st Century continues to challenge regional economic vitality.

At the same time, the lasting effects of extreme climate are now evident across Long Island. Communities will continue to recover from the devastation inflicted by October 2012's Superstorm Sandy and other weather events. Unprecedented weather patterns have brought new focus to ongoing discussions about the region's response to increased frequency, intensity and duration of weather events. They have heightened public awareness about the need to reduce the climate-affecting carbon emissions for regional sustainability-based planning, and to initiate strategies to provide adaptation to the unavoidable effects of climate change.

Long Island is fortunate that there are many resources within the communities that can be tapped to address these issues. Municipalities, organizations, and citizens have shown great interest and enthusiasm to pursue sustainable approaches and solutions to ensure a more resilient future. Their efforts have laid the groundwork for the CGLI Plan.

In 2011, Governor Andrew Cuomo announced the Cleaner Greener Communities program in his State of the State address, thereby establishing a program that empowers regions to create more sustainable communities by funding smart development practices. Planning teams have partnered with public and private experts across a wide range of fields, along with residents, to lead the development of regional sustainability plans and to implement the projects that will significantly improve the economic and environmental well being of their communities. This effort will guide integrated, sustainable solutions—from statewide investments to regional decision-making on land use, housing, transportation, infrastructure, energy, and environmental practices—to improve overall quality of life.

Under the Cleaner Greener Communities program, the Consortium and its partners (see Figure 1) are engaging in a robust and inclusive dialogue about the future, ensuring that the plans and the community values they represent are incorporated into the CGLI Plan. Through a robust pub-

1 Long Island Regional Planning Council, Long Island 2035 Regional Comprehensive Sustainability Plan, 2010. Long Island 2035 represents a multi-year initiative to assess the position of Long Island relative to environmental, social, and economic sustainability. It included a Regional Visioning Initiative to achieve regional public consensus of land use, transportation, and institutional issues, a Regional Comprehensive Sustainability Plan, and Technical Studies to support growth scenario planning.

lic engagement process, the plan reflects a community-based vision.

The CGLI Plan provides a new platform to build upon the collaboration already underway as the region makes strides toward long-term sustainable economic development. By example, one of the primary recommendations in the Long Island 2035 Plan was to build consensus for a regional economic development strategy. The Long Island Regional Planning Commission (LIRPC) adopted the Sustainable Strategies from the Long Island 2035 Plan (as well as a Comprehensive Economic Development Strategy) and the Long Island Regional Economic Development Council (LIREDC) then built upon this groundwork when it adopted its own Strategic Economic Development Plan to provide a cohesive vision for the future of Long Island's economy.

The LIREDC key strategies focus on opportunities to support and advance the workforce, promote industry and commercialization of new and green technologies, and make the improvements to infrastructure that will be necessary to secure a sustainable future. The goals that have been developed for the CGLI Plan, represented in the subject area chapters that follow, are well aligned with the LIREDC's key strategies for economic growth (see Table 1 - Table 6).

While the CGLI Plan includes regionally-based strategies and initiatives, "regional" approaches will not necessarily require "centralized" solutions. The community representatives that have participated in this planning undertaking have made clear that Long Islanders value their unique community characteristics and are committed to self-governance under the local 'home rule' system. They place high value on the ability to address their needs through accessible local government. Communities across Long Island have been shaping community-based planning efforts that are in various stages of implementation.

Planning Process

The planning process employed to develop the CGLI Plan was based on the process outlined by NYSERDA for the Cleaner Greener Communities program. Key phases of work included:

- Baseline Assessment A baseline assessment was prepared for each subject area included: identification of existing procedures, policy and projects; identification of sustainability indicators and collection of baseline data; Tier II Green House Gas (GHG) Inventory to determine current levels of emission (prepared by New York Institute of Technology); projections for 2020GHG Emissions based on Business as Usual (BAU); and baseline calculations of each indicator as the basis to measure progress that may be achieved through recommended strategies.[2]
- **Target Assessment** A target has been identified for each sustainability indicator, which is a feasible and reasonable estimate of progress that can be achieved by 2020, assuming implementation of the proposed strategies.
- **Implementation Strategies** Strategies to achieve the goals for GHG emission reduction, job creation, and other selection criteria were identified through the process. Where feasible, GHG emission reduction potential was calculated for projection year 2020 by assessing potential savings in comparison to the BAU scenario. Strategies have also been designed to support improved performance of indicators.
- **Sustainability Plan Report** The report is a compilation of the work that was prepared during the planning process and provides further definition of the recommended strategies.

Project Organization

The Cleaner Greener Consortium of Long Island, representing the participating municipalities, was formed to provide direction, review, and approval at each phase of work. A Steering Committee, comprised of the lead municipality, local non-governmental organizations, and the planning and technical consultants, was also formed to serve as the steering body for the larger planning partners and for day-to-day administration and production. A Planning Team representing the municipalities in the Consortium and other regional partners was established to review and approve all project deliverables.

The Working Groups, comprised of local stakeholders and technical experts, were engaged throughout the process to support the development of each of the following subject areas as the focus for the plan:

- Economic Development and Workforce Housing
- Energy
- Transportation
- Land Use and Livable Communities
- Waste Management
- Water Management
- Governance and Implementation

2 Baseline assessment is based on 2010 data. 2020 is used for goals and targets to focus on short-term actions and outcomes.

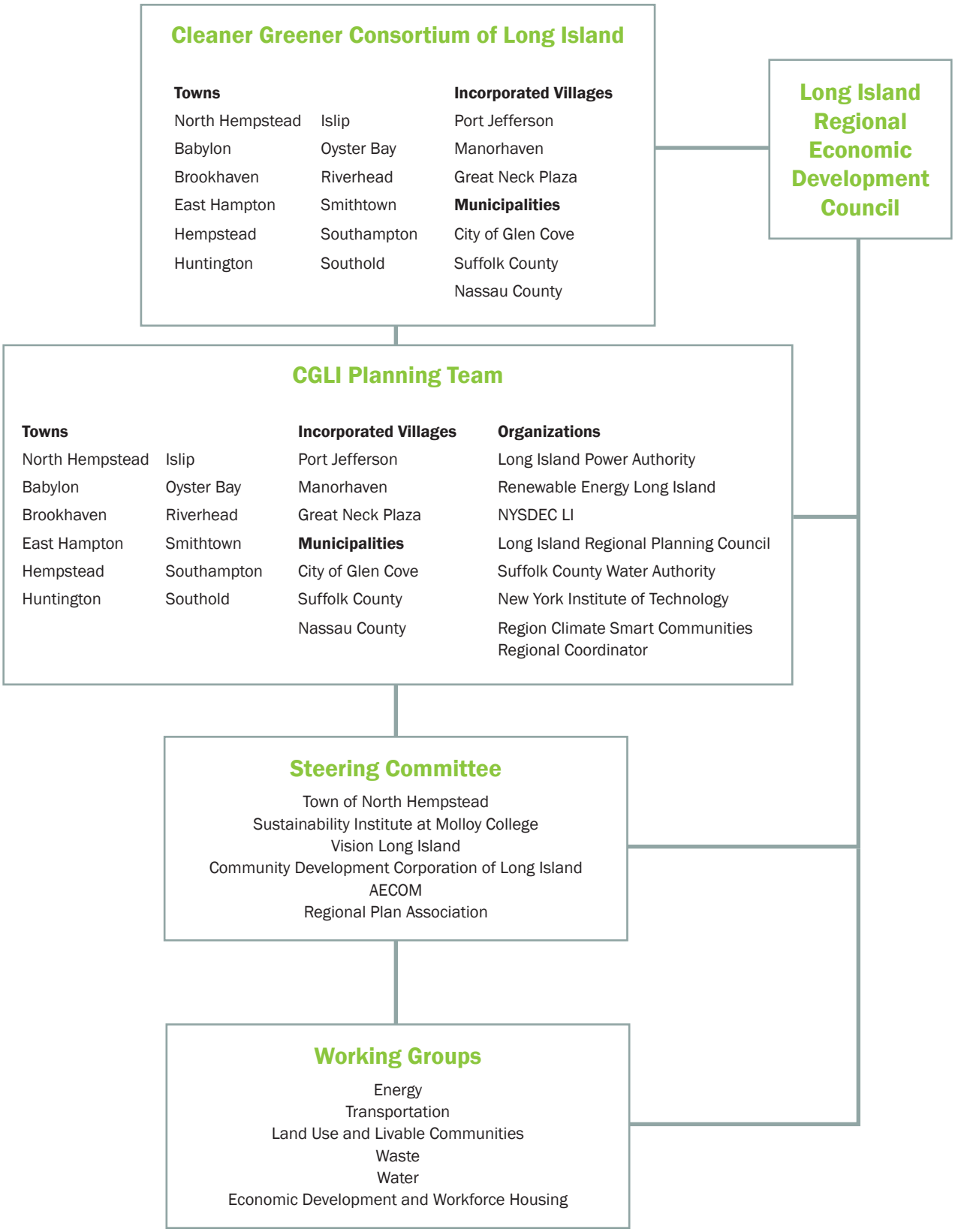


Figure 1 Cleaner Greener Long Island Project Organization
See acknowledgements for further information on project participants.

Public Engagement

Two organizations led the charge in the public outreach effort, the Long Island Smart Growth Working Group, a consortium of over 300 government, community, chamber of commerce and environmental leaders, and the Long Island Clean Energy Leadership Task Force, comprised of over 400 municipal officials and staff, green business and environmental leaders. The outreach process engaged roughly 800 Long Island leaders. In addition, over 300 different community, business and local government leaders were also engaged directly in the planning process as members of the Working Groups.

Public outreach also included securing input through individual meetings with public, institutional and private stakeholders. Meetings were held with Town Supervisors in North Hempstead, Babylon, Islip, Huntington, Riverhead, Southampton, East Hampton; the Suffolk County Supervisors Association; Councilpersons in Brookhaven and with the municipal staff from each of the Towns participating in the plan. In addition business, community and environmental leaders representing areas across Long Island were engaged. Outreach for this project reached over a dozen business organizations, twenty civic associations, and ten environmental groups. Feedback and priorities from these organizations has been incorporated into the development of both goals and implementation strategies.

In order to invite the large and broadly disperse population into the planning dialogue, e-mail invitations were distributed to over 30,000 Long Islanders through direct solicitation. Electronic and social media efforts involved the Vision Long Island website, updates on Facebook pages, Twitter and Smartphone applications. Press coverage for this process included articles in Newsday, the Patch, LI Business News, and the Corridor, as well as an Editorial in Newsday.

Outreach through the LI Green Homes Consortium was ongoing throughout the process. The CGLI Plan also benefited from panel discussions at the LI 2012 Smart Growth Summit (with over 1,000 attendees) and at the Advanced Energy Center at Stony Brook. Further outreach was provided by AARP, business groups and environmental organizations.

Members of the Steering Committee collaborated with the Working Groups to develop indicators, goals, implementation strategies, and targets for performance. This work was incorporated in the draft CGLI Plan and presented in public engagement meetings March 4 - 6, 2013, to provide further review and comment and to ensure the plan represents the goals of Long Island.

Regional Vision

It is essential that the strategies identified under the CGLI program reflect the regional vision for a more sustainable future and complement the Long Island Regional Economic Development Strategic Plan. Otherwise, the plan will lack meaning and purpose for the communities responsible for implementation. To that end, the CGLI Plan builds on the visioning and goal-setting activities developed through the planning work done by the municipalities prior to this engagement.

CGLI also references the visioning that was conducted for the recent regional undertaking to prepare the Long Island 2035 Plan due to the extensive public engagement that was conducted in 2009. The following vision was articulated through that process:

> *A sustainable Long Island is a place that offers an affordable, high quality of life, a strong economy, and equitable communities allowing everyone to enjoy the cherished quality of life that Long Islanders desire.*

While embracing this vision as a good reflection of core sustainable planning principles, the vision statement developed for the CGLI Plan also reflects the recent impact and challenges posed by extreme weather events, suggesting that a more action-oriented vision is in order:

> ***Long Island will implement policies and practices that support our communities as they adapt to the challenges of the 21st Century and pursue an affordable, high quality of life, a strong economy, and equitable communities with amenities all Long Islanders can enjoy.***

This Vision provides the framework for the goals that have been developed for each of the subject areas and the selection of sustainability indicators to measure progress towards these goals.

Key stakeholders engaged in the CGLI Kick-off Meeting.
Source: Town of North Hempstead

GHG Emissions on Long Island

The Cleaner Greener Communities program included preparation of a Tier II baseline GHG emissions inventory for each region. The GHG Inventory follows a protocol developed specifically for the Cleaner Greener Communities program using 2010 emissions data, allowing for comprehensive and comparable emissions results among the NY economic development regions identified under this initiative.[3]

Currently, the largest source of GHG emissions on Long Island is the residential sector (Figure 2). Many Long Islanders are relatively affluent and live energy-intensive lifestyles in large homes. The majority of the housing stock was built prior to enactment of the New York State Energy Conservation Construction Codes in 1979.

As shown in Figure 2, on-road vehicles are the second largest contributor to Long Island's carbon footprint. The infrastructure created over decades to serve the suburban residential and car-centered development will not be changed easily or quickly to lessen the impact. Thus, about 70% of the region's greenhouse gas emissions will continue to come from the residential and on-road vehicle sectors. The other significant source of GHG emissions is the commercial sector, including office, retail and industrial uses.

The Long Island region's Energy Use Intensity (EUI), the amount of annual energy consumed per person, is currently 193 million British thermal units (mmBtu) per person annually. The New York State average EUI is 192 mmBtu/capita and the US average EUI is 315 mmBtu/capita.[4]

This better-than-US average EUI ranking is largely due to the inherent efficiency of dense communities and city or village centers with very good access to public transportation and minimal large industries, as compared to other regions or states. Most of Long Island is considered suburban, dominated by single family homes. This may be thought of as less-dense land use and brings to mind the term "sprawl" but in fact, compared to the population density of other states, Long Island is a highly dense area. The current population density of Nassau County is 4,655 inhabitants per square mile and the current population density of Suffolk County is 1,637 inhabitants per square mile. The current population density of the US is 88 inhabitants per square mile. This difference in population density between the Long Island region and the US is a direct correlation to the lower EUI for Long Island than compared to the rest of the country.

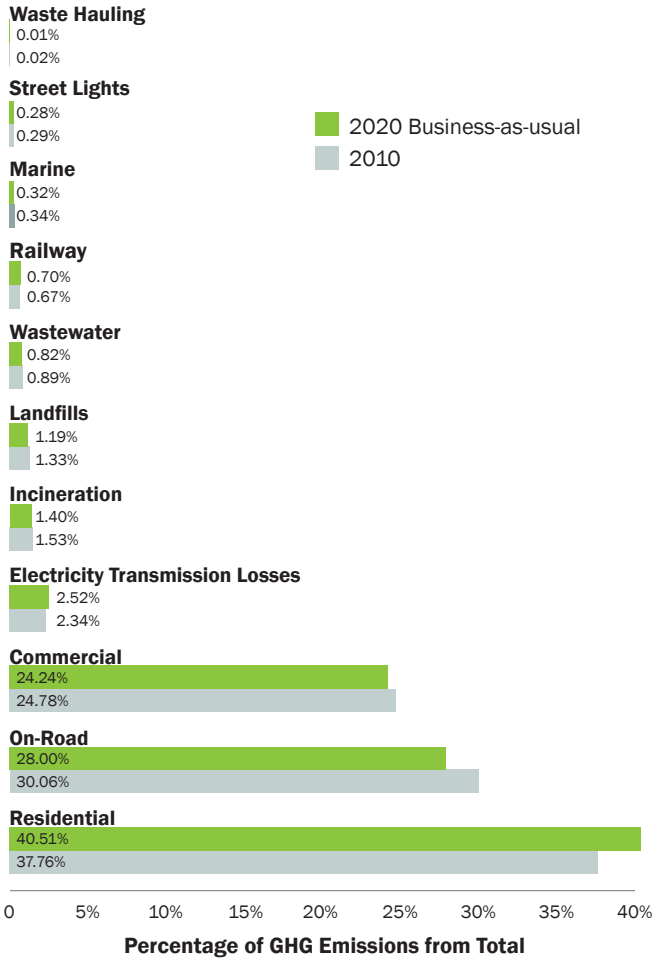


Figure 2 Long Island GHG Emissions Percentages by Sector

In order to provide meaningful metrics that the sustainability plan can use to evaluate the impact of strategies on emissions reduction, the 2010 baseline emissions inventory results were extrapolated to an emissions projection for the year 2020 under a business-as-usual (BAU) growth pattern. The 2020 BAU emissions projections represent the emissions output if current sectoral growth (population, economy, transportation trends, etc.) continued at the current estimated growth rates with no intervention. The projected growth for BAU 2020 (Figure 2) shows that the largest increase in emissions will be from electricity consumption between residential, commercial, industrial and

3 The Long Island regional GHG inventory was originally prepared as part of the Long Island Carbon Footprint Project in 2010 by the International Council for Local Government Initiatives (ICLEI) and the New York Institute of Technology (NYIT), using the 2005 calendar year as the inventory baseline. NYIT has developed an update to this inventory based on 2010 calendar year activity data and it is used as the baseline for the CGLI Plan.

4 http://www.eia.gov/beta/state/rankings/?sid=US#/series/12

rail transportation sectors. This is driven by projected increases in population, increases in economic activity on Long Island and increases in Long Island Rail Road ridership.

Greenhouse Gas Emissions Reduction Potential

One of the overarching goals of this undertaking is to contribute to New York State's goal of GHG emissions reduction. To that end, AECOM's Climate Action Plan Toolkit has been utilized to estimate the potential for those recommended strategies with sufficient data available to reduce GHG emissions by the target year of 2020. (The quantifications are presented in the chapters on specific subject areas.)

Figure 3 represents the calculation of the potential reduction in GHG emissions in 2020 that could be generated through the combined effects of the strategies proposed in the CGLI Plan with ongoing federal and state strategy programs. Through optimum participation and performance, these programs and strategies position the region to achieve 7,530,596 MT CO_2e/year in emissions reductions per year by 2020. This represents approximately a 13% reduction from the 2010 GHG emissions baseline.

The 15% GHG emissions reduction target is a first step towards achieving the NYS goal of 80% GHG emissions reduction by 2050. Clearly, the region will benefit from federal and state activities underway. Other communities such as New York City (30% by 2030) and Washington DC (30% by 2020) have more ambitious GHG reduction targets. This is an opportunity for the communities of Long Island to assess the feasibility and impacts of both voluntary and mandatory measures recommended in the CGLI Plan as they define the next generation of GHG reduction strategies and actions.

The value of the GHG Emissions Inventory, the BAU projections, and the estimate of the reduction that can be achieved through the strategies proposed in the CGLI Plan can help focus communities on where they can or need to take action. They also establish metrics and means to measure the success of their actions. Incorporating GHG emission reduction potential into the planning process provides policy makers and municipal leaders with a new level of information that can assist them to make sound investment decisions in the selection of strategies to implement.

Summary of Goals and Strategies by Subject Area

The primary objective of the Cleaner Greener Communities program is to create a regional sustainability plan framed by sustainability goals and guided by implementation strategies that promote community and region-wide benefit. Through public and working group engagement, goals and strategies have been developed for the following seven subject areas that were selected for focus by the Consortium.

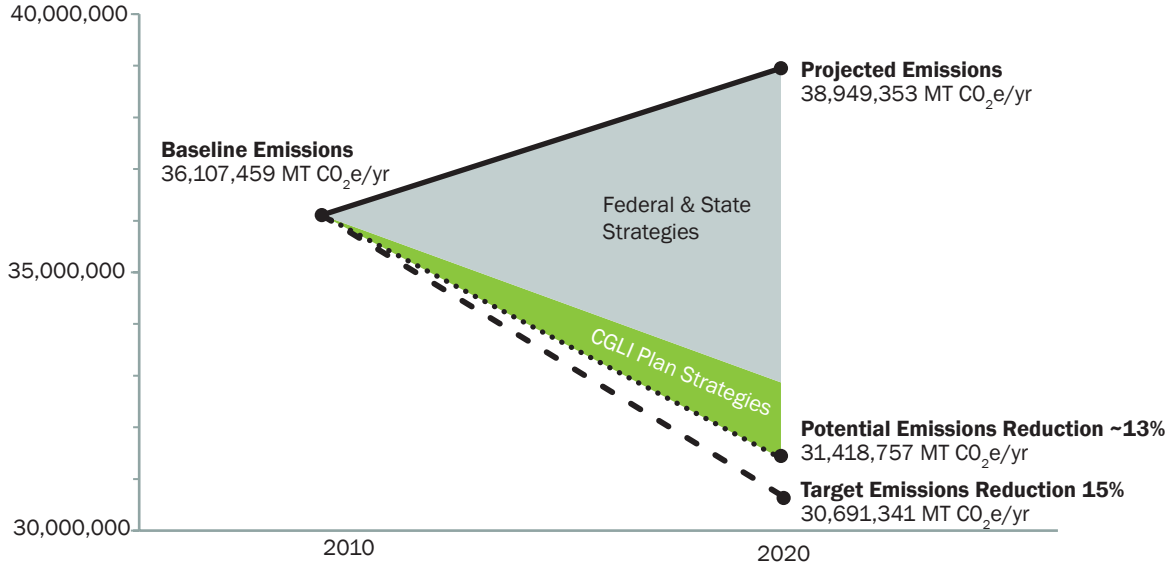


Figure 3 Long Island GHG Emissions Potential for 2020

The goals and strategies are identified in Table 1 through Table 7 (with notation of those strategies aligned with LI-REDC goals and that benefit climate adaptation) with introductory comments and presented in detail in chapters 5 through 11.

Economic Development and Workforce Housing

Obstacles While Long Island benefits from a well-educated workforce and close proximity to New York City, the region faces a number of critical economic challenges that have been further exasperated by the impacts of extreme weather events. The costs of doing business and living on Long Island are higher than the regional average. The quality of jobs has been decreasing and there is need to prepare for the future workforce. Long Island has experienced a decline in its younger workforce due to cohort effects and out-migration. Long Island's economy has transitioned from defense contracting to lower-paying service-based industries and is dependent on population growth to sustain its economy. The region is 90% built out with over 80% of its housing stock single family homes primarily constructed before 1970.

Opportunities There are number ongoing initiatives that support the goals of this plan. For instance, there are a number of location-efficient development projects in the region that are or are likely to be approved but are waiting for gap financing, density bonuses or tax incentives before proceeding. The green business sectors have been taking advantage of resources made available to them through the Green Jobs/Green New York Program and the consolidated funding application (CFA) process.

Table 1 Economic Development and Workforce Housing Goals and Strategies

	Align w/ LIREDC Goals	Adapt to Climate Change
Goal 1 Improve housing and transportation affordability by providing incentives for workforce housing and commercial buildings that are location efficient, affordable and green; thereby creating jobs for local contractors and local labor.		
Strategy 1.1 Provide gap financing and technical assistance incentives for new and redeveloped buildings that are location efficient, affordable and green.	x	x
Goal 2 Support a green innovation economy and local jobs by retaining, growing and attracting green business clusters.		
Strategy 2.1 Provide financial assistance for the incubation and commercialization of energy and green technologies. Facilitate growth and retain technologies developed by Long Island's research laboratories and universities, creating and retaining local jobs and businesses.	x	
Strategy 2.2 Retain and grow the green construction sector through technical assistance and financing of a fuel neutral cooperative advertising program. Provide home performance contractors with resources to market and expand this emerging sector through the use of a successful tool that has worked well in other parts of the state.	x	
Strategy 2.3 Retain and grow the aquaculture and agriculture sectors by providing gap financing and technical assistance for projects that will help them green their operations and distribution channels. Increase the amount of locally grown products sold on Long Island to reduce GHG impacts and create/retain local jobs.	**x**	
Goal 3 Support a green innovation economy and local jobs through green business designations and marketing.		
Strategy 3.1 Provide technical and financial assistance to businesses to green their operations, secure a third party green business designation, and provide marketing support.	x	
Goal 4 Promote high-value jobs through green workforce development.		
Strategy 4.1 Support green training of the new and incumbent workforce to grow opportunities for local jobs.	x	
Strategy 4.2 Maintain and grow the network between educational institutions, workforce investment boards, students, employers and labor organizations.	x	
Goal 5 Advance Superstorm Sandy recovery and rebuilding to manage future economic risks.		
Strategy 5.1 Provide incentives for rebuilding greener and more resilient developments in areas impacted by the storm surge or encourage relocation locally outside the floodplain and develop and implement strategies for enhancing resilience and more rapid restoration of the electric grid.	x	x

Energy

Obstacles Energy use on Long Island is burdened by very high energy rates and the region has somewhat limited access to more cost-effective natural gas and other non-fossil renewably-sourced alternatives. Long Islanders live very energy-intensive lifestyles. The majority of the Island's housing stock was built prior to the 1970s and the implementation of more strict energy efficiency construction codes. Long Island has a higher-than-average percentage of single-family homes, which tend to use more energy than other dwelling types, and homes built more recently tend to be larger. Until recently, energy efficiency has not been a high priority for most builders or homebuyers. As a result, residential energy use is the single largest contributor to the region's greenhouse gas emissions.

The pattern of auto-dependent, suburban sprawl was first established on Long Island. On-road vehicles are the number-two contributor to Long Island's carbon footprint. The infrastructure created over decades to serve car-centered development cannot be changed easily or quickly to greatly increase transit availability and reduce dependence on individual vehicles. Transitioning to a cleaner vehicle fleet could be more effective in reducing emissions in the short-to-medium term.

Table 2 Energy Goals and Strategies (continued on next page)

	Align w/ LIREDC Goals	Adapt to Climate Change
Goal 1 Improve energy efficiency of existing residential building stock.		
Strategy 1.1 Require Energy Performance Certificates at point of sale or rental.		x
Strategy 1.2 Continue to develop, evolve, and expand outreach and education campaigns to promote energy efficiency and renewable programs and basic energy efficient behaviors (such as use of a comparative billing software).	x	x
Goal 2 Improve energy efficiency of existing commercial building stock.		
Strategy 2.1 Require annual energy benchmarking for all non-residential buildings over 25,000 sq ft (approximately 3,500 existing buildings).		x
Strategy 2.2 Require energy audits every 5 years for all non-residential buildings over 25,000 sq ft (approximately 3,500 buildings).		x
Strategy 2.3 Encourage use of energy alignment clause in leases.		x
Strategy 2.4 Encourage energy conservation education for building owners, property managers and real estate community.	x	x
Goal 3 Improve energy efficiency of new building stock.		
Strategy 3.1 Promote adoption of more stringent local Energy Efficiency Construction Code by municipalities. (Home Energy Rating System for residential, International Green Construction Code for commercial).	x	x
Strategy 3.2 Provide incentives (such as property tax waivers) for new homes that meet the Passive House standard.		x
Strategy 3.3 Provide enhanced sustainable and energy conservation training of design professionals.	x	x
Goal 4 Double local renewable energy generation by 2020.		
Strategy 4.1 Develop and encourage municipal adoption of "Solar ready" code requirements for new construction so that retrofitting photovoltaic or solar hot water is structurally easy and cost-effective.	x	x
Strategy 4.2 Call for municipalities to require a feasibility study of renewables and/or combined heat and power for new commercial development over 25,000 sq ft with the installation of a minimum 30% of electric demand (or equivalent) through renewables.	x	x
Strategy 4.3 Standardize permit process for renewable energy commercial projects.	x	x
Strategy 4.4 Encourage geothermal heat pump projects through education and incentives. Develop an incentive program for replacing fuel oil boilers with natural gas or ground source heat pumps (where no gas supply available) that leverages or enhances existing LIPA rebates.	x	x
Strategy 4.5 Develop a series of regular conferences on adoption of renewable energy on Long Island.		x

Long Island's wind resource is not particularly impressive on-shore, and due to population density, there is a lack of areas that are appropriate for wind power development on the Island.

Opportunities As Long Islanders pay a higher rate for electricity than most of the nation, the "green premium" for renewable energy and energy efficiency investments is reduced and provides a more competitive environment for their adoption.

As Long Island approaches "build out," improving the performance of the older housing and building stock in the region presents greater opportunities for energy savings and GHG reductions than new construction. Energy efficiency and significant reductions in GHG emissions could be achieved through integrated, comprehensive programs to educate homeowners and landlords about the benefits of energy performance upgrades, provide useful information about energy performance to home buyers and tenants, promote market transformation, increase awareness of and support for incentives and rebates, and expand financing options to pay for improvements.

Although adopting more stringent energy efficiency construction codes does not have the same short-term, direct GHG reduction potential as improving efficiency in existing buildings, it does provide a number of benefits. In addition to creating highly efficient new building stock, it develops markets for efficient products, introduces new construction practices and materials to the region, and familiarizes the trade with best practices.

Forty-nine percent of Nassau and Suffolk Counties' housing uses oil heat. Large-scale conversion to natural gas and geothermal heat pumps could have a tremendous impact on emissions of both GHG and other pollutants that impact local air quality. However, these options can be expensive, especially in areas not already served by natural gas.

Long Island has a slightly better solar resource than some other regions of New York State and there are significant opportunities on Long Island to continue to expand the adoption of solar energy. The LIPA Solar Pioneer program has spurred the growth of a well-trained, growing solar installation industry. The newly approved (Oct. 2012) program for solar leasing makes solar PV more attractive for customers who cannot afford the initial purchase price of a system and provides significant opportunities to grow the solar market. In addition, the Atlantic Ocean offers significant opportunities for offshore wind power-development.

Table 2 Energy Goals and Strategies (continued from previous page)

	Align w/ LIREDC Goals	Adapt to Climate Change
Goal 5 Lead by example and improve energy efficiency of municipal buildings, fleets and other operations (20% by 2020).		
Strategy 5.1 Promote and implement energy efficiency improvements in municipal facilities, including street lighting, traffic lights, parking lot and park lighting and wastewater facilities.	x	x
Strategy 5.2 Promote and implement energy efficiency improvements across LI school buildings through cost-effective, shared services for audits and retrofits.		x
Goal 6 Increase market penetration of electric, plug-in hybrid, and other low-carbon alternative fuel vehicles (30% by 2020).		
Strategy 6.1 Expand and develop electric vehicle charging and mapping infrastructure and enhance grid services to allow widespread charging capacity for electric vehicles.	x	x
Strategy 6.2 Create and promote incentives for electric vehicles and alternative fuel vehicles both for private sector and for municipal fleets.	x	x
Goal 7 Encourage innovation and adoption of 21st century technologies that increase the capabilities of the electric grid.		
Strategy 7.1 Encourage research and pilot programs to advance smart grid technologies, controls and improved renewable energy forecasting that can enhance the security and integrity of smart grid infrastructure.	x	x
Strategy 7.2 Support efforts to increase the efficiency, reliability, and resilience of the grid (transmission and distribution), including its capacity for self-monitoring and self-repair, and adapt to the challenges presented by the addition of electric vehicles as a new energy demand on the grid.	x	x

Transportation

Obstacles A lack of viable transportation alternatives has led to more than 75% of Long Island commuters relying on single occupancy vehicles for their commute. This has led to heavily congested roadways and it also contributes to Long Island's GHG emissions profile, of which transportation accounts for 30%. Lack of complete streets and pedestrian/bike friendly commercial areas discourages alternative transportation locally. Historically, there has been a lack of capital funding available for transportation and transit projects. Lack of alternative fuel infrastructure fosters dependence on high carbon intensity fuels.

Opportunities Existing transit services include local bus service and regional train service, which already serves thousands of riders daily. Efforts to reduce single occupancy vehicle ridership and increase transit participation can be low cost, such as improving alignment of schedules among multi-modal transit connections. Other relatively low cost measures include transportation demand management (TDM) efforts led by employers which can expand participation in existing programs (i.e. commuter tax benefit and carpooling) to incentivize behavior changes that promote more cost-efficient commuting. Enhancing existing transit services to better serve intra-Island commuting, including north-south connections, will help create viable alternatives to single occupancy vehicle commuting. Expanding support infrastructure for rail will help attract freight service on Long Island, which would help remove long-haul truck traffic on Island highways. Multi-municipality coordination in planning for an alternative fuel infrastructure network can promote shared cost savings associated with region-wide network planning as opposed to independent actions led by each municipality. Promotion of complete streets design standards by each municipality can ensure roadway repairs incrementally account for pedestrian friendly improvements.

Table 3 Transportation Goal and Strategies

	Align w/ LIREDC Goals	Adapt to Climate Change
Goal 1 Improve transportation options for all Long Islanders: reduce Long Island's vehicle miles traveled, fuel consumption and GHG emissions.		
Strategy 1.1 Expand and improve public transportation across the Island (rail and bus).	x	
Strategy 1.2 Increase the number of Long Island employers providing incentives/services to employees for VMT reduction.	x	
Strategy 1.3 Improve safety of streets for pedestrians and cyclists through implementation of Complete Streets, signal optimization, and a comprehensive bike plan.	x	x
Strategy 1.4 Increase the number of alternative fuel vehicles on Long Island by targeting municipal and private fleets and buses.		x
Strategy 1.5 Reduce long-haul truck traffic through improvements to rail freight system.	x	x

Table 4 Land Use & Livable Communities Goal and Strategies

	Align w/ LIREDC Goals	Adapt to Climate Change
Goal 1 Increase the number of communities with reduced auto dependence and increased livability on Long Island.		
Strategy 1.1 Increase mixed-use developments in Long Island downtowns and near LIRR stations by 100%.	x	x
Goal 2 Increase the amount of natural resources and protected open space on Long Island.		
Strategy 2.1 Permanently protect 10% of the Island's most critical unprotected open space and farmland.	x	x
Strategy 2.2 Preserve 10% of unprotected open space along the coasts to serve as a storm-resilient buffer.	x	x
Strategy 2.3 Restore the tree canopy on Long Island to pre-Superstorm Sandy conditions.		x
Goal 3 Increase the resiliency of coastal development.		
Strategy 3.1 Utilize best practices for the redevelopment of neighborhoods in coastal areas to become more resilient.	x	x

Land Use and Livable Communities

Obstacles Historically, Long Island developed around its extensive rail network, with compact transit-oriented communities centered on a local rail station and a vibrant downtown. From the 1950s through the 1980s, development in Nassau County and western Suffolk County was more sprawling and suburban in nature, which has contributed to the consumption of unprotected open space, traffic congestion, long driving distances and car dependence. This growth pattern has also limited opportunities for more focused, compact housing that consumes less land and enables mixed-use and transit-oriented communities that can promote a high quality of life. Communities are actively planning and implementing downtown revitalization projects, but lack sufficient resources to provide public amenities, such as complete streets and streetscaping features, comprehensive parking, and design guidelines that preserve local character. Furthermore, lack of sewer coverage limits a community's ability to redevelop downtowns in a traditional, compact way. The amount of public open space is low and land acquisition costs, particularly for coastal parcels, which can serve as storm buffers and flood protection,require significant funding for further conservation. The tree canopy has been diminished by limb losses due to Superstorm Sandy and tree cutting by residents after the storm. Increasing resiliency of coastal areas will help protect residents from future losses. Long Island communities are committed to self-governance and the "home rule" system but many lack the resources to address their local environment, energy and sustainability needs.

Opportunities Increasingly, Long Islanders have been embracing the idea of focusing redevelopment in existing downtowns. Promotion of growth in these already developed areas will support a reduction of GHG emissions, through more efficient housing and by reducing the distance people have to go for basic services. It also offers more diverse transportation options such as walking, biking and transit. By adopting guidelines for form, parking, and streetscaping, towns can ensure new development preserves local character. Additional open space will provide more opportunities for outdoor recreation closer to home and, in coastal areas, it will also provide protection from flooding during future storms.

Waste Management

Obstacles Long Island is burdened with above-average waste generation rates and high costs due to the need

Table 5 Waste Management Goals and Strategies

	Align w/ LIREDC Goals	Adapt to Climate Change
Goal 1 Reduce the amount of municipal solid waste generated.		
Strategy 1.1 Promote public procurement policies that allow elimination of waste at source.		
Strategy 1.2 Develop regionally-shared education programs and waste audits to promote waste reduction opportunities in residences, government offices, schools and large institutions.		
Strategy 1.3 Expand pilot testing "Pay As You Throw / Save Money and Reduce Trash" programs to evaluate impact of cost incentives and provide lessons learned.		
Goal 2 Develop localized facilities to the reduce volume of organics transported to landfills and increase energy capture.		
Strategy 2.1 Expand New York State pilot program to test viability of food waste to biogas on Long Island.	x	x
Strategy 2.2 Create new and/or expand existing yard waste compost facilities to serve most municipality and commercial needs.		
Goal 3 Increase the amount of locally recycled non-organics.		
Strategy 3.1 Initiate market feasibility assessment for regional facility/ies to expand capacity to recycle plastics waste.	x	
Goal 4 Promote energy efficiency throughout waste management processes and systems.		
Strategy 4.1 Expand efficient management of municipal and private municipal solid waste fleets to include biodiesel and compressed natural gas vehicles.	x	x
Strategy 4.2 Initiate cross-municipality and operator discussion on upgrades to incinerator facilities that would optimize energy capture from waste.	x	x

to export waste for disposal off-island. Long Island also has low rates for recycling. There has been resistance to new waste management approaches by the traditional waste hauling industry due to the threat of reduced waste stream revenue. There has been limited dialogue and engagement of municipal leadership on region- or island-wide initiatives and localities have tended to promote actions that are easily implemented and proven to work well. It is challenging to advance new technologies as there is a common perception that "green" costs more and is less effective than traditional practices.

Opportunities Convening a municipal sustainable waste management workshop can initiate a regionally-based dialogue about best practices and the benefits of centralized facilities for composting and recycling. Municipalities can demonstrate and educate commercial and residential users about green procurement products that are cost-effective and meet or exceed traditional performance standards.

Water Management

Obstacles Long Island has an abundant and inexpensive water supply from the aquifer underlying the island. However, the aquifer is threatened by contamination and over-pumping. Water service is provided by numerous, independent districts which can be challenging to align around common best practices. However, only a portion of water service is provided by water entities and many residents rely on private wells. Much of the region is serviced by septic systems and lacks strategic planning and sewer system upgrade investment. The cost of implementing water monitoring, aquifer management and providing incentives for more efficient technology would be significant.

Opportunities While alignment of stakeholders is challenging, it would significantly strengthen the region's water resource management. Exploration of water service pricing is likely to reveal efficiencies in pricing and low cost opportunities for water system investments. The next generation of water users can be engaged through school water resource curriculum to promote strong stewardship of the limited water supply. Green infrastructure, native plantings and other water-saving best practices can reduce costs, maintain landscapes and ensure a sustainable water supply.

Governance and Implementation

The CGLI Plan addresses governance issues within the chapter for each subject area. In general, the planning process has served to enhance regional cooperation

Table 6 Water Management Goals and Strategies

	Align w/ LIREDC Goals	Adapt to Climate Change
Goal 1 Work together to preserve the region's sole source aquifer and maintain it in a sustainable way.		
Strategy 1.1 Develop a regional entity to coordinate management of the aquifer system.	x	x
Strategy 1.2 Continue water monitoring by the U.S. Geological Survey in Suffolk County and obtain funding to re-establish monitoring in Nassau County.	x	
Strategy 1.3 Provide educational program about the aquifer to Fourth Grade students.		
Strategy 1.4 Curb pesticide usage.	x	x
Goal 2 Reduce water consumption.		
Strategy 2.1 Reduce potable water consumption due to excessive irrigation.	x	x
Strategy 2.2 Show water use trends on water bills.		
Strategy 2.3 Conduct a rate study to provide more uniform water rates across the region that are commensurate with the environmental cost of the resource.		
Goal 3 Increase wastewater pollution control.		
Strategy 3.1 Conduct a feasibility study to convert septic systems in priority areas to cluster treatment facilities with better treatment capabilities.	x	x
Strategy 3.2 Incentivize the replacement or retrofit of failing septic systems.	x	x
Goal 4 Control flooding and surface water pollution from stormwater runoff.		
Strategy 4.1 Increase the development of green infrastructure in the public and private realms.	x	x

through the development of far- reaching sustainability goals and implementation strategies. Communities are welcome to adopt strategies within this plan (i.e. participation in Climate Smart Communities). In order to facilitate participation in Cleaner Greener Communities funding, the Consortium will convene workshops to provide education and outreach to prospective applicants and to help facilitate the process for the LIREDC.

Obstacles Long Island's population of 2.8 million residents is governed by many overlapping units of local government. The region has more than 700 units of general or special purpose local governments including 2 counties, 2 cities, 13 towns, and 97 incorporated villages, as well as many special taxing districts that provide water, sewer, sanitation, parks, fire protection and other services to residents. Education and related services are provided through 127 school districts, 110 library districts, and 3 Boards of Cooperative Education Service (BOCES) districts.

Long Islanders value and consistently support New York's local 'home rule' system that addresses their needs through accessible government. Each local government is challenged to address environmental, energy and sustainability services during a period of high property taxes, weak revenue, and high local unemployment.

Opportunities Long Island has already undertaken or is currently engaged in significant regional sustainability planning initiatives that provide models for further regional approaches. These include the Sustainable Strategies for Long Island 2035 Plan and the Comprehensive Economic Development Strategy (CEDS) developed by the LIRPC, the Long Island Carbon Footprint Project developed by ICLEI, the Long Island Power Authority Plan, the LIREDC's Strategic Economic Development Plan, and the New York-Connecticut Sustainable Communities Initiative.[5]

5 Regional Plan Association is leading this metropolitan effort. Nassau and Suffolk Counties, the LIRPC, and Vision Long Island are participating on behalf of the Long Island region.

Municipalities on Long Island have been working cooperatively to address their needs through consensus based planning and implementation. The Long Island Green Homes Consortium (LIGH) was established to facilitate energy efficiency programs on Long Island and to bring to scale residential home efficiency improvements throughout Long Island.[6] Many of the towns participating in the LIGH Consortium also took the Climate Smart Communities pledge.

LIGH joined with the Clean Energy Leadership Task Force[7] and the Smart Growth Working Group[8] to develop the application for NYSERDA's Cleaner, Greener Sustainable Communities Grant. Under the CGLI Plan process, the Consortium has grown to include most of the towns, the cities and other municipalities along with non- governmental organizations and businesses.

Local government and public participation in state and regional planning and funding initiatives are important to Long Island communities. The CGLI Plan effort has served as a model for incorporating local input into larger regional decision-making. This model could be replicated for public participation for other state and regional planning efforts.

Adaptation to Climate Change

Superstorm Sandy and other extreme weather events in the past make it clear that Long Islanders must take action to reduce risks, make better plans for rapid recovery and en-

6 LIGH participates in providing marketing and outreach for NYSERDA's energy efficiency programs administered through the Green Jobs/ Green New York Act (GJGNY) of 2009.

7 Clean Energy Leadership Task Force serves as a forum for Long Island municipalities to learn and share information about energy efficiency and renewable energy projects and policies.

8 The Smart Growth Working Group includes municipal, civic and business organizations working collaboratively to advance sustainable development of growth centers on Long Island.

Table 7 Governance and Implementation Goal and Strategies

	Align w/ LIREDC Goals	Adapt to Climate Change
Goal 1 Promote regional coordination of sustainability planning and implementation.		
Strategy 1.1 Support the continuation and expansion of the Long Island Green Homes Consortium in sustainability education, outreach and planning.	x	x
Strategy 1.2 Facilitate plan implementation by coordinating public engagement, outreach and workshops on behalf of NYSERDA and the LILIREDC for prospective CFA funding applicants. Participation would include a wide group of stakeholders including local governments, businesses and organizations.	x	
Strategy 1.3 Increase the number of Climate Smart Communities and certified Climate Smart Communities.	x	x

sure that all capital and operational investments combine to improve life/safety outcomes and reduce harm in the future. The CGCLI Plan provides the basis for communities to develop plans to take actions that address energy, land use, transportation and other regional systems in an integrated manner, promoting a more resilient and sustainable future, thus ensuring that scarce resources are invested as prudently as possible.

Changes in climate patterns as the cause of extreme weather events is well-recognized by the NYS Legislature and the Office of the Governor. Under NYSERDA and other organizations, ongoing research is documenting the patterns of change and projecting the likely impacts expected across a broad array of economic, social and environmental activities. Much work is also being done by NYS to identify steps to reduce climate related risks, providing a great resource for Long Island. Although there are variations in the predictions for Climate Change on Long Island, it is generally understood that it will include more frequent and intense storms. The island will have an increased risk of storm surges and coastal flooding that is compounded by sea level rise of 15 to 30 inches by 2050.

Anticipated Impacts of Climate Change The impacts of climate change are likely to be far- reaching. As so clearly demonstrated by Superstorm Sandy's landfall in November 2012, low-lying transit systems, roadways and bridges near the coast are at risk of flooding from storm surge and heavy rainfall events. Higher temperatures, particularly during heat waves will increase energy demand for air conditioning. This could lead to an overloading of the electricity grid and frequent outages. Heavier downpours in built-up areas could cause flash flooding if stormwater systems are overwhelmed, resulting in polluted runoff into rivers and the sea affecting water quality and local ecosystems. Waste water treatment plants could also become inundated through sea level rise and extreme rain events, further worsening local pollution.

Gradually over time, sea level rise may become a dominant stressor on vulnerable salt marshes, which provide a critical adaptation role in floodwater absorption and nutrient cleansing as well as providing valuable habitat for flora and fauna. Sea-level rise may also contribute to erosion of barrier islands and sand formations which currently protect coastal beaches, dunes and wetlands from direct wave and storm impacts. Across the region, the impacts of climate change will affect diverse population groups differently, with the very young, very old and those on lower incomes tending to be particularly vulnerable. Vulnerability to these impacts and capacity to adapt are uneven across the region and it will require detailed analysis to understand what and who are most at risk.

Policies and practices are being developed that Long Island can draw on as the region addresses Climate Adaptation planning. These include "non-structural" strategies, such as NYS's guidance to enhance resilience, on-going insurance and property risk re-evaluations, FEMA's revision of flood maps and coastal resilience mapping, and the update of municipal comprehensive plans and land use regulations.

Table 8 Summary of Climate Variables

Extreme event	baseline	2020s	2050s	2080s
Temperature				
Number of days per year with maximum temp exceeding 90°F	19	20 to 42	24 to 58	31 to 80
Number of days per year with maximum temp exceeding 95°F	4	4 to 15	6to 28	9 to 47
Number of heat waves /year	2	4 to 15	3 to 7	4 to 9
Average duration of heat waves	4	4 to 5	5 to 6	5 to 8
Number of days per year with min. temp. at or below 32°F	72	48 to 66	31 to 56	22 to 56
Precipitation				
	47"	0 to +5%	0 to +10%	+5-10%
No. of days per year with rainfall exceeding 1"	14	11to 16	11 to16	11 to 17
No of days per year with rainfall exceeding 2"	3	2 to 5	3 to 5	2 to 5
Sea level rise				
Sea level rise	N/A	2 to 5 in	7 to 12 in	12 to 23 in
Sea level rise with rapid ice-melt scenario	N/A	5 to 10 in	19 to 29 in	41 to 55 in

Source: Rosenzweig, C., W. Solecki, A. DeGaetano, M. O'Grady, S. Hassol, P. Grabhorn (Eds.). Responding to Climate Change in New York State: The ClimAID Integrated Assessment for Effective Climate Change Adaptation. Technical Report 11-18. NYSERDA. 2011.

"Structural" practices include shoreline and infrastructure protection, the re-evaluation of rebuilding and renovation, and the emerging energy-efficient building market.

Adaptation to climate change must be cross-cutting; adaptation strategies will need to address and be integrated within each of the subject areas selected for this study. There are ongoing efforts in adaptation at the federal, state, and regional level. The summary list of goals and strategies in the Executive Summary indicate those strategies with direct co-benefits for adaptation. The chapter on climate adaptation includes strategies for adaptation to higher temperature; flooding, storm surge and sea level rise conditions; and infrastructure protection as well as plans to direct areas for inundation during storm events.

How to Use this Report

The CGLI Plan is non-binding guidance that has been developed to create a framework to pursue regionally-based solutions to more effectively face the challenges confronting our communities' in the 21st Century. The Plan is intended to serve as a common point of reference for local governments, non-governmental organizations, businesses and residents. It includes initiatives for implementation, objectives and performance targets, as well as a wealth of baseline information (in the appendices) that can be incorporated into comprehensive plans, management plans, zoning, and other planning and strategy initiatives.

The Plan is intended to serve inter-municipality dialogue and decision-making in the pursuit of integrated solutions to such large scale issues as water management, economic development, the environment, and others that transcend individual municipalities and are essential to a more sustainable future.

2 Methodology & Stakeholder Engagement

The CGLI Plan provides guidance to Long Island municipalities on developing policies, plans and programs that offer integrated, sustainable solutions to improve the quality of life on Long Island. It represents a collaborative undertaking of municipal representatives, public, non-profit, and private experts across a wide range of fields, and citizen volunteers to articulate a community-based vision for a more sustainable future. The following is an overview of the planning process undertaken to develop the plan and the stakeholder engagement process employed to ensure community representation.

Key to understanding the structure of the CGLI Plan is the decision by the Consortium to focus on the following subject areas that are represented throughout each phase of work:

- Economic development and workforce housing
- Energy
- Transportation
- Land use and livable communities
- Waste management
- Water management
- Governance and Implementation

Planning Process

The planning process shown in Figure 4 was employed to develop the CGLI Plan was based on the process outlined by NYSERDA for the Cleaner Greener Communities program and included the following:

Baseline Assessment

A baseline assessment was prepared for each subject area including:

1. Identification of existing procedures, policy and projects within each subject area;
2. Preparation of Tier II Greenhouse Gas (GHG) Inventory to determine current levels of emission (prepared by New York Institute of Technology and referenced in this plan);
3. The projection of 2020 GHG Emissions based on a Business as Usual (BAU) scenario (see Chapter 3); and
4. The selection of sustainability indicators.

The baseline assessment materials are contained in the report appendix.

Sustainability Indicator Selection

Indicators provide a means to measure and track the region's progress in achieving its sustainability goals. The existing condition or status of the indicator at base year was calculated (hereinafter baseline calculations) to provide the baseline from which to measure the progress that may be achieved by implementation of the strategies recommended in this plan. The Sustainability Indicators Inventory Memo, listing the sustainability indicators selected for the CGLI Plan and a summary of the baseline calculations, is included in the report appendix.

Target Assessment

Long-term and short-term targets that reflect the goals of the community were established for each sustainability indicator. The targets are a feasible and reasonable estimate of progress that can be achieved by 2020, assuming implementation of proposed strategies.

Sustainability Goals Refinement

The goals are statements which reflect the region's sustainability aspirations across each subject area of the plan. The goals emerged from stakeholder engagement, build upon a synthesis of previous plans drawn from municipalities and regional entities across Long Island, and reflect the local aims to achieve GHG emissions reduction, job creation,

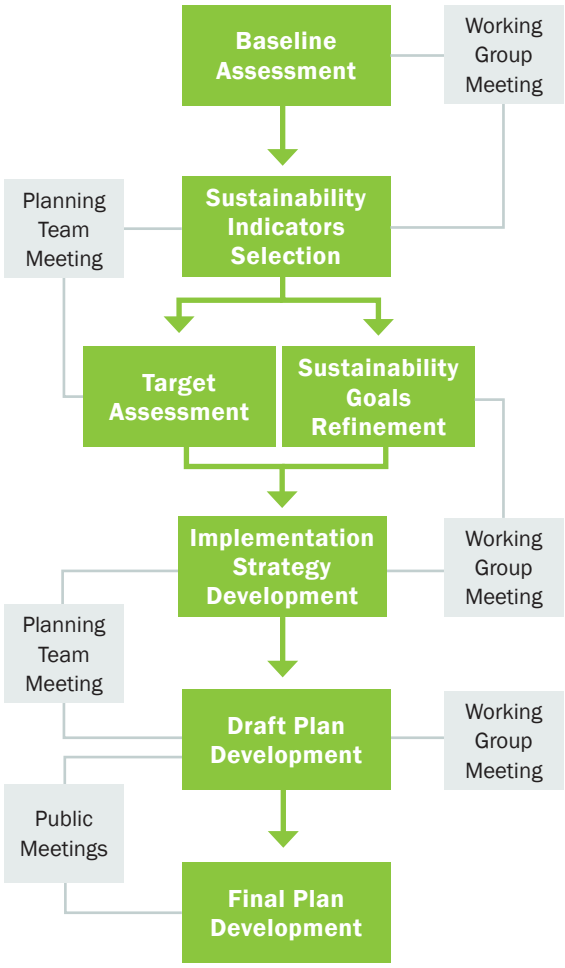


Figure 4 **Planning Process Diagram**

and other selection criteria and sustainability targets identified through the process. The sustainability goals are addressed in the context of each strategy in the subject area chapters.

Implementation Strategy Development

The implementation strategies recommended in the plan demonstrate broad mechanisms to achieve the goals and the related targets established during the planning process. They were developed by the Working Groups with the aid of an evaluation matrix, a tool developed to assess each strategy's capacity to address the primary goals and objectives. Strategies are designed to support improved performance of indicators.

Plan Report Development

The CGLI Plan Report is a compilation of the work that was prepared during the planning process and provides further definition of sustainability goals and recommended strategies. It includes guidance for municipalities, institutions and other key stakeholders about steps needed to implement the strategies.

Cleaner Greener Long Island Organization

The Cleaner Greener Consortium of Long Island has engaged in a robust and inclusive planning methodology that builds upon the substantive body of existing plans and policies. A four-tiered project organization structure was established to administer and produce the CGLI Plan process:

- **Cleaner Greener Consortium of Long Island (Consortium),** representing the participating municipalities, was formed to provide direction, review, and approval at each phase of work.
- **Long Island Regional Economic Development Council (LI REDC),** was a stakeholder with representation throughout the planning process. LI REDC working groups were briefed on the draft plan in preparation for presentation and discussion at their April 9, 2013 meeting.
- **Planning Team,** including representatives of the municipalities in the Consortium as well as partnering organizations, was establishing to review and approve all project deliverables.
- **Steering Committee,** comprised of the lead Consortium municipality, local non-governmental organizations, and the planning and technical consultants, was formed to serve as the steering body for the larger planning partners and for day-to-day administration and production. Members of the steering committee also served as Captains and technical leaders to work with the Subject Area Working Groups.
- **Subject Area Working Groups,** comprised of local stakeholders and technical experts, representing local municipalities, communities, environmental and business groups, were engaged throughout the process to support the development of each phase of work.

Planning Team and Working Group Process

The eight-month planning period commenced in July 2012 with a Consortium coordination meeting and the planning team began work in September. Key meetings, held at Molloy College in Farmingdale, NY to provide a central-island location, included:

- **Project Kick-Off and Working Group Meeting (September 2012),** to introduce the project partners and to present an overview of the process to the Planning Team and the Working Groups. In breakout groups by subject area, discussion was initiated on

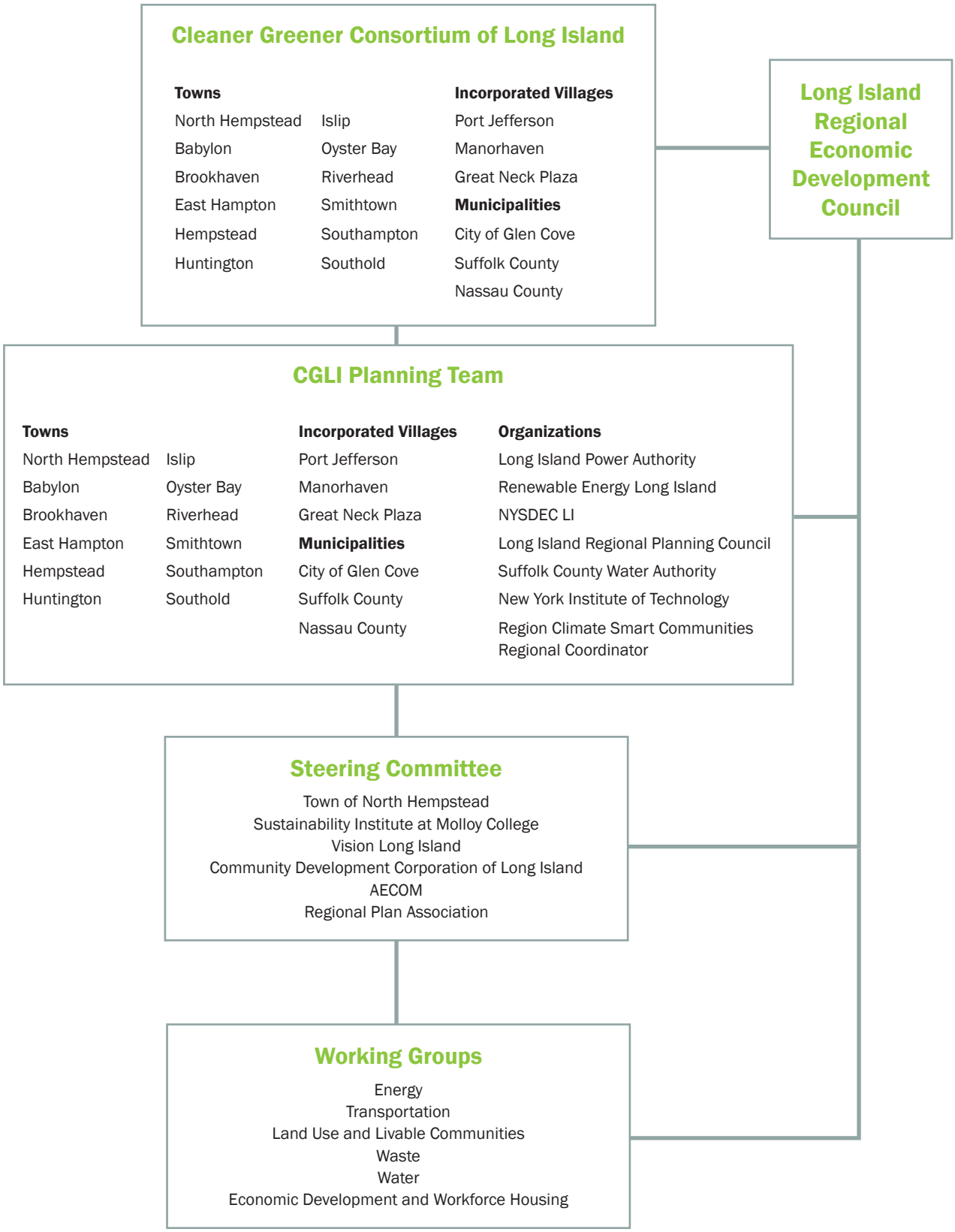


Figure 5 Cleaner Greener Long Island Project Organization
See acknowledgements for further information on project participants.

issues and goals, sustainability indicators that reflect the goals, and ideas for programs and projects. The group discussions and the follow up comments that were received after the meeting provided the initial framework for identification and prioritization of the implementation strategies.

- **Planning Team Meeting (December 2012),** to review the sustainability indicators selected by the Working Groups for each subject area and the strategy selection criteria that had been developed to evaluate and prioritize the strategies.
- **Working Group Workshop (January 2013)** to initiate brainstorming about implementation strategies for each subject area to advance the goals and ambitions reflected in the selection of sustainability indicators.
- **Planning Team Meeting (February 2013),** to review the regional vision statement, the sustainability goals, and prioritization of the list of implementation strategies that had been developed with the Working Groups.
- **Working Group Workshop (March 2013),** to refine the implementation strategies and targets for performance. The working groups came together in one meeting so that the strategies could be viewed and discussed in entirety.

Municipal and Public Outreach and Engagement

Vision Island and the Sustainability Institute at Molloy College conducted stakeholder engagement for the plan. Stakeholder engagement included outreach through the Long Island Smart Growth Working Group,[1] Long Island Clean Energy Leadership Taskforce,[2] and the Long Island Green Homes Consortium.[3] Vision Long Island and the Sustainability Institute held individual meetings with Town Supervisors, Councilmembers, and the Suffolk County Supervisors Association with the Towns of Babylon, Brookhaven, East Hampton, Huntington, Islip, North Hempstead, Riverhead, Smithtown, and Southampton. Municipalities had staff participation on both the Planning Team and the Working Groups. The plan has overall island-wide support but not all strategies are supported by each individual municipality. (See appendix for Public Engagement Summary, meeting notes documenting public input, and a list of stakeholders.)

Public engagement included meetings with over a dozen business organizations, twenty civic associations, 10 environmental groups and other organizations. Engagement through the LIGH Consortium was ongoing throughout the planning process. Further outreach was provided by AARP, business groups, and environmental organizations.

The CGLI Plan was presented at a panel discussion at the LI 2012 Smart Growth Summit[4] and at the Clean Energy Small Business Incubator at Stony Brook University.

In order to invite the large and broadly dispersed population into the planning dialogue, e-mail invitations were distributed to over 30,000 Long Islanders through direct solicitation. Electronic and social media efforts involved the Vision Long Island website, updates on Facebook pages, Twitter and Smartphone apps. Press coverage for this process included articles in Newsday, the Patch, LI Business News, the Corridor and an Editorial in Newsday.

Public Meetings

The draft of the CGLI Plan was presented at public meetings held March 4-11, 2013, to provide further review and comment and to ensure the plan represents the goals of Long Island.

In order to ensure representation of all communities and to generate input for each subject area at these meetings, invitations were sent to a comprehensive list of community groups, elected officials, and businesses. Public meetings were conducted in three locations across Long Island: Nassau County, Western Suffolk County, and Eastern Suffolk County. Central locations in each area were selected to allow for maximum attendance with minimal travel. At each meeting the consultant team presented the strategies, goals, and indicators to the participants then opened the meeting to public comments (see public participation summary and meeting minutes in Appendix.)

1 The Smart Growth Working group, with a membership of over 300, includes representation from municipal, civic and business organizations working collaboratively to advance sustainable development of growth centers on Long Island. See www.visionlongisland.org

2 Long Island Clean Energy Leadership Task Force, with a membership of over 400, serves as a forum for Long Island municipalities to learn and share about energy efficiency and renewable energy projects and policies. See www. See http://www.molloy.edu/long-island-connections/the-sustainability-institute/program-description

3 LIGH Consortium includes 8 towns, NYSERDA, LIPA, National Grid and NGOs providing energy planning, marketing and outreach for energy efficiency programs on Long Island. See www.longislandgreenhomes.org .

4 The LI 2012 Smart Growth Summit has over 1,000 attendees.

- **March 4th Public Meeting - Nassau County** ("Yes We Can" Community Center, New Cassel) Over 60 people attended the meeting. A general introduction was given by Town of North Hempstead Councilwoman Viviana Russell and other local elected officials.
- **March 5th Public Meeting – Western Suffolk County** (Islip Town Hall West) Approximately 70 people attended the presentation. Due to the size of the attendance, the participations were broken up into groups by subject area after the general presentation.
- **March 11th Public Meeting – Eastern Suffolk County** (Southampton Town Hall) Over 60 people attended the meeting, which began with an introduction by Southampton Supervisor Anna Throne Holst.

Conclusion

The public engagement process conducted for the CGLI Plan has demonstrated that there is broad support for many of the strategies and programmatic, policy and project initiatives that were developed through the representative planning process. The goals and values of the communities are further reflected in the strategies that have been recommended for implementation. The public meetings to preview the CGLI Plan did not warrant significant changes to the draft CGLI Plan.

It was also found that the feedback from the public process is consistent with the many years of community interaction that has taken place to shape the numerous public plans that have been prepared on Long Island. Concerns about long running economic stagnation have been a focus of these plans and the post-Sandy recovery efforts have served to heighten these concerns. Most Long Islanders want to see continued and tangible progress in many of the areas that the CGLI Plan addresses and are already engaged in efforts to move sustainable strategies forward in their community.

3 Greenhouse Gas Emissions

One of the paramount goals of the Cleaner Greener Communities program is to contribute to NYS's goal of reducing GHG emissions. To support that objective, the CGC initiative has included the preparation of a Tier II baseline GHG emissions inventory to establish the basis through which communities can measure the progress and impact of the strategies proposed in the CGLI Plan on the reduction of GHG emissions. The Tier II GHG inventories follow a protocol developed for the CGC program using 2010 emissions data, thereby allowing for comprehensive and comparable emissions results among the NY economic development regions participating in the initiative.

2010 GHG Emissions on Long Island

New York Institute of Technology (NYIT) was commissioned to prepare a Long Island regional Tier II GHG inventory. (See appendix for summary of the inventory.) As part of the 2010 GHG Inventory, NYIT compared GHG emissions findings to the 2005 baseline year inventory.[1] A review of the findings provides useful context for demonstrating the progress that can be achieved through implementation of emissions reduction strategies. On an overall level, GHG emissions reduced 9.75% from 2005 to 2010 with key reductions including;

- Although vehicle miles travelled increased 2.85% from 2005 to 2010, the use of more efficient vehicles and less polluting fuels contributed to approximately 2.4% less GHG emission in 2010 from on-road vehicles.
- Decreasing GHG emissions in the waste sector (9.69% from 2005 to 2010) are explained in part by reduced volume of waste disposed and increased waste recovery, recycling and reuse.

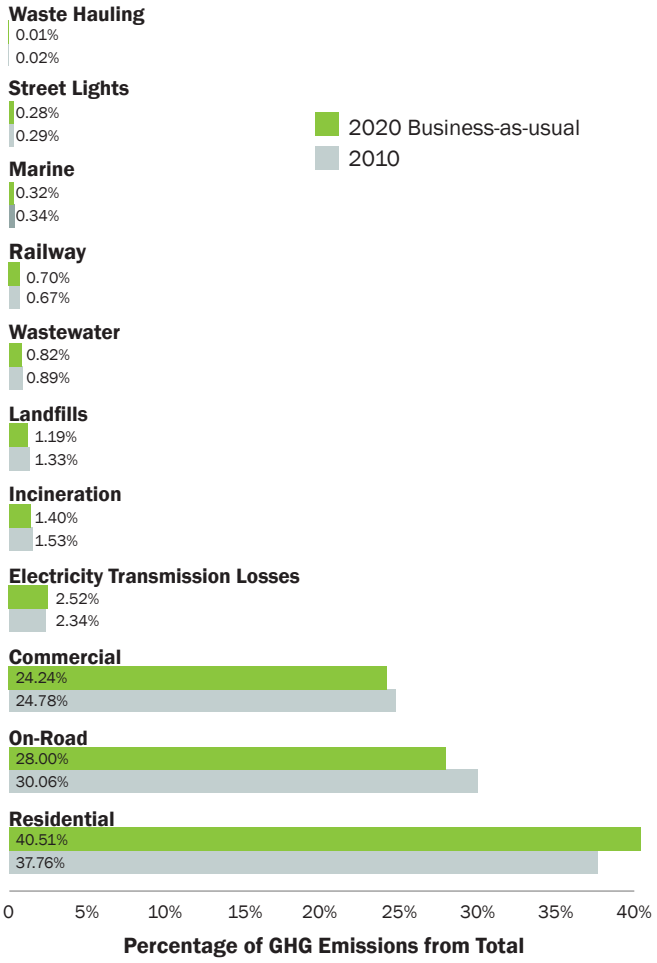


Figure 6 **Long Island GHG Emissions Percentages by Sector**

1 *Long Island Carbon Footprint Project, 2005-2010 Comparison, February 2013. NYIT.*

- Fuel switching from home heating oil to natural gas accounts for GHG decreases in the energy sector as natural gas emits fewer GHGs per unit than home heating oil.
- Implementation of LED streetlights and signal lights led to a 2.3% decrease in GHG emissions from 2005 to 2010.

The 2010 GHG Inventory found that the largest source of GHG emissions on Long Island is the residential sector (Figure 6). Many Long Islanders are affluent, live very energy-intensive lifestyles, and in energy consuming large homes. On-road vehicles are the second largest contributor to Long Island's carbon footprint. The highway infrastructure created over decades to serve the suburban residential and car-centered development will not be changed easily or quickly to lessen the impact of the fossil-fueled automobile. Thus, about 70% of the region's GHG emissions will continue to come from the residential and on-road vehicle sectors. The other significant source of GHG emission is the commercial sector, including office, retail and industrial uses.

The Long Island region's Energy Use Intensity (EUI), the amount of annual energy consumed per person, is currently 193 million British thermal units (mmBtu) per person annually. The New York State average EUI is 192 mmBtu/capita and the US average EUI is 315 mmBtu/capita.[2]

2 *http://www.eia.gov/beta/state/rankings/?sid=US#/series/12*

This better-than-US-average EUI ranking is largely due to the inherent efficiency of dense communities and city/village centers with very good access to public transportation and minimal large industries compared to other regions/states. Most of Long Island is considered suburban, dominated with single family homes. This may be thought of as low density land use and brings to mind the term "sprawl" but in fact, compared to the population density of other suburban areas, Long Island is a highly dense area. The current population density of Nassau County is 4,655 inhabitants per square mile and the current population density of Suffolk County is 1,637 inhabitants per square mile. The current population density of the entire US is 88 inhabitants per square mile. This difference in population density between the Long Island region and the US is a direct correlation to the lower EUI for Long Island than compared to the rest of the country.

2020 Greenhouse Gas Emissions Projections

The 2010 GHG Inventory was used as the baseline to project the amount of emissions that would result under a Business as Usual (BAU) growth scenario in 2020 to compare the degree of reductions in emissions that might be achieved by implementing the strategies proposed in the CGLI Plan. The 2010 activity data was extrapolated to establish emissions projection for the year 2020, represent-

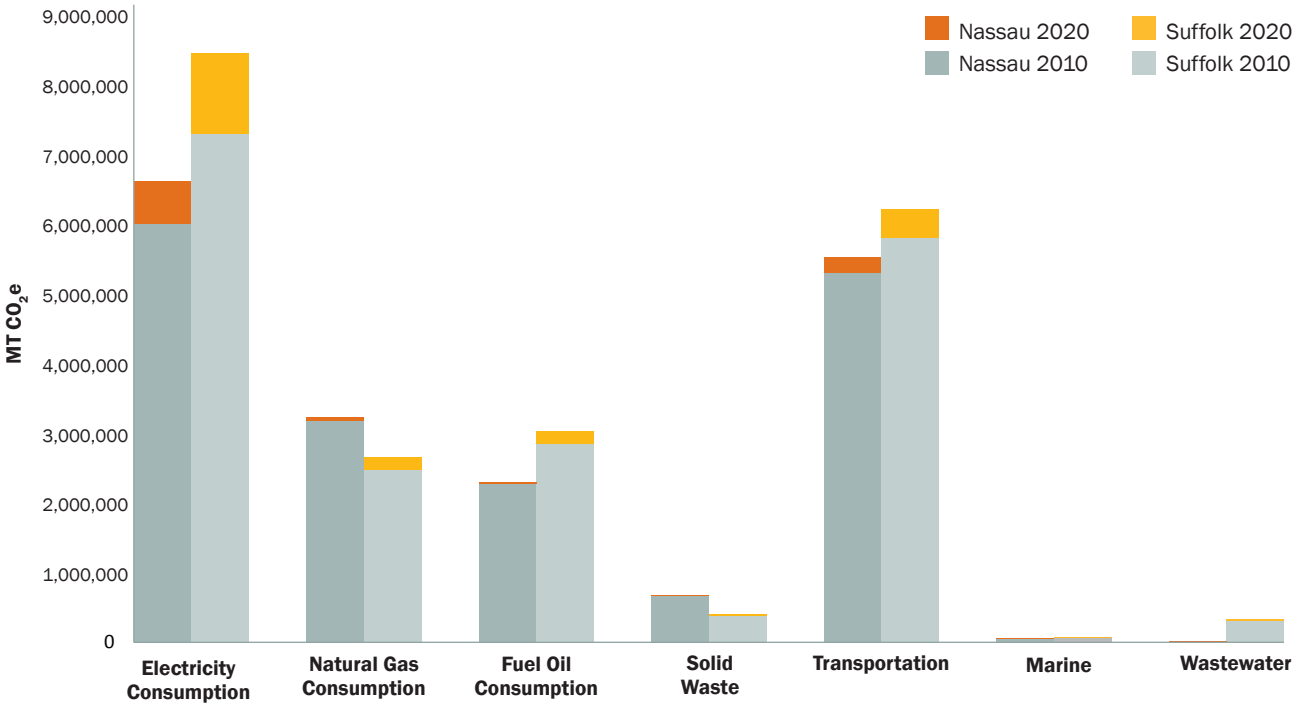


Figure 7 Current (2010) and Projected (2020) LI GHG Emissions

ing the emissions output if current sectoral growth (population, economy, transportation trends) continued at the current estimated growth rates with no intervention (see Appendix).

Overall, the projected growth for BAU 2020 represents an 8% increase in GHG emissions compared to the 2010 Inventory (Figure 6). The largest increase in emissions will be from electricity consumption between residential, commercial, industrial and rail transportation sectors. This is driven by projected increases in population, increases in economic activity on Long Island and increases in Long Island Rail Road ridership. Figure 7 illustrates the current emissions by source and the projected emissions, stacked for both Nassau and Suffolk County.

Methodology

To produce the 2020 GHG emissions projections, forecasted growth rates to 2020 were applied to the 2010 GHG Inventory using growth rate data from the New York Metropolitan Transportation Council (NYMTC) 2035 Regional Transportation Plan and the Long Island Power Authority (LIPA) Electric Resources Plan 2010-2020. Individual growth rates were extracted and applied to the 2010 GHG inventory where appropriate. Applying the growth parameters, data sources and growth rates to the 2010 GHG inventory data created the projections for available sector emissions (see Appendix).

Greenhouse Gas Emissions Reduction Potential

A primary goal of the CGLI Plan is to reduce the rate of increase in GHG emissions that is projected for Long Island under the BAU 2020 scenario. The plan recommends policies, programs, and activities in the subject area chapters that can contribute directly or indirectly toward the reduction of GHG emissions.

The planning and evaluation process has included the use of AECOM's Climate Action Planning (CAP) Toolkit[3] to assess the potential GHG emissions reductions of those strategies that have sufficient specificity and data available for quantification. By calibrating the CAP Toolkit to the Long Island context and updating it with data on existing conditions, GHG emissions, and forecasts, the toolkit has generated:

1. An estimation of the GHG emissions reductions that will be produced by the quantifiable strategies.
2. An estimation of how these quantifiable emissions reductions will impact the BAU 2020 projections.

By example, the CAP Toolkit has quantified the GHG emissions for a proposed transportation strategy promoting transit-oriented development (TOD) (Figure 8). The Land Use and Livable Community strategy 1.1 (see Chapter 8) seeks to increase development around LIRR stations within Long Island downtowns by promoting existing development efforts underway. TODs concentrate residents and commercial activity within walking distance of mass transit stations. Research has shown that TODs can reduce vehicle miles travelled (VMT) by 20% compared to more traditional development patterns. The reduction in VMT produces a

3 The Climate Action Planning (CAP) Toolkit is a decision support model for the development of effective GHG reduction and related sustainable strategies. The CAP Toolkit is calibrated to a locality's specific context and incorporates existing conditions, GHG emissions inventory, and forecast data. This data provides the inputs needed for quantification strategies, resulting in better understanding of the climate and sustainability planning context. Toolkit information is organized in a graphic dashboard format that allows users to select strategies and "game" or test key performance and participation variables to tailor the policy design to fit their technical, socioeconomic, and political context. The testing of assumptions is critical for customizing strategies to fit a community's particular political, economic, and physical context. After customization of the performance and participation assumptions, the Toolkit will quantify energy savings, GHG reduction, and financial performance metrics of the strategies.

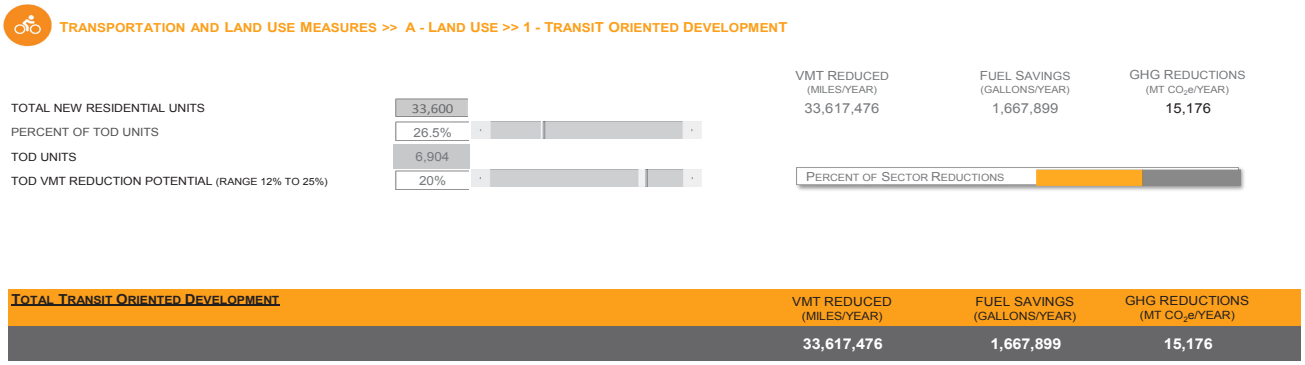


Figure 8 Estimated GHG Emission Reduction Potential from Transit-oriented Development Strategy

reduction in gallons of fuel and a corresponding reduction in GHG emissions. Based on available data of the potential number of TOD units planned on Long Island by 2020, implementation of this strategy could contribute to an estimated reduction of 383,289 VMT per year, which can be converted into GHG reduction savings for 2020.

The contribution each strategy might make toward the reduction in GHG emissions was an important consideration in the prioritization of the strategies that are recommended in the Plan. Those strategies having quantifiable benefits have been assigned a rate of expected participation along with a level of performance or typical savings that it might yield. Strategies with indirect benefits, such as those promoting education and planning activities, do not have outcomes that are quantifiable. Although they contribute to GHG reductions, they are considered supporting and are not included in estimations.

There are several strategies included in the plan that provide more notable levels of direct reductions in GHG emissions that are highlighted in Table 9. While they are primarily energy strategies, due to the direct relation to CO2, there are several other subject area strategies with quantifiable benefits. The strategies are described further detail in the subject area chapters 5 though 10.

In addition to the reduction potential of individual strategies, the cumulative reduction that could be achieved through the combination of the proposed CGLI Plan strategies and federal and state programs currently underway was also developed. Contributing federal and state measures include:

- **CAFE (Corporate Average Fuel Economy),** which assumes an average fuel economy standard of 35.5 miles per US gallon by 2016, yielding a reduction of 2,851,654 MT CO_2e/year.
- **Renewable Portfolio Standard,** which assumes 16.5% of electricity to be generated from renewable sources by 2015,yielding a reduction of 2,755,593 MT CO_2e/year.
- **Existing and proposed LIPA Efficiency Long Island programs,** based on LIPA ELI target for 2018, yielding a reduction of 474,481 MT CO_2e/year.

Figure 9 represents the calculation of the 2020 GHG emissions reductions potential that could be generated through the combined effects of federal and state strategy programs (6,081,728 MT CO_2e/year) and CGLI strategies (1,448,868 MT CO_2e/year) thereby aligning the region to achieve 7,530,596 MT CO_2e/year in emissions reductions per year by 2020. This 2020 savings represents approximately 13% less than the 2010 GHG baseline emissions.

The 15% GHG emissions reduction target is a first step towards achieving the NYS goal of 80% GHG emissions reduction by 2050. Clearly, the region will benefit from federal and state activities underway. Other communities such as New York City (30% by 2030) and Washington DC (30% by 2020) have more ambitious GHG reduction targets. This is an opportunity for the communities of Long Island to assess the feasibility and impacts of both voluntary and mandatory measures recommended in the CGLI Plan as they define the next generation of GHG reduction strategies and actions.

The value of the GHG Emissions Inventory, the BAU projections, and the estimate of the reduction that can be achieved through the strategies proposed in the CGLI Plan can help focus communities on where they can or need to take action. They also establish metrics and means to measure the success of their actions. Incorporating GHG emission reduction potential into the planning process provides policy makers and municipal leaders with a new level of information that can assist them to make sound investment decisions in the selection of strategies to implement.

Table 9 Strategies Quantifiable for GHG Emissions Reduction

	GHG Emission Reduction Potential MT CO_2e/yr
Energy	
Strategy 1.1 Require Energy Performance Certificates at point of sale or rental.	108,930
Strategy 1.2 Continue to develop, evolve, and expand outreach and education campaigns to promote energy efficiency and renewable programs and basic energy efficient behaviors (such as use of a comparative billing software).	123,301
Strategy 2.1 Require annual energy benchmarking for all non-residential buildings over 25,000 sq ft (approximately 3,500 existing buildings).	59,030
Strategy 2.2 Require energy audits every 5 years for all non-residential buildings over 25,000 sq ft (approximately 3,500 buildings).	147,575
Strategy 3.1 Promote adoption of more stringent local Energy Efficiency Construction Code by municipalities. (Home Energy Rating System for residential, International Green Construction Code for commercial).	98,652
Strategy 4.1 Develop and encourage municipal adoption of "Solar ready" code requirements for new construction so that retrofitting photovoltaic or solar hot water is structurally easy and cost-effective.	178,012
Strategy 4.4 Encourage geothermal heat pump projects through education and incentives. Develop an incentive program for replacing fuel oil boilers with natural gas or ground source heat pumps (where no gas supply available) that leverages or enhances existing LIPA rebates.	589,680
Strategy 6.1 Expand and develop electric vehicle charging and mapping infrastructure and enhance grid services to allow widespread charging capacity for electric vehicles.	4,258
Strategy 7.1 Encourage research and pilot programs to advance smart grid technologies, controls and improved renewable energy forecasting that can enhance the security and integrity of smart grid infrastructure.	63,621
Transportation	
Strategy 1.2 Increase the number of Long Island employers providing incentives/services to employees for VMT reduction.	50,906
Land Use and Livable Communities	
Strategy 1.1 Increase mixed-use developments in Long Island downtowns and near LIRR stations by 100%.	15,176
Waste Management	
Strategy 2.1 Expand New York State pilot program to test viability of food waste to biogas on Long Island.	6,276
Strategy 2.2 Create new and/or expand existing yard waste compost facilities to serve most municipality and commercial needs.	3,451
Total GHG Emission Reduction Potential from CGLI Strategies	**1,448,868**

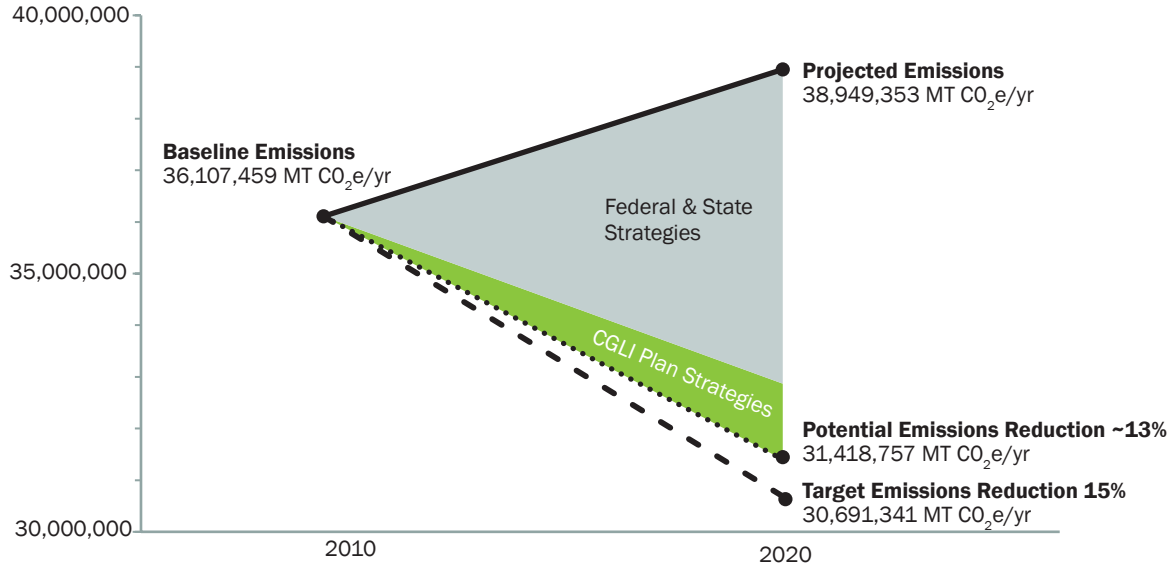


Figure 9 Long Island GHG Emissions Potential for 2020

4 Introduction to Organization of Goals & Strategies

The goals and strategies that have been developed for the CGLI Plan establish a framework that communities of Long Island can reference as they plan a more sustainable future for Long Island. The CGLI goals reflect the region's sustainability aspirations and the strategies demonstrate broad mechanisms to achieve the goals and meet the performance targets established during the planning process.

Implementation strategies are presented in the chapters 5 through 11 to address the subject areas of economic development and workforce housing, energy, transportation, land use and livable communities, waste management, water management, and governance. Each chapter is organized under the following categories:

Trends and Issues

An introduction to each subject area is provided by an overview of the key trends and issues that have informed the planning effort. The overview incorporates the concerns that were articulated by the working groups and public and forms the basis for prioritization of the strategies included in the plan.

Sustainability Indicators

Indicators of sustainability performance have been selected for each subject area that represent the interests and goals of the community and, in the future, will serve as the basis to measure and track the region's progress in achieving its sustainability goals.

Goals and strategies

Sustainability goals were developed through a review of existing planning documents collected for the baseline assessment and through the planning engagement. The goals provided the framework for identifying the implementation strategies to best achieve the goals.

Strategies are presented for each goal and include the following details:

Description and Intent Detail is provided as to what the strategy entails, why the strategy was chosen, and the relation of the strategy to the goals and targets it is intended to help to achieve.

Obstacles and Opportunities The obstacles that each strategy will likely confront are identified along with suggestions on how to address them. Opportunities that will be presented in pursuit of successful implementation are also listed.

Policy mechanism Each strategy will be implemented through either a mandatory action, requiring legislative approval, or voluntary action implemented by choice. Mandatory actions generate high rates of participation but may be politically challenging to initiate. Voluntary actions may require limited political capital to implement but participation rates tend to be much lower than mandatory actions.

Targets Targets established for each strategy are an estimation of the feasible and reasonable progress that can be achieved by 2020 if the strategy is implemented.

Recommended Actions Steps that need to be taken to implement each strategy are listed with guidance for municipalities, institutions and other key stakeholders and the potential entities responsible for taking action are identified.

GHG Emissions Reduction Potential Where feasible, the potential GHG emissions reduction from a strategy was calculated and noted. The amount of MT CO_2e reduction

represents assumptions on performance and participation levels for the strategy projected to 2020 and compared against the 2020 BAU scenario. However, as numerous strategies support the reduction of GHG emissions rather than have direct impacts, the calculation was not always feasible.

While the strategies recommended in the plan are organized by subject area, in numerous instances both the intentions for the strategy as well as the influences the strategy may reach well beyond a particular subject area. To that end, individual strategies may include additional information to highlight the opportunities for further integration across the subject areas.

5 Economic Development & Workforce Housing

Snapshot of the Region Today

Long Island's key economic assets are a well-educated and productive workforce, its proximity to New York City, the country's largest employment hub, premier research and academic institutions, and a high quality of life and treasured natural resources. The Region has been working together toward long-term sustainable economic development. The Long Island Regional Planning Council adopted the Sustainable Strategies for Long Island 2035 Plan[1] and a Comprehensive Economic Development Strategy (CEDS)[2] supplement. One of the primary recommendations in the Long Island 2035 Plan was to build consensus for a regional economic development strategy.

The Long Island Regional Economic Development Council (LIREDC) built upon this groundwork when adopting the Strategic Economic Development Plan,[3] which provided a cohesive vision for the future of Long Island's economy. The Cleaner Greener Long Island (CGLI) Plan provides additional implementation strategies and resources for policies and projects that will significantly improve the economic and environmental health of the Long Island Economic Development Region.

1 Link to the LIRPC Sustainable Strategies 2035: http://www.lirpc.org/3.2010-12-02_LI2035StrategiesReport.pdf

2 The CEDS is developed to satisfy the requirements of the US Department of Commerce's Economic Development Administration for funding. The link for the CEDS Plan is:

http://www.lirpc.org/ADFiles/2.%20LIRPC%20Revised%20CEDS%20August%202012%20FINAL.pdf

3 Link to LI REDC Strategic Plan: http://regionalcouncils.ny.gov/themes/nyopenrc/rc-files/longisland/LongIslandsFutureEconomy.pdf. LInk to Progress Report 2012: http://regionalcouncils.ny.gov/themes/nyopenrc/rc-files/longisland/longisland_2012progressreport.pdf

Both the Long Island 2035 Plan and the LIREDC Strategic Plan highlight key critical economic challenges that have since been further exasperated by the effects of recent extreme weather events. These challenges as well as potential opportunities are summarized in the following section.

Trends and Issues

Employment

Long Island's proximity to New York City will continue to provide employment opportunities for Long Islanders including higher wage jobs. However, the quality of jobs in Long Island is decreasing as employment growth has primarily been within lower wage sectors. Long Island was one of the first communities in the United States to enter into the recession due to the collapse of Wall Street and the financial sector and the mortgage foreclosure crisis. Unfortunately, many of the jobs lost during the economic downturn appear to be permanent and as a result, Long Island has had a very slow economic recovery. The 20 year-long trend of having high paying defense contracting jobs replaced primarily by lower paying service jobs has compounded slow growth. The average pay per employee on Long Island has reached a 10-year low, while average wages increased nationally over the same period. Although the region has an official poverty rate lower than the state, the region's high cost of living effectively places 20% of the population, or more than 500,000 adults and children, below the poverty line. To reverse this decline, to the greatest extent feasible, projects in this plan should create living wage jobs for local businesses, local contractors and local labor.

Cost of Living

The costs of living and doing business on Long Island are higher than elsewhere in the region and continue to rise. The national *Housing + Transportation Affordability Index*[4] measures the percentage of households within a given community that pay more than a combined 45% of household income for housing and transportation costs.[5] According to the Index, 83% of Long Island residents spend unaffordable levels of their income on housing, while 100% of Long Island residents spend unaffordable levels of their income on transportation. Compared to the region, 40% more of Long Island households spend unaffordable levels on their housing and transportation than the New York City metro area. In addition to living costs, Long Island lacks the range and depth of business attraction and retention incentives present in the metropolitan region. For businesses considering locations in the NYC metro area, Long Island remains at a significant disadvantage for reasons including high taxes, burdensome regulations, high-energy costs and the lack of affordable housing options.

Population Growth

There is an increasing dependency upon population growth to sustain Long Island's economy. Service industries make up a large percentage of Long Island's economy. Businesses that export products or services beyond the region bringing in new dollars are declining. The region is no longer growing and lower wages cannot support growth in service sector industries.

Labor Force

The population of young adults (aged 25 to 34) has declined by almost 129,000[6] due to the high cost of living, lack of affordable and rental workforce housing, and lack of decent paying jobs. With a substantial portion of Long Island's skilled employees on the verge of retirement and the ongoing decline of the 20-35 year old labor force, the next generation of the labor force on Long Island is not adequately skilled or prepared to respond to the challenges of a hi-tech and globally competitive economy. The workforce is not sufficiently trained in science, technology, engineering and math. The manufacturing sector also has difficulty in attracting and retaining skilled labor, as this sector often is not considered a viable career path among young adults.

Montauk State Park
Source: AECOM

Housing

Settled primarily as an agricultural and fishing community, Long Island became one of the nation's first suburbs with its population exploding in the post-World War II suburban boom, steadily expanding eastward with affordable homes providing an attractive, suburban lifestyle. Today, Long Island is 90% developed and more than 80% of the region's housing stock is single-family homes - primarily owner occupied. Housing and transportation costs make housing for many residents unaffordable. The region's housing stock, commercial facilities and municipal infrastructure are aging and will require significant reinvestment. In Nassau County, 72% of the housing stock was built before 1960 and 90% built before 1980. In Suffolk County, 74 % of the housing stock was constructed before 1980. Long Island lacks diversity in its housing stock with too few of the affordable rental units that young workers and retirees prefer. The development of rental housing is difficult due to community opposition of affordable housing and housing density.

4 Housing + Transportation Affordability Index: http://htaindex.cnt.org/

5 Household spending on housing is assumed to be affordable when it requires less than 30% of household income. Spending on transportation is assumed to be affordable when it represents less than 15% of household income.

6 Net change in population in Nassau and Suffolk County from 2000 to 2010 – source US Census.

Economic Redevelopment

Revitalizing downtowns, blighted neighborhoods and commercial centers are a priority on Long Island. LIREDC has identified several transformative transit-oriented, mixed-use developments that are in planning stages or underway. The goal of developing location and energy efficient mixed-use buildings is supported by several regional planning efforts. More than 8,300 acres of undeveloped land and surface parking lots within a half mile of downtown centers and Long Island Railroad Stations have been identified and may provide an opportunity for mixed-use transit-oriented development.[7] Long Island is also participating in the NY-CT Sustainable Communities Initiative[8] with Nassau County focusing on transit-oriented development projects and Suffolk County addressing the transfer of development rights as a tool for location efficient redevelopment. Currently, redevelopment can be long and arduous due to challenges with land assembly, environmental remediation, outdated zoning, and community concerns about density.

Research & Development

Long Island has the potential to be a regional leader by breaking new ground in energy research, rolling out sustainable energy strategies on the ground, and developing a trained workforce that is at the leading edge of technological innovation.

- **Smarter Electric Grid 3** Stony Brook University and Brookhaven National Laboratories are collaborating in establishing the Smarter Electric Grid Research, Innovation, Development, Demonstration, and Deployment Center. The goal is to establish Long Island as a national center for energy research, development and manufacturing that bring the added regional benefits of low power costs, improved research capacity and training for high-tech students to Long Island.
- **Accelerate Long Island**[9] is a region-wide initiative that unites major research institutions to commercialize their innovations by matching scientists with financing and creating a path to manufacture technology locally. By commercializing new technologies from the region's many research centers, Long Island has the ability to create a large number of well-paying jobs boosting the local economy.
- **Thought Box 1** This innovative incubator located in Hicksville is a regionally replicable model that brings the Accelerate Long Island concept to a downtown transit hub, with affordable workforce housing, offices, labs, recreation, and commercialization services for fledgling high-tech ventures under one roof. This incubator is located a half-block from the Hicksville Long Island Railroad Station – the region's second busiest station.

Growth Sectors

The green construction sector has emerged as a growing industry that will meet local demand for energy-efficiency retrofitting of residences, businesses and institutions.[10] LIREDC has made investments in the agriculture and aquaculture industry to support regional food production, distribution, and sales.

Workforce Training

Workforce training initiatives, including training for new and incumbent workers, are underway. Training programs include the Advanced Energy Training Institute (AETI)[11] at Stony Brook and programs at Farmingdale State University, Suffolk Community College, and the New York Institute for Technology. A STEM Workforce Innovative Network[12] is established to integrate regional workforce, industry and education assets and implement a plan for skills training and job creation for an ideal workforce-industry fit for both the current and future workforce.

Active Programs

Long Island Green Homes Consortium (LIGHC)

LIGHC is an unprecedented effort to facilitate energy efficiency planning and programs on Long Island. Long Island municipalities, NGOs, NYSERDA, LIPA, National Grid, Oil Heat Institute of Long Island, Efficiency First and contractors are working together to bring residential and small business energy efficiency improvements to scale on Long Island. Leveraging NYSERDA's Green Jobs-Green New York loan program, LIPA and National Grid rebates, home performance contractors install energy efficiency upgrades

7 Places to Grow: An Analysis of the Potential for Transit-Accessible Housing and Jobs in Long Island's Downtowns and Station Areas, Report Prepared by the Regional Plan Association for the Long Island Index, January 2010. Link: http://www.longislandindex.org/explore/ba2fab1cacfbf6edd9f2339ca40c9679

8 New York and Connecticut Sustainable Communities link: http://www.sustainablenyct.org/

9 Accelerate Long Island: http://www.longislandassociation.org/accelerate-long-island.cfm

10 Initiatives such as NYSERDA's Green Job-Green New York Program, LIPA's Efficiency Long Island Program, the Clean Energy Leadership Task Force and the Long Island Green Homes Consortium have supported this industry.

11 http://www.stonybrook.edu/commcms/cet/AETI.html

12 STEM is science, technology, engineering and math.

in single-family homes incentivized by free or reduced cost audits, low-cost financing, rebates and incentives. Long Island municipalities and NGOs provide extensive advertising, marketing and outreach to homeowners and small businesses. The program is continuously reviewed and improved with best practices shared on a monthly basis.

Advanced Energy Research & Technology Center (AERTC)

AERTC is a true partnership between academic and research institutions, energy providers, and private corporations. Its goal is to establish a broad based interdisciplinary research program, which integrates fundamental science, nanotechnology, and engineering to design the next generation of advanced energy systems. Columbia University is partnering with Stony Brook University, Brookhaven National Laboratories and Cornell University's NYC –Tech to develop regional Proof-of-Concept Centers dedicated to helping inventors and scientists turn their high-tech, clean-energy ideas into successful businesses.

Source: Vision Long Island

Sustainability Indicators

Two key sustainability indicators were selected to evaluate Long Island's current economic condition:

- **Housing and Transportation Affordability Index**[13] A tool that measures the affordability of housing and transportation costs for households.
- **Employment by Sector** Databases prepared by the Bureau of Labor Statistics as well as the NYS Labor Department measuring change in employment within non-farm sectors.

According to the Housing and Transportation Affordability index, roughly 95% of Long Island residents have unaffordable levels of housing and transportation expenses (see Figure 10). Meanwhile only 56% of metropolitan New York City households have unaffordable levels of housing and transportation expenses.[14] This indicator provides a useful way to evaluate changes in Long Island's affordability both in terms of its change over time, and its affordability relative to the larger region.

Employment by sector provides an excellent snapshot of Long Island's largest employment industries. As Table 10 shows, Long Island's employment remained relatively constant between 2011 and 2012. However, key target industries such as Natural Resources and Construction, and Manufacturing both experienced drops in employment of between 2 and 4% over the past year. Being able to monitor changes in employment in these target industries is an effective way to measure the success of proposed workforce and business development programs.

Targets

Overall program targets for the two indicators by 2020 are:

- **Housing and Transportation Affordability Index** Reduce the percentage of Long Island households for which housing and transportation is at unaffordable levels to under 90% by 2020.
- **Employment by Sector** Reverse the decline of employment in key employment sectors such as Construction and Manufacturing.

13 http://htaindex.cnt.org/
14 Defined as a combined expense of more than 45% of household income.

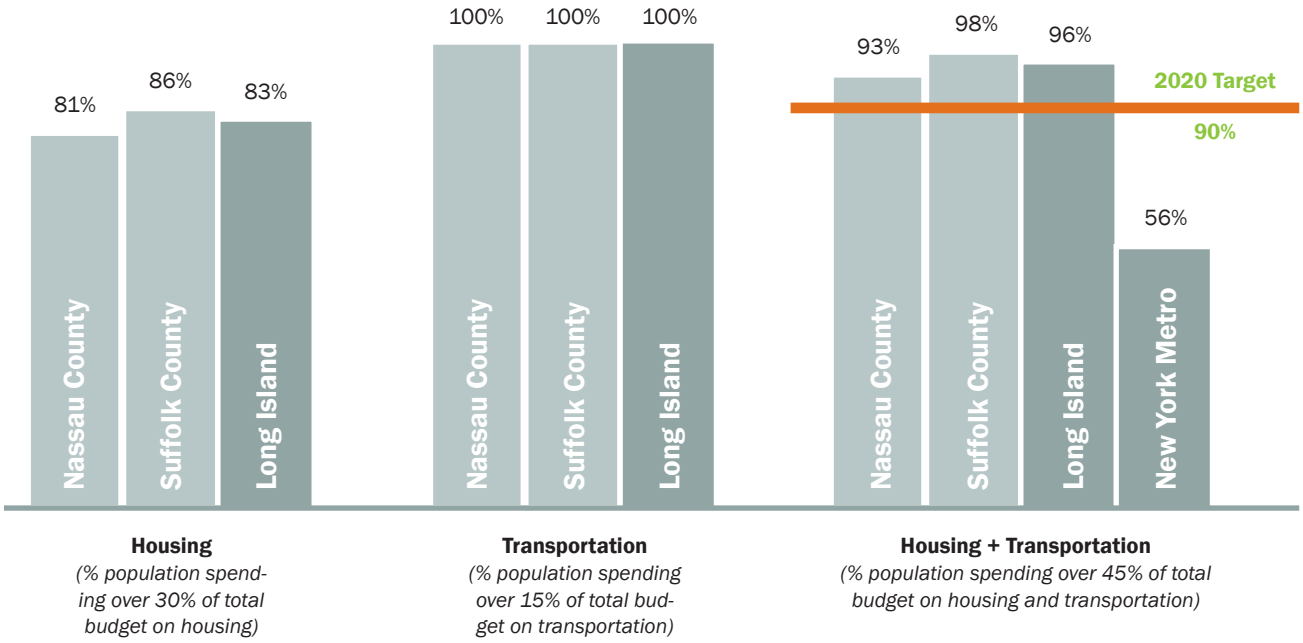


Figure 10 Housing and Transportation Affordability Index
Source: http://htaindex.cnt.org/

Table 10 Long Island Employment by Non-Farm Sector (2012)

Sector	2012 Employment	% Change over 2011	2012 Sector Employment as % of Total
Total Private	**1,058,100**	**0.80%**	**84%**
Goods Producing	**126,900**	**-3.00%**	**10%**
Natural Resources, Mining and Construction	55,600	-4.10%	4%
Manufacturing	71,300	-2.10%	6%
Service-Providing	**1,136,100**	**0.60%**	**90%**
Private Service-Providing	**931,200**	**1.40%**	**74%**
Trade, Transportation, and Utilities	271,300	0.60%	21%
Information	23,900	-2.00%	2%
Financial Activities	75,700	5.30%	6%
Professional and Business Services	164,800	1.90%	13%
Education and Health Services	242,600	2.30%	19%
Leisure and Hospitality	97,500	-2.00%	8%
Other Services	55,400	2.60%	4%
Government	204,900	-2.90%	16%
Total Nonfarm	**1,263,000**	**0.20%**	**100%**

Source: Bureau of Labor Statistics, NYS Labor Department

Goals and Strategies

There are five key economic and workforce housing development goals presented in this report. Each goal contains a number of specific strategies to further develop the goal. The economic development and workforce housing goals and strategies are summarized in Table 11.

Prioritization of Strategies

These goals and strategies were prioritized through the Economic Development & Housing Working Group and the Planning Team. These strategies were reviewed by a liaison to the LIREDC as well as regional Empire State Development Corporation staff. The strategies set forth below are ripe for action now as follows:

- Local developers are pursuing the development of transit-oriented development as it is attractive to both younger adults and empty nesters. With the abundance of pending projects, incentivizing these projects to be more energy efficient makes sense in terms of reducing green house gas emissions. As the ability to model and tracking the return on investment of installing energy efficient measures improve, the investment in energy efficient upgrades is becoming a more compelling strategy for business and property owners to reduce their exposure to increasing energy costs.
- Federal American Recovery and Reinvestment Act, Energy Efficiency and Conservation Block Grant (EECBG), Green Jobs / Green New York program, LIREDC funding, and LIPA's Efficiency Long Island program have helped seed innovations and changed the region's outlook on the emerging green business sector. Innovative pilot projects such as Innovate Long Island, Thought Box I, and the AERTC have started and could use resources to expand the green innovation sector.
- Long Island's Home Performance sector grew through Green Jobs/ Green New York and EECBG funding with the region participating in the NYSERDA Home Performance program for the first time. One of the projects being piloted is the establishment of a fuel neutral cooperative advertising program being seeded with a small amount of American Recovery and Reinvestment Act Better Buildings program funding through the Long Island Green Homes Consortium (LIGHC).[15] Continuation of the marketing and outreach provided by the LIGHC along with the cooperative advertising fund will help continued growth of this emerging sector.
- LIREDC funding has seeded several important initiatives underway to stabilize and grow the agriculture, fisheries and aquaculture sector. The LIREDC strategic plan highlighted the need for a number of targeted infrastructure and marketing investments that could help this sector grow and create jobs.
- Green job training supported through American Recovery and Reinvestment Act and Green Jobs / Green New York grants have helped transition the workforce for tomorrow's economy. The strategy of linking workforce training, labor and employers would help reduce the unemployment rate. There is an immediate need for specialty training for the workforce to address the rebuilding and recovery from Superstorm Sandy. Job training was identified as a high priority during the planning process.

Rebuilding Long Island both greener and more resilient after the destruction of Superstorm Sandy was identified as a high priority during the planning process.

The following is a description of the economic development and workforce housing goals and the strategies selected to achieve the objectives articulated by the Working Group in collaboration with the Steering Committee and technical consultants. Strategies were prioritized though to identify key strategies that represent the interests and ambitions of the community. The goals and strategies are summarized In Table 11.

15 Long Island has had limited participation in the cooperative advertising program because it is funded by SBC charges. This fund is well established throughout New York by NYSERDA and has been successful in helping home performance contracting businesses grow.

Table 11 Economic Development and Workforce Housing Goals and Strategies

	Align w/ LIREDC Goals	Adapt to Climate Change
Goal 1 Improve housing and transportation affordability by providing incentives for workforce housing and commercial buildings that are location efficient, affordable and green; thereby creating jobs for local contractors and local labor.		
Strategy 1.1 Provide gap financing and technical assistance incentives for new and redeveloped buildings that are location efficient, affordable and green.	x	x
Goal 2 Support a green innovation economy and local jobs by retaining, growing and attracting green business clusters.		
Strategy 2.1 Provide financial assistance for the incubation and commercialization of energy and green technologies. Facilitate growth and retain technologies developed by Long Island's research laboratories and universities, creating and retaining local jobs and businesses.	x	
Strategy 2.2 Retain and grow the green construction sector through technical assistance and financing of a fuel neutral cooperative advertising program. Provide home performance contractors with resources to market and expand this emerging sector through the use of a successful tool that has worked well in other parts of the state.	x	
Strategy 2.3 Retain and grow the aquaculture and agriculture sectors by providing gap financing and technical assistance for projects that will help them green their operations and distribution channels. Increase the amount of locally grown products sold on Long Island to reduce GHG impacts and create/retain local jobs.	x	
Goal 3 Support a green innovation economy and local jobs through green business designations and marketing.		
Strategy 3.1 Provide technical and financial assistance to businesses to green their operations, secure a third party green business designation, and provide marketing support.	x	
Goal 4 Promote high-value jobs through green workforce development.		
Strategy 4.1 Support green training of the new and incumbent workforce to grow opportunities for local jobs.	x	
Strategy 4.2 Maintain and grow the network between educational institutions, workforce investment boards, students, employers and labor organizations.	x	
Goal 5 Advance Superstorm Sandy recovery and rebuilding to manage future economic risks.		
Strategy 5.1 Provide incentives for rebuilding greener and more resilient developments in areas impacted by the storm surge or encourage relocation locally outside the floodplain and develop and implement strategies for enhancing resilience and more rapid restoration of the electric grid.	x	x

Goal 1 Improve housing and transportation affordability by providing incentives for workforce housing and commercial buildings that are location efficient, affordable and green; thereby creating jobs for local contractors and local labor.

Strategy 1.1 Provide gap financing and technical assistance incentives for new and redeveloped buildings that are location efficient, affordable and green.

Description and Intent The LIREDC Strategic Plan, LIRPC 2035 Plan, and the Long Island Index have all identified the need for location and energy efficient affordable workforce housing. The Long Island Index has identified the high cost of living, particularly associated with housing, as a key reason that young adults are leaving Long Island. Financial and technical incentives are an effective means to spur local development and redevelopment. This strategy was identified as important for long-term, sustainable economic growth on Long Island and is supported by regional planning efforts. More than 8,300 acres of undeveloped land and surface parking lots within a half-mile of downtown centers and the Long Island Railroad Stations have been identified as potential locations to develop mixed-use transit-oriented development.

Obstacles In general, development projects are difficult to finance due to the high cost of land, taxes, and the need for infrastructure investments. Some areas of Long Island, particularly Suffolk County, do not have sanitary sewers or may need investment in new water wells or treatment facilities. As Long Island is approximately 90% built out, most opportunities for development are infill redevelopment or adaptive reuse.

Some communities within Long Island do not have adequate zoning in place to include residential or mixed-use workforce housing in and near downtowns or train stations. Developers have had difficulty in financing multi-family projects without additional incentives and grants, as it is extremely difficult to finance cooperatives and condominiums in today's economic climate. Communities often prefer the stability of ownership housing over rental housing and there is resistance to "urbanization" and the inclusion of multifamily and/or affordable housing.

Opportunities The recent approval of various development projects on Long Island indicates that developers are slowly finding ways to overcome political, financial and social obstacles. LIREDC is investing in a number of transformative transit-oriented, mixed-use developments which are in planning stages or underway.

- **Wincoram Commons** is a shovel-ready, model smart growth project that will redevelop a blighted and deteriorated site into a mixed-use, transit-oriented development.
- **Wyandanch Rising** is a planned Leadership in Energy and Environmental Design Neighborhood Development (LEED ND) redevelopment area with mixed-use transit-oriented development.
- **Hempstead Village Renaissance** is a proposed mixed-use project with 3,400 new housing units and 700,000 square feet of commercial space around Nassau County's busiest multi-modal transit center.
- **Ronkonkoma-MacArthur Transit Hub** is a smart growth transit-oriented village planned between Suffolk County's largest train station and a regional airport.
- **Heartland Town Square** is a proposal to transform one of the world's largest psychiatric hospitals into a self-contained suburban city adjacent to two highways and an inactive rail station.

In addition, there are a number of smaller projects approved or being planned throughout Long Island.

Incentives to improve housing and transportation affordability not only help increase transportation and economic access within a community, but also support a diversified economy and encourage economic sustainability. These incentives support other subject areas goals and targets as well:

- **Water Strategy 2.1** Reduce potable water consumption due to excessive irrigation
- **Water Strategy 4.1** Increase the development of green infrastructure in the public and private realms.
- **Transportation Strategy 1.1** Expand and improve public transportation across Long Island (bus and rail
- **Transportation Strategy 1.2** Increase the number of Long Island employers providing incentives/services to employees for vehicle miles traveled (VMT) reduction

- **Transportation Strategy 1.3** Improve the safety of streets for pedestrians and cyclists through implementation of Complete Streets policies
- **Land Use Strategy 1.1** Increase revitalization and development around LIRR stations within Long Island downtowns – improving the H&T Affordability Index.

In addition, the incentives also support the following existing plans:

- **Plan 2035 E-7** stimulate development and preservation of mixed-income workforce housing options.
- **Plan 2035 T-2** create vibrant, transit-supported communities
- **LIREDC** create new workforce housing opportunities.

Projects receiving incentives should provide jobs opportunities for both local contractors and local labor to the greatest extent feasible in order to stem the decline of construction jobs on Long Island.

Policy Mechanism Voluntary Incentives

Target(s)

- Improve the Housing + Transportation Affordability Index – Reduce percentage of households spending unaffordable levels on housing and transportation to under 90% by 2020.
- Support development of 5,000 units of location and energy efficient workforce housing affordable to households at or below 120 % of Nassau / Suffolk HUD Area Median Income by 2020 to meet the above target and to create local jobs for local contractors and labor to meet the jobs indicator.

Recommended Actions	Key Stakeholders
Promote local government support for plans to improve both workforce housing and transportation affordability and support implementation (being undertaken by regional NGO, planning agencies, LI Smart Growth Working Group)	LIREDC Infrastructure Working Group; municipalities including zoning and planning boards, IDAs and CDAs; counties including housing offices, IDAs and planning commissions; LIRPC; for-profit and not-for-profit housing developers; NGOs; LI Smart Growth Working Group and LI Clean Energy Leadership Task force
Prioritize rezoning for development of these types of projects, particularly for transit-oriented development sites. (County and local planning agencies, developers)	
Develop model-zoning ordinances that will provide density bonuses for location efficient and affordable green building. (Code development being undertaken by municipal planning departments).	
Encourage Counties, Towns, Cities and Villages to adopt green property tax incentives for new and retrofitted buildings. (LI Clean Energy Leadership Task Force, LIGH Consortium, municipalities)	

LIREDC has identified the development of innovation and industry clusters as a key strategy for economic growth. Long Island has three distinct green business clusters with shared infrastructure investments and market support: (1) Advanced energy research and product development and manufacturing, (2) Green Construction Sector, and (3) Agriculture and Aquaculture. By providing additional support to green business clusters, the region can stimulate the green innovation economy that creates and sustains local jobs.

Goal 2 Support a green innovation economy and local jobs by retaining, growing and attracting green business clusters.

Strategy 2.1 Provide financial assistance for the incubation and commercialization of energy and green technologies. Facilitate growth and retain technologies developed by Long Island's research laboratories and universities, creating and retaining local jobs and businesses.

Description and Intent Long Island has the potential to be a regional leader by breaking new ground in energy research, rolling out sustainable energy strategies on the ground, and developing a trained workforce that is at the leading edge of technological innovation.

Obstacles Long Island has premier research laboratories and education institutions that are developing new technologies for commercialization (such as Brookhaven National Laboratories, Cold Spring Harbor Laboratories and SUNY Stony Brook). However, much of this technology leaves Long Island to be manufactured elsewhere. As an important component of research and development funding, access to federal funds has become increasingly unreliable, creating a key obstacle for development. High costs of taxes, energy, labor, and office space to expand an incubator project into manufacturing on Long Island create additional barriers to successful technology development.

Opportunities Stony Brook University and Brookhaven National Laboratories are collaborating on the Smarter Electric Grid Research, Innovation, Development, Demonstration, Deployment Center (Smarter Electric Grid 3). Their goal is to establish Long Island as a national center for energy research, development and manufacturing, bringing the added regional benefits of low power costs, improved research capacity and training for high-tech students to Long Island. The proposed financial incentives would also support the following synergistic goals:

- **Energy** improving the energy efficiency of existing and new building stock.
- **LI Plan 2035 E-2,** level the economic playing field for business retention and attraction incentives, and **E-9,** build the healthcare, life sciences, green energy, brownfields remediation and homeland security industries as growing employment sources.

Policy Mechanism Voluntary

Target(s) Increase employment within the green sector from just under 2% of all employment to 5% by 2020 to retain and potentially increase jobs in the construction and manufacturing sector.

Recommended Actions	Key Stakeholders
Provide financial support to organizations that assist in the commercialization of new technologies developed by research institutions and entrepreneurs.	LIREDC Innovation and Industry Clusters Working Group; academic and research institutions; entrepreneurs and private sector businesses;economic development organizations; AERTC; Innovate Long Island; NYSERDA EDGE Regional Outreach Coordinator

Strategy 2.2 Retain and grow the green construction sector through technical assistance and financing of a fuel neutral cooperative advertising program. Provide home performance contractors with resources to market and expand this emerging sector through the use of a successful tool that has worked well in other parts of the state.

Description and Intent The green construction sector has emerged as a growing industry that will meet local demand for energy-efficiency retrofitting of residences, businesses and institutions.

Obstacles Contractors tend to rely on utility-sponsored and incentivized leads to generate business, which is not bringing the industry to scale. Additionally, there is a history of inconsistent programs and incentives for green construction (i.e. changes in rebates and eligibility) that confuse and distract from merits.

Opportunities Long Island's Home Performance Sector is working collaboratively together along with NYSERDA, LIPA, National Grid and the Long Island Green Home Program in growing this industry sector. This initiative is being piloted

with some American Recovery and Reinvestment Act funds and will be ready to bring to scale in phase 2 of the project.

Policy Mechanism Voluntary

Target(s)

- Increase cooperative advertising participation from 0 to 10 NYSERDA/LIPA contractors and help create and grow jobs in this sector by 3%.
- Increase number of households annually participating in Home Performance with ENERGY STAR ® retrofits from 1,088 to 2,500 households.

Recommended Actions	Key Stakeholders
Provide financial support for funding the program.	NYSERDA; LIPA; National Grid; Long Island Green Homes Consortium; Efficiency First and Building Performance Contractors Association; building performance contractors

Source: AECOM

Strategy 2.3 Retain and grow the aquaculture and agriculture sectors by providing gap financing and technical assistance for projects that will help them green their operations and distribution channels. Increase the amount of locally grown products sold on Long Island to reduce GHG impacts and create/retain local jobs.

Description and Intent The LIREDC Strategic Plan recognized the tremendous opportunity to expand agriculture, fisheries and tourism via strategic investment. Agriculture and fishery-related businesses are important economic drivers on Long Island currently employing approximately 2,500, with cash receipts of more than $240 million per year. Suffolk County ranks first in the state in the value of crops sold. Most of the farms on Long Island are small in size but are specialized with direct market appeal. Long Island is a leader in producing ducks, oysters and bay scallops, sod, and other specialty products.

Commercial and sport fishing industries as well as marine recreation and aquaculture are all important to Long Island's economy. In 2011, New York State fisheries pulled in over 27 million pounds of finfish, shellfish and crustaceans with a landed value of over $37.8 million – 99% of which occurs in the Long Island region. This translates into a regional economic value of over $170 million. Commercial fisheries are subject to regulatory limitations. LIREDC identified a need for greater infrastructure development, better marketing of Long Island seafood and expansion of bay scallop fisheries.

Long Island is the second most popular tourist destination in New York State after New York City. Overall, tourism supports over 70,000 jobs or 5.9 % of all jobs on Long Island. Superstorm Sandy has affected Ecotourism, with many infrastructure needs along the coast. In addition to general tourism, Long Island is a unique locavore region, attracting agro-tourists. Long Island's vineyards attract 1.2 million visitors annually. However, in order to transform conventional agriculture into more sustainable practices and to transport produce to communities in need of fresh produce, the region needs additional financial, political and social support.

Obstacles To preserve and expand agriculture as a principal economic driver, a number of needs must be addressed. Investments in infrastructure, workforce development, public education and marketing are key obstacles to supporting the local industries. Farming is threatened by

suburban encroachment with farmland being developed as housing. The commercial fishing industry is challenged by water pollution, national competition, and lack of infrastructure to support moving products to multiple markets.

Opportunities LIREDC has recognized these challenges and has been focusing investments in these natural assets as transformative priority projects.

- The **Agri-Park project**, marketed as Grapes and Greens, developing chilled processing plant and distribution network to allow East End farmers, fisherman, and other food producers reach more markets that have specific handing, storage and transportation standards.
- A large-scale **bay scallops restoration program** will transform the industry by increasing production for the region and New York City's gourmet markets while stimulating both business and job creation.
- **Montauk commercial fisheries infrastructure improvement** projects include improving docking and processing facilities at separate locations in Montauk to keep the existing fleet from seeking services in other states and induce other fleets to bring their business to New York.

There are numerous other opportunities to enhance the agriculture and fisheries sector, helping to retain and create jobs, while reducing greenhouse gas emissions.

Policy Mechanism Voluntary

Target(s) Create or retain 50 jobs in Long Island's aquaculture and agriculture sectors.

Recommended Actions	Key Stakeholders
Provide financial assistance to emerging projects.	LIREDC Natural Assets Working Group; Long Island Farm Bureau; Peconic Land Trust; Cornell Cooperative Extension; local businesses; NYSERDA EDGE Regional Outreach Coordinator

Goal 3 Support a green innovation economy and local jobs through green business designations and marketing.

Strategy 3.1 Provide technical and financial assistance to businesses to green their operations, secure a third party green business designation, and provide marketing support.

Description and Intent The program aims to create value around sustainable work and products on Long Island, while raising the awareness and recognition of companies that are committed to green practices. Additionally, the program will encourage businesses to adopt energy efficient green business practices, helping them to save money that can be reinvested in the local economy, while reducing GHG emissions. The program will encourage businesses to adopt green business practices as a competitive advantage.

Obstacles Key obstacles to supporting green business designation include insufficient funding for brand development, marketing, advertising and outreach.

Opportunities There are existing plans in place to build on the effort to support a green innovation economy:

- **LI Plan 2035 E-3,** Market Long Island's assets nationally to attract new businesses and workforce .
- **LIREDC Strategic Plan** Workforce and Education, Green Technologies training.

Policy Mechanism Voluntary

Target(s)

- 200 new businesses with green business designations
- Increase awareness of local green businesses, and grow support for local green businesses.

Recommended Actions	Key Stakeholders
Identify green business designation through community and stakeholder participation.	LIREDC; business organizations; trade associations; chambers of commerce
Consider creation of a "Green Long Island" or similar brand to highlight compliant companies and the work they do.	

Source: Vision Long Island

Goal 4 Promote high-value jobs through green workforce development.

Strategy 4.1 Support green training of the new and incumbent workforce to grow opportunities for local jobs.

Description and Intent Although construction sector jobs have been reduced by the economic downturn, energy efficiency retrofitting, a new construction activity to provide a homeowner or business with both costs savings and comfort could be a value-added component to help expand the HVAC and remodeling industry. As was indicated in New York State Green Jobs Survey for Long Island, 67% of construction trade firms on Long Island are currently having trouble finding qualified "green" employees for their work. Additionally, 20% of employers in building services are also having trouble finding qualified employees with the appropriate green skills. Such statistics point to a strong need for better training and job-skill matching programs. This strategy proposes to:

- Provide better access to training resources for new and incumbent workers to help them secure or retain their jobs and expand businesses scope of work.
- Expand green training programs for skilled trades in coordination with training and apprenticeship programs. Provide training for Superstorm Sandy Recovery and Rebuilding.
- Increase the number of local companies and local employees trained and accredited in green technologies to compete for and secure new business, both locally and regionally.

Obstacles Most skilled construction workers do not have training in green construction techniques such as home performance with energy star or the equivalent. Some industries (i.e. HVAC) are ideal for expanding into the home performance field but employers do not know about or see the value of becoming a participating contract; thereby losing work potentially to out-of-town firms. Most of the green construction work is small sized projects with private homes and businesses. This discourages participation from some of the larger employers.

Opportunities There is interest in the Construction Trades unions in including green training as part of their skill set so they can be more competitive than out-of-town firms, thereby retaining jobs locally. Training for incumbent workers has been identified as a need by the home performance sector.

Policy Mechanism Voluntary

Target(s)

- Facilitate the training and job placement for 500 new or incumbent "green" workers on Long Island.
- Increase the skill match of local labor for green positions, making it easier for local firms to find qualified employees.

Recommended Actions	Key Stakeholders
Identify existing green training programs and resources.	LIREDC Workforce and Education Working Group; Stony Brook Advanced Energy Training Institute; Farmingdale State College; Suffolk Community College; New York Institute of Technology; other educational institutions providing jobs training programs; contractors associations; trade organizations; labor organization training programs;employers; NYSERDA EDGE Regional Outreach Coordinator
Facilitate additional green training in coordination with existing training programs and skilled trades and apprenticeship training programs. Work with labor unions on identifying skills needed to be more competitive than out-of-town firms.	

Strategy 4.2 Maintain and grow the network between educational institutions, workforce investment boards, students, employers and labor organizations.

Description and Intent The LIREDC strategic plan identified green technologies as an industry cluster and growth sector. According to the New York State Department of Labor New York State Green Jobs Survey: Report for the Long Island Region, green jobs on Long Island are growing and employers that employ green employees need both trained employees and prospective employees. This strategy is intended to identify the needs in the green business sector and tailor education and skill development of the workforce to meet those needs to grow and keep jobs on Long Island.

Obstacles Funding

Opportunities A STEM Workforce Innovative Network was selected by the LIREDC as a transformative project. This network has been established to integrate regional workforce, industry, and education assets. The network is implementing a plan for skills training, internship and on the job training opportunities, and job creation for an ideal workforce-industry fit for both the current and future workforce.

Policy Mechanism Voluntary

Target(s) Create or retain 250 jobs.

Recommended Actions	Key Stakeholders
Create method for connection between potential employers and skilled "green" employees.	LIREDC Workforce and Education Working Group; Workforce Innovative Network; Workforce Investment Boards; labor organizations; educational institutions; employers; NYSERDA EDGE Regional Outreach Coordinator
Identify which jobs and industries Long Island would like to grow, and the skill needs of existing industries.	
Provide financial resources to implement these strategies.	

Source: Molloy College

Goal 5 Advance Superstorm Sandy recovery and rebuilding to manage future economic risks.

Strategy 5.1 Provide incentives for rebuilding greener and more resilient developments in areas impacted by the storm surge or encourage relocation locally outside the floodplain and develop and implement strategies for enhancing resilience and more rapid restoration of the electric grid.

Description and Intent Long Island sustained a tremendous amount of economic loss due to Superstorm Sandy and a Nor'easter that followed nine days later. According the Long Island Association, the region sustained a loss of 3,300 payroll jobs including a loss of 5,100 private sector jobs between October 2012 and November 2012. Hardest hit were small business that were flooded and/or lost power.

Obstacles Rebuilding homes and businesses destroyed in Superstorm Sandy has been challenging especially for homeowners or business owners who do not have sufficient savings to pay for rebuilding costs out of pocket while waiting for insurance, flood insurance, FEMA or other federal assistance.

Opportunities Providing incentives to rebuild greener and more resilient will help reduce GHG emissions, create short-term construction jobs, and permanent jobs as businesses re-open. Incentives are available for construction that met a recognized standard such as Home Performance with ENERGY STAR®, ENERGY STAR 3, LEED, or other standards recognized by NYSERDA. There is also an opportunity for further planning to develop strategies to enhance resilience and future response to storms.

These incentives are linked to other strategies as follows:

- **Energy Strategy 7.2** Support efforts to increase the efficiency, reliability, and resilience of the grid (transmission and distribution, including its capacity for self-monitoring and self-repair), and adapt to the challenges presented by the addition of electric vehicles as a new energy demand on the grid.
- **Land Use and Livable Communities Strategy 2.1** Protect the Island's most critical unprotected open spaces.
- **Land Use and Livable Communities Strategy 2.2** Foster an island-wide storm resilient open space buffer.
- **Climate Change Adaptation**

Policy Mechanism Voluntary/incentivize

Target(s) Increase the number of communities participating in the National Flood Insurance Program Community Rating System.

Recommended Actions	Key Stakeholders
Identify funding gaps	LIREDC Infrastructure Working Group; NYSERDA; LIPA; National Grid; US HUD; NY HCR; counties and impacted municipalities; not-for-profit housing and community development organizations; AERTC; Stony Brook and Brookhaven National Laboratories; builders and contractors; contractors organizations; business organizations
Identify strategies to enhance resilience and future response to storms.	
Provide resources to homeowners and businesses through organizations providing Sandy relief.	

6
Energy

Trends and Issues

High Cost of Energy

The cost of energy on Long Island is expensive due to high electric rates and fluctuations with long-term increases in fuel prices. Large-scale conversion to more cost-effective natural gas for home and commercial heating could be hampered by the constraints of current pipelines and the lack of infrastructure in some areas. According to the U.S. Census 2011 American Community Survey 1-Year Estimates, 49.6% of Nassau and Suffolk Counties' housing uses oil heat. Large-scale conversion to natural gas and geothermal heat pumps could have a tremendous impact on reduction of GHG emissions and other pollutant levels that impact local air quality. However, these options can be expensive, especially in areas not already served by natural gas. Continued emphasis on programs to improve the performance of homes heated by oil will also be necessary.

The relative affluence across much of Long Island[1] means that the region and a good number of residents have the financial means to adopt measures to save energy and to develop clean, renewable sources of energy. For example, the region leads the State with almost 6,000 homeowner-owned solar roofs, and a significant number of homeowners have invested in energy efficiency upgrades. On the other hand, the high cost of living can make it difficult for less well-off residents, who suffer most from high energy costs, to invest in energy efficiency improvements to their homes.

1 The Long Island median household income reported in 2012 is approximately $88,653 according to the American Community Survey 2012, while the US median household income is approximately $50,233 according to the "Household Income for States: 2010 and 2011" United States Census, American Community Survey Briefs, September 2012.

High Energy Demand

Historically there has been a steady increase in electric demand to support very energy-intensive lifestyles on Long Island. Over the past decade, the increase has averaged slightly less than 3% per year, with the exception of the years impacted by the recent financial crisis. This growth rate is greater than the population growth. A key driver of energy demand is that the majority of the Island's housing stock was built prior to the implementation of more strict energy efficiency construction codes in the 1970s. Compared to regions with similar populations, Long Island has a higher-than-average percentage of single-family homes, which tend to use more energy than other dwelling types. Homes built more recently tend to be larger and until recently, energy efficiency has not been a high priority for most builders or homebuyers. As a result, residential energy use is the single largest contributor to the region's greenhouse gas emissions.

Auto-dependency

Long Island, home to the nation's first suburb, has a well-established pattern of auto-dependent suburban sprawl. On-road vehicles are the number-two contributor to Long Island's greenhouse gas emissions. The infrastructure created over decades to serve car-centered development cannot be changed easily or quickly to greatly increase transit availability and reduce dependence on individual vehicles. Transitioning to a cleaner fuel vehicle fleet could be effective in reducing emissions in the short-to-medium term.

Energy Efficiency

As Long Islanders pay a higher rate for electricity than most of the nation, the return on energy efficiency projects is greater, and the "green premium" for renewable energy

investments is reduced. This provides a more competitive environment for their adoption. Over the last decade, government and utilities have significantly increased their investments in energy efficiency and renewables, and Long Island municipalities have become increasingly supportive of efforts to promote clean energy initiatives. The increasing trend of municipal official interest in cleaner energy is evidenced by (1) the active participation in the Greater Long Island Clean Cities Coalition, the Long Island Clean Energy Leadership Task Force and Climate Smart Communities, (2) by the significant number of municipal building efficiency retrofits and conversion of municipal vehicle fleets, and (3) implementation of code changes to require high efficiency for new home construction and establish uniformity for solar PV permits.

In recent years, Long Island homeowners have been responding to public education campaigns regarding energy efficiency and have begun to make changes. In one poll by the Rauch Foundation, it was found that 75% of homeowners indicated that they made at least one investment in their homes to reduce their use of energy.

Promoting energy efficiency and significantly reducing GHG emissions could be achieved through integrated, comprehensive programs to educate homeowners and landlords about the benefits of energy performance upgrades, provide useful information about energy performance to home buyers and tenants, promote market transformation, increase awareness of and support for incentives and rebates, and expand financing options to pay for improvements.

Renewably Sourced Energy

Long Island has a slightly better solar resource than some other regions of New York State and there are significant opportunities on Long Island to continue to expand the adoption of solar energy. The LIPA Solar Pioneer program has spurred the growth of a well-trained, growing solar installation industry. The newly approved (Oct. 2012) program for solar leasing will make solar PV more attractive for customers who cannot afford the initial purchase price of a system. The reduced cost of installing solar PV systems on Long Island (a solar system that would have cost $100,000 ten years ago now costs $30,000) is due largely to national and international trends reducing PV manufacturing costs, but was also supported by this local market transformation strategy to reduce "balance of system" costs. Solar PV is on track (if current trends and financial support for the industry continues to be strong) to achieve parity with LIPA residential electric rates in approximately five years. In addition, the Atlantic Ocean offers significant opportunities for offshore wind power-development. However, Long Island's wind resource is not particularly impressive on-shore, and there is a lack of areas appropriate for large-scale wind power development due primarily to population density.

Source: Molloy College

Green Construction

As Long Island approaches "build out" capacity, improving the performance of the older housing and building stock in the region presents greater opportunities for energy savings and GHG reductions than new construction. Although adopting more stringent energy efficiency new construction codes does not have the same short-term, direct GHG reduction potential as improving efficiency in existing buildings, it does provide a number of benefits. In addition to creating highly efficient new building stock, it develops markets for efficient products, introduces new construction practices and materials to the region, and familiarizes the trade with best practices.

Existing Initiatives and Plans

Long Island municipalities, utilities and NGOs have been early leaders in championing numerous initiatives to promote energy conservation, efficiency and renewable energy. (See *Compendium* in appendix.) A few of the ongoing regional efforts are outlined below:

Long Island Power Authority (LIPA), the public utility, has increased its investment in clean energy and has adopted a vision statement to be a national leader in promoting energy efficiency and renewable energy. LIPA has established the Efficiency Long Island (ELI) program, a ten-year; $924 million plan to eliminate 520 MW of electric demand. LIPA has stated a policy in their most recent Energy Resource Plan that investments in efficiency are their first, best in-

vestment. In 2012 LIPA became first utility in New York State to adopt a Feed-In-Tariff (FIT). It contracted for the largest solar PV array in the eastern U.S. at Brookhaven National Labs, and solar carports throughout Suffolk County. LIPA's Solar Pioneer program, which now provides rebates for owned and leased systems, has provided incentives to almost 6,000 homeowners to install solar PV on their roofs. This has made the region a leader in solar in the state, and placed LIPA consistently in the top ten utilities in the nation for total installed solar PV. LIPA has received the *2013 ENERGY STAR Partner of the Year – Sustained Excellence Award* from the U.S. Environmental Protection Agency in recognition of its continued leadership and achievements in energy efficiency.

Climate Smart Communities Twelve Long Island municipalities have adopted the Climate Smart Communities pledge. These communities are in the process of adopting Climate Action Plans and implementing strategies to promote energy savings, GHG reductions and sustainable job growth.

Long Island Green Homes Consortium Long Island was an early leader in local government efforts to promote residential energy retrofits. The Town of Babylon was a pioneer in establishing a Property Assessed Clean Energy Loans (PACE) program and instituted the Long Island Green Homes program. Currently seven towns participate in the Long Island Green Homes Consortium. The efforts of the Consortium, with the support of NYSERDA and LIPA, have made Long Island a state and national leader in implementing home energy efficiency retrofits and participation in Home Performance with ENERGY STAR.

Greater Long Island Clean Cities Coalition Greater Long Island Clean Cities Coalition (GLICCC) was launched in 1996 to support local decisions to reduce petroleum consumption in the transportation section through the use of alternative fuels, advanced technology vehicles, and fuel economy measures. GLICCC is an active and well organized initiative with almost 50 stakeholder organizations, including most large municipalities and many businesses on Long Island. It has helped to direct tens of millions of dollars in funding to promote the use of clean vehicles on Long Island roads.

L. I. Clean Energy Leadership Task Force The L. I. Clean Energy Leadership Task Force was established in 2004 with the purpose of encouraging Long Island municipalities to lead their residents by example through implementing energy efficiency and renewable energy projects. The Task Force, which is organized by the Sustainability Institute at Molloy College, hosts half-day conferences three times a year, attended by local government officials and staff, where presentations are made on new clean energy technologies, funding and financing options, codes, and case studies of successful energy projects. Through the Task Force, municipalities can share information and ask each other questions about their experiences in implementing clean energy. One outcome of the Clean Energy Leadership Task Force was the development of the ENERGY STAR Homes code for new residential construction, and its adoption by 10 of 13 Long Island towns. Unified Solar Permitting, which has now been adopted by most Long Island towns, was also initially discussed at Task Force meetings.

Financing opportunities

Residents, businesses, municipalities and institutions are encouraged to investigate and monitor financing opportunities which can include low interest loans, grants, rebates and tax incentives. Specific opportunities available for the region include:

LIPA offers a wide variety of rebates and incentives promoting energy efficiency for commercial customers including existing buildings and new construction including lighting upgrades, cool roofs, compressors, HVAC, kitchen equipment and green building design. Municipalities and non-profits are also eligible for these rebates. Commercial, municipal, and non-profit organizations are also eligible for rebates including installation of renewables such as solar, wind or geothermal energy. On-bill recovery is available to residential and small commercial customers as a way to obtain low interest financing for energy efficiency upgrades. NYSERDA provides the financing and LIPA collects the loan payments through monthly electric bills.

North Hempstead Platinum LEED Certified "Yes We Can" Community Center.
Source: racanelliconstruction.com

LIPA Home Performance Direct provides comprehensive home assessments (energy audits) at no cost[2] and includes identification of energy efficiency savings, and provides energy efficient light bulbs and duct sealing for customers with central air conditioning.

Leased solar photovoltaic (PV) systems are now eligible for LIPA rebates. Through leasing, residential customers can finance a solar system installation at no up-front cost while paying monthly charges for the amount of solar-generated electricity consumed by the residence. A residential customer can also buy a solar system outright and receive rebates. LIPA's CLEAN Solar Initiative feed in tariff is a LIPA program that pays the owners of mid-to-large, solar PV systems a fixed rate for electricity generated. This type of agreement can assist the owner in obtaining financing.

NYSERDA provides a number of program offerings on Long Island and coordinates with LIPA through many offerings such as the Green Jobs-Green New York program and the Home Performance with ENERGY STAR. NYSERDA provides performance based incentives to manufacturers and data centers that implement cost effective natural gas and process improvements saving more that 10,000 MMBTu annually. for small and large businesses.

Weatherization Assistance Program is a federal initiative to install energy efficiency measures in the homes of low-income renters and homeowners that is offered through New York State Homes & Community Renewal and administered locally by Community Development Corporation of Long Island.

National Grid offers a number of rebates for commercial and residential gas heat customers for the installation and purchase of specific items such as furnaces, insulation, water heaters, thermostat and boiler controls and ENERGY STAR certified commercial kitchen equipment.

Greater Long Island Clean Cities Coalition is a non-profit that engages government and industry partners to promote transportation energy efficiency through providing grants for retrofit of petroleum-dependent vehicles to compressed natural gas (CNG) and the purchase of alternative fuel vehicles. GLICCC has worked with NYSERDA on CNG fleet promotion and with LIPA to develop a rebate program for the purchase of plug-in hybrid and electric vehicles.

NY Green Bank is a program proposed by the New York State Governor in 2013. Currently under development, it is intended to leverage public and private capital for investments in energy efficiency. While the state has not yet established this bank, the region should monitor developments in order to be in best position to take advantage of the program. Connecticut's Clean Energy Finance and Investment Authority (CEFIA) is currently operating and could be tracked for understanding how the NY Green Bank may function.

Property Assessed Clean Energy Loans (PACE) were pioneered in the Town of Babylon, which has been financing residential energy efficiency improvements through benefits assessments. New York State has passed legislation enabling municipalities to adopt PACE. If the current federal lawsuit challenging a Federal Housing Finance Agency's policy that undermines PACE is successful, more municipalities could emulate Babylon's program.

2 Comprehensive home assessments are provided through NYSERDA's Green Jobs-Green New York Program.

Sustainability Indicators

Energy use in the built environment generates 23,696,768 MT CO_2e per year or 65.6% of Long Island's GHG emissions. The Sustainability Indicators selected for this undertaking will provide the basis for measuring progress.

GHG emissions per dollar of gross regional product

- **Baseline 2010** 0.27 kg CO_2e/$ gross regional product (GRP) MMBtu per capita[3]
- **Target 2020** 0.23 kg CO_2e/$ gross regional product (GRP) MMBtu per capita (15% reduction from baseline)

Regional electricity grid fuel mix

- **Baseline 2010** Gas 43%, Nuclear 11%, Energy Efficiency 4%, Refuse 4%, Renewables 3%, Residual Oil 2%, Distillate Oil 1%, Purchases (ISO-NE, NYISO, PJM) 32%[4]
- Municipalities on Long Island do not have direct control over grid fuel mix, so targets for most sources are not being proposed. LIPA has not adopted official targets for efficiency and renewables as a percentage of their grid mix, and is not covered under the State Renewable Portfolio Standard (RPS), but they have set a goal of reducing peak demand by 520 MW through these measures by 2018. Targets are proposed for increasing renewables to 16.5%, and efficiency to 10%.

Reduction in annual energy use per end use

- **Baseline 2010** 155,203 Mega-Watt hours (MWh) (saved through LIPA rebate programs for electricity only). Savings for oil/gas associated with 2 programs expected from LIPA.[5]
- **Target 2020** 776,000 MWh (Based on LIPA Efficiency Long Island (ELI) target for 2018, combined with Plan strategies.)

Regional energy consumption per capita

- **Baseline 2010** 384.39 MMBtu per capita
- **Target 2020** 345.99 MMBtu per capita (10% reduction from baseline)

3 *Regional Tier II LI GHG Inventory, baseline 2010 (2012)*
4 *LIPA Energy Plan (2010)*
5 *LIPA Efficiency Long Island Annual Report 2011*

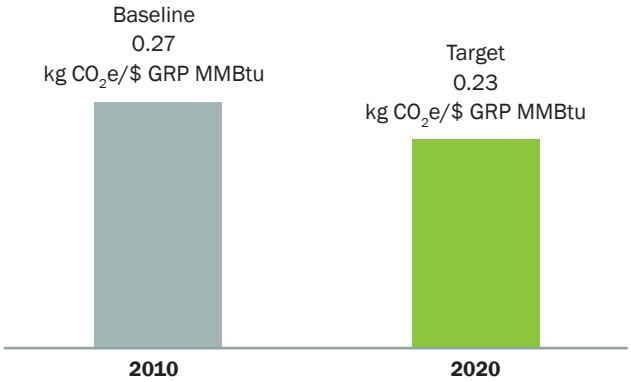


Figure 11 **GHG Emissions per Dollar of Gross Regional Product**

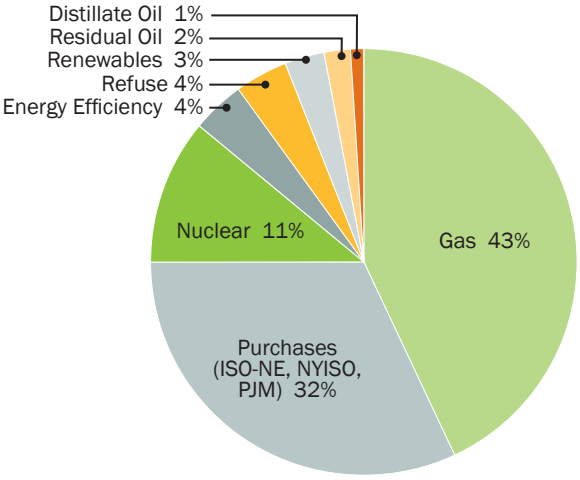


Figure 12 **2010 Regional Electricity Grid Fuel Mix**

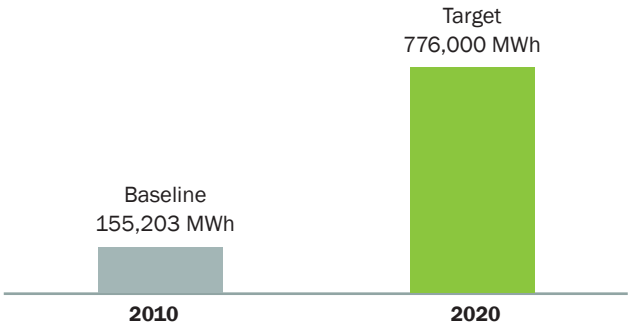


Figure 13 **Reduction in Annual Energy Use**

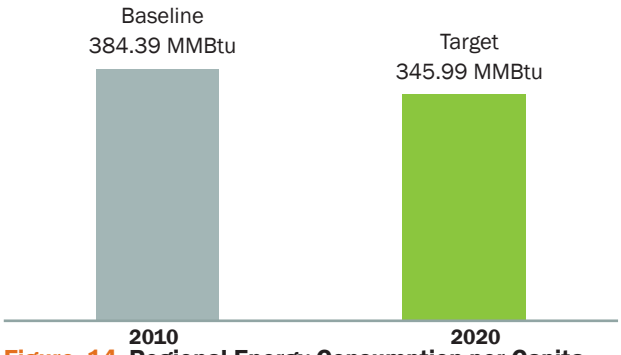


Figure 14 **Regional Energy Consumption per Capita**

Goals and Strategies

In developing a regional energy strategy and aligning energy conservation programs, Long Island can realize an affordable, reliable and diverse low-carbon energy supply. Long Island has the potential to be a leader by breaking new ground in energy research, rolling out sustainable energy strategies on the ground, and developing a trained workforce that is at the leading edge of technological innovation. Leveraging and aligning NYSERDA, LIPA, and NYPA clean energy programs has been an effective strategy to finance clean energy projects. The primary challenge identified by the Energy Working Group is bringing efficiency and renewable programs to scale by promoting awareness of the regional importance of clean energy, driving program participation, and fostering market transformation that moves clean energy measures from the 'early adopter' phase into the mainstream.

The following is a description of the energy goals and the strategies selected to achieve the sustainability goals that were articulated by the Energy Working Group in collaboration with the Steering Committee and technical consultants.

The list of strategies was prioritized though an iterative process to identify those key strategies that represent the interests and ambitions of the community. The CGLI Plan emphasizes energy efficiency projects for existing buildings on Long Island because these projects are easy to implement, create immediate benefits, and sustain long term results. Taking action to reduce energy use in existing buildings, paired with clean and renewable power generation, and a low-carbon approach to transportation will create a higher quality of life and increase health and well-being for Long Islanders while ensuring a more sustainable future. The energy goals and strategies are summarized on Table 12.

Table 12 Energy Goals and Strategies (continued on next page)

	Align w/ LIREDC Goals	Adapt to Climate Change
Goal 1 Improve energy efficiency of existing residential building stock.		
Strategy 1.1 Require Energy Performance Certificates at point of sale or rental.		x
Strategy 1.2 Continue to develop, evolve, and expand outreach and education campaigns to promote energy efficiency and renewable programs and basic energy efficient behaviors (such as use of a comparative billing software).	x	x
Goal 2 Improve energy efficiency of existing commercial building stock.		
Strategy 2.1 Require annual energy benchmarking for all non-residential buildings over 25,000 sq ft (approximately 3,500 existing buildings).		x
Strategy 2.2 Require energy audits every 5 years for all non-residential buildings over 25,000 sq ft (approximately 3,500 buildings).		x
Strategy 2.3 Encourage use of energy alignment clause in leases.		x
Strategy 2.4 Encourage energy conservation education for building owners, property managers and real estate community.	x	x
Goal 3 Improve energy efficiency of new building stock.		
Strategy 3.1 Promote adoption of more stringent local Energy Efficiency Construction Code by municipalities. (Home Energy Rating System for residential, International Green Construction Code for commercial).	x	x
Strategy 3.2 Provide incentives (such as property tax waivers) for new homes that meet the Passive House standard.		x
Strategy 3.3 Provide enhanced sustainable and energy conservation training of design professionals.	x	x
Goal 4 Double local renewable energy generation by 2020.		
Strategy 4.1 Develop and encourage municipal adoption of "Solar ready" code requirements for new construction so that retrofitting photovoltaic or solar hot water is structurally easy and cost-effective.	x	x
Strategy 4.2 Call for municipalities to require a feasibility study of renewables and/or combined heat and power for new commercial development over 25,000 sq ft with the installation of a minimum 30% of electric demand (or equivalent) through renewables.	x	x

Table 12 Energy Goals and Strategies (continued from previous page)	Align w/ LIREDC Goals	Adapt to Climate Change
Strategy 4.3 Standardize permit process for renewable energy commercial projects.	x	x
Strategy 4.4 Encourage geothermal heat pump projects through education and incentives. Develop an incentive program for replacing fuel oil boilers with natural gas or ground source heat pumps (where no gas supply available) that leverages or enhances existing LIPA rebates.	x	x
Strategy 4.5 Develop a series of regular conferences on adoption of renewable energy on Long Island.		x
Goal 5 Lead by example and improve energy efficiency of municipal buildings, fleets and other operations (20% by 2020).		
Strategy 5.1 Promote and implement energy efficiency improvements in municipal facilities, including street lighting, traffic lights, parking lot and park lighting and wastewater facilities.	x	x
Strategy 5.2 Promote and implement energy efficiency improvements across LI school buildings through cost-effective, shared services for audits and retrofits.		x
Goal 6 Increase market penetration of electric, plug-in hybrid, and other low-carbon alternative fuel vehicles (30% by 2020).		
Strategy 6.1 Expand and develop electric vehicle charging and mapping infrastructure and enhance grid services to allow widespread charging capacity for electric vehicles.	x	x
Strategy 6.2 Create and promote incentives for electric vehicles and alternative fuel vehicles both for private sector and for municipal fleets.	x	x
Goal 7 Encourage innovation and adoption of 21st century technologies that increase the capabilities of the electric grid.		
Strategy 7.1 Encourage research and pilot programs to advance smart grid technologies, controls and improved renewable energy forecasting that can enhance the security and integrity of smart grid infrastructure.	x	x
Strategy 7.2 Support efforts to increase the efficiency, reliability, and resilience of the grid (transmission and distribution), including its capacity for self-monitoring and self-repair, and adapt to the challenges presented by the addition of electric vehicles as a new energy demand on the grid.	x	x

Goal 1 Improve energy efficiency of existing residential building stock.

Strategy 1.1 Require Energy Performance Certificates at point of sale or rental.

Description and Intent This low-cost strategy targets residential energy GHG emissions, the largest single portion of the region's GHG emissions, by requiring homeowners or landlords to issue energy performance certificates (EPCs) at the point of sale or rent. The time of home sale/rent is one of the few intervention points that municipalities have to encourage existing homeowners (or landlords) to upgrade homes.

An EPC reports the results of an assessment of a home's energy performance that would be carried out using a program like the U.S. Department of Energy's Home Energy Score. LIPA and the Town of Babylon are already DOE Home Energy Score Partners using the Home Energy Scorecard, which identifies low-cost energy efficiency upgrades and shows the savings that could be expected if those measures were installed.

This strategy is seen as a market transformation tool at a time when Long Island needs to engage with a large segment of the homeowner demographic who have yet to act on energy efficiency measures voluntarily beyond easy measures such as energy efficient light bulbs. While this strategy would not require homeowners to make specific upgrades, EPCs are seen as way to change behavior, by educating the home purchasers about the cost benefits from energy efficiency improvements and stimulating the region's residential energy efficiency market. Awareness of energy performance and potential benefits yielded from energy efficient investments, such as lower utility bills and potential for increased competitiveness in the housing market, can incentivize people to consider the cost of utilities for a home as a factor in purchasing or renting a home. People often undertake home improvements when they first move in so it can be very effective to align awareness of energy performance with the point of purchase in order to incorporate energy improvements in the plans and financing.

Obstacles Real estate brokers and agents, who may think this will pose a challenge to the home sales or rental market, should be involved in the development of the program to enhance their understanding of how home energy scoring can sustain or strengthen the housing market. Early adoption may actually make a town a more attractive place to live, if energy bills are demonstrably lower. It will add a slight cost at the point of sale in order to have a qualified person to assess the home's energy performance and assign a score. No legal obstacles have been identified. Outreach materials about the requirement can focus on the rebates available to help fund improvements, as well as the short payback that is possible from low cost energy efficiency improvements.

Opportunities With approximately 19% of residential housing expected to turn over through sale or rent by 2020, implementation of this measure across the Island could provide a significant boost to residential energy efficiency.[6] The roll-out of a home audit and rating program could contribute to job creation for qualified assessors, and for home improvement contractors as it stimulates demand for energy retrofits.

EPCs can be the first step towards encouraging homeowners and towns to consider requiring housing stock to be bought up to a minimum through adopting a Residential Energy Conservation Ordinance, although State legislation may be necessary to permit such an ordinance.

Policy Mechanism Mandatory

Target(s)

- 1 jurisdiction to have EPC requirement in place within 2 years
- Area containing 50% of LI population to have EPC requirement in place within 5 years
- Whole Island to have adopted EPC requirement by 2020.

GHG Emission Reduction Potential
108,930 MT CO_2e

Emission Reduction Assumptions Turnover of stock (rental and owner occupied) assumed to be 19% by 2020. Assume that 25% of these implement measures suggested by the EPC.

6 Long Island has approximately 1,000,000 housing units, with single family homes comprising 79% (791,534) of the residential housing stock. (ACS Survey 2010)

Recommended Actions	Key Stakeholders
Confirm that the DOE Home Energy Score is the appropriate rating system to use http://homeenergyscore.lbl.gov/	NYSERDA, LIPA
LI municipalities to become Energy Score Partners (note that LIPA and Babylon are already Home Energy Score Partners); Identification of the number of home energy auditors on Long Island	Permits and Zoning / Building Departments (or equivalent) of Municipalities, LI Clean Energy Task Force, LI Green Homes program, LIPA
Identify one or two municipalities to be pilots for rolling out EPC requirement and ensure clear communications about EPC benefits.	Sustainability Institute at Molloy College
Work with remaining Municipalities to pass legislation to require an EPC to be part of home selling process.	County and municipal leadership, LIPA, Sustainability Institute at Molloy College

Strategy 1.2 Continue to develop, evolve, and expand outreach and education campaigns to promote energy efficiency and renewable programs and basic energy efficient behaviors (such as use of a comparative billing software).

Description and Intent While over 40,000 Long Island homeowners have participated in residential energy efficiency programs (LIPA, LIGH) since 2006,[7] many people still do not realize that small behavior changes and low-cost energy efficiency measures can have a significant impact on their utility bills. In one town (Babylon), the average energy bill savings for homeowners in the Long Island Green Homes Consortium (LIGH) has been $1,084 per year, approximately 20% of home energy costs. Research by O Power has shown a 3% energy reduction through behavior change alone.

A key part of this outreach campaign would be to extend the LIGH program to communities throughout the Island, ensure funding continues to support the program and raise awareness about existing rebate programs available to Long Island residents. LIGH helps homeowners get comprehensive home energy audits and make cost-effective energy upgrades to their home. This builds on existing programs and should be relatively straight forward to implement.

7 *LIPA, 2013*

Source: Regional Plan Association

Obstacles LIPA's rebate programs and other community outreach programs like LIGH require funding for educating residents and incentivizing behavior change. This outreach strategy requires creation of additional partnerships between LIPA and outreach partners as well as creative thinking for how to engage the community in taking up recommended actions emerging from energy audits and rebate incentives.

Opportunities National Grid has already partnered with an organization called O Power that helps inform residents about how their gas usage compares with neighbors and other similar sized homes. The program also identifies simple steps which homeowners can take to reduce their bills, resulting in an average annual savings of $20 for upstate NY customers. LIPA has recently contracted with Renewable Energy Long Island to provide outreach services. LIPA also provides an online tool for homeowners to perform self-assessments of their home's efficiency.

Policy Mechanism Outreach/education; Incentivize

Target(s)

- An increased usage rate of LIPA rebates.
- All towns on the Island join the LI Green Homes Consortium program.
- Comparative billing available to all LI customers of electricity and gas by 2020.
- Exceed current LIGH goal of 2,500 energy audits per year, of which 50% convert to retrofits.

GHG Emission Reduction Potential

123,301 MT CO_2e

Emission Reduction Assumptions 10% of population is using comparative energy use, feedback, or billing program by 2020 - achieving 3.8% savings. Expansion of Long Island Green Homes program assuming current annual retrofits quadruples from current 1250 annual retrofits.

Recommended Actions	Key Stakeholders
Collaboration with LIPA, National Grid and NYSERDA to extend existing outreach campaign.	Municipalities, NYSERDA, LIPA, National Grid, LIGHC, Renewable Energy Long Island
Identify geographic areas where rebates have not been utilized significantly yet.	LIPA, National Grid, NYSERDA and municipalities
Identify community champions to help get the word out through existing community organizations and activities.	LIGHC, Home Performance contractors, Renewable Energy Long Island
Encourage municipalities not part of the LI Green Homes Consortium to join.	LI municipalities, Renewable Energy Long Island
Confirm continued funding for LI Green Homes Consortium with NYSERDA, LIPA and National Grid. Seek new funding sources for the Consortium.	NYSERDA, LIPA and National Grid. Other government and foundation funders.
Review outreach plan for the program to ensure it is reaching appropriate parts of the LI community and to build on existing outreach successes in current participating towns. The outreach plan could include, for example, a few free home makeovers for energy efficiency with before and after results featured in local newspaper, TV, etc.	LIGHC, Renewable Energy Long Island
Work with National Grid and LIPA to understand and promote access of LI customers to comparative billing.	Sustainability Institute at Molloy College, LIGHC, Renewable Energy Long Island

Goal 2 Improve energy efficiency of existing commercial building stock.

Strategy 2.1 Require annual energy benchmarking for all non-residential buildings over 25,000 sq ft (approximately 3,500 existing buildings).

Description and Intent Long Island's commercial buildings, approximately 25,000 buildings in total covering 390 million sq ft, comprise 25% of GHG emissions. This strategy requires all non-residential buildings over 25,000 sq ft (approximately 3,500 buildings) to benchmark and report energy usage data using the existing EPA Portfolio Manager tool. EPA Portfolio Manager is a no-cost tool that is used by building owners/landlords for inputting energy data for a building and comparing energy performance with other similar buildings. Benchmarking will enable building owners, managers and the marketplace to see how a building's total energy use and energy use per square foot compares to buildings of similar size, location and type of use. This baseline of information can empower owners to see the potential for cost-effective energy efficiency upgrades and can stimulate market demand for more efficient buildings. Disclosure of a building's energy performance can enable owners and managers to differentiate their building from others in the marketplace by informing potential buyers and tenants about the building's energy performance, as well as clearly identifying high performance buildings for tenants looking for a new space.

This strategy is increasingly being used by cities in the U.S. (and beyond) as a market transformation mechanism to incentivize commercial building owners and tenants to value the energy performance of their building. In 2012, New York City implemented mandatory benchmarking for its large buildings over 50,000 square feet, which consume approximately 45% of the City's energy (NYC Mayor's Office). The initial report from the New York City experience shows that if all comparatively inefficient large buildings were brought up to the median energy use intensity in their category, the energy consumption in the city's large buildings could be reduced by roughly 18% and GHG emissions by 20%.[8] One recommendation from the NYC program is that benchmarking would be streamlined if the utilities were to automatically upload electrical and gas data directly into the EPA Portfolio Manager. Energy performance benchmarking will be required for all non-residential buildings over 5,000 sq ft in the State of California by July 2014.

Obstacles There may be resistance from building owners who may object to the reporting requirement. Also, the limited capacity of building managers to use the ENERGY STAR® Portfolio Manager may be seen as a concern. However, lessons from New York City show that basic trainings offered by the City, along with streamlined utility company reporting can overcome this obstacle. The benefits of understanding a building's energy performance will be a central part of outreach activities to support this strategy.

Opportunities Buildings that receive high ratings can be recognized by municipalities, utilities and the real estate community. Also, a highly favorable energy performance rating can enable a building to achieve EPA certification, which can strengthen the marketability of a building for lease/rent or sale. LIPA provides funding for commissioning on large projects, which helps ensure that building owners and tenants realize the potential savings from efficient design and construction.

Policy Mechanism Mandatory

Target(s)

- Adoption of a benchmarking ordinance by 90% of LI jurisdictions by 2020
- 75% compliance with the law across the Island by 2020

GHG Emission Reduction Potential
59,030 MT CO_2e

Emission Reduction Assumptions Assume 25,000 sq ft buildings only (46% of the floor area of commercial buildings on LI), and that 10% of those implement retrofits by 2020.

Recommended Actions	Key Stakeholders
Confirm typology and sizes of buildings to be affected by mandate.	Building Managers and Operators Association (BOMA), Permits and Zoning / Building Departments (or equivalent) of municipalities

8 *New York City Local Law 84 Benchmarking Report, NYC Mayor's Office. 2012.*

Recommended Actions	Key Stakeholders
Confirm reporting tool to use (ENERGY STAR® Portfolio Manager is suggested).	As above
Confirm whether the benchmarking data should be publicly available, made available at point of lease or sale, or just reported to the city.	As above
Pass local laws or ordinances to mandate the benchmarking requirement.	Town, city and village boards
Provide training and support to local consultants / building operators on how to use ENERGY STAR®.	As above
Working with utilities to facilitate direct uploading of utility demand into the benchmarking tool.	LIPA, National Grid, BOMA

Strategy 2.2 Require energy audits every 5 years for all non-residential buildings over 25,000 sq ft (approximately 3,500 buildings).

Description and Intent This strategy requires energy audits to be conducted for the region's largest buildings. The audits will help to identify what energy efficiency opportunities exist in their buildings. However, this strategy does not require building owners or managers to implement any actions identified through the audit.

It is assumed that many owners will choose to implement the no and low cost energy efficiency improvements identified as part of an energy audit, due the near-term operational cost savings. This strategy would support green job creation goals.

Obstacles Resistance from building owners to this requirement may occur. Up-front capital cost of the audit could be a limiting factor to compliance.

Opportunities If a building earns an ENERGY STAR® rating or other recognized levels of energy performance, it could be exempted from this audit requirement, or the time period between audits could be extended. Small non-profits and businesses which would be included under this strategy can utilize LIPA utility bill savings to finance energy efficiency upgrades. The NYSERDA FlexTech program offers free energy audits to small businesses (under 100 employees) and not-for-profit entities, which have electric demand of 100 kW or less. This can lessen the financial impact of required audits on businesses and organizations that might have large facilities but limited financial resources.

Policy Mechanism Mandatory

Target(s)

- Adoption of an energy auditing requirement by 100% of LI jurisdictions by 2020
- 75% compliance with the law across the island by 2020.

GHG Emission Reduction Potential
147,575 MT CO_2e

Emission Reduction Assumptions Assume 25,000 sq ft buildings only (46% of the floor area of commercial buildings on LI), and that 25% of those implement retrofits by 2020.

Recommended Actions	Key Stakeholders
Confirm typology and sizes of buildings to be affected by mandate.	BOMA, Permits and Zoning / Building Departments (or equivalent) of Municipalities
Identify and confirm availability of energy auditors on the island. Work with training providers and colleges if a deficit of trained individuals is identified.	Universities, job training entities, Building Performance Contractors Association, Efficiency First
Consider adding a retro-commissioning requirement at later date.	Permits and Zoning / Building Departments (or equivalent) of Municipalities

Strategy 2.3 Encourage use of energy alignment clause in leases.

Description and Intent Commercial buildings that lease space to numerous tenants have limited incentive to pay for major capital expenses, such as energy retrofits, because most of the savings from reduced energy usage are realized by the tenant. Energy alignment lease provisions can encourage commercial landlords and tenants to share the costs and benefits of energy saving measures. This strategy calls for the development and promotion of energy alignment clauses throughout the commercial lease and rental sector. Also, the signing of a lease is one of the few points of intervention for municipalities to affect the energy efficiency of the existing building stock.

Obstacles Buy-in from Building Owners and Managers Association (BOMA) Long Island and other real estate groups

would be helpful for ensuring these clauses can be widely used. This process may meet resistance as it requires an amendment to the existing leasing language as well as modified transactional arrangements as owners and renters share energy savings. Since this strategy is voluntary, the opposition of some will not prevent others from moving forward. Any amendment to a commercial lease can be seen as technically complicated, so educating businesses will be necessary. If a few large commercial property owners adopt these clauses, their efforts can be used as examples for others to follow.

This may require installation of sub-meters to track specific tenant usage. Introduction of modified leases requires time and expertise to help landlords and tenants understand terms and conditions. Municipalities can lead by example, through adopting such lease language in new properties that they move into (or control). BOMA's release of a green lease guide in 2008 to address commonly cited barriers to implementing green building practices represents industry acceptance. The guide serves as a legal-language tool to help building owners and managers maintain a green building through operations and management practices. The BOMA guide also educates brokers and tenants about what is expected of tenants in a high-performance green building and the responsibilities of all parties involved in the on-going efforts to keep it green and encourage continuous improvement.

Opportunities This policy may be seen as very attractive by landlords given the sharing of costs it provides for investments in energy efficiency improvement to their properties.

Policy Mechanism Voluntary

Target(s) 10% of commercial properties that turnover by 2020 to have signed a green lease.

Recommended Actions	Key Stakeholders
Identify model green lease language in partnership with BOMA and other real estate groups to be promoted on Long Island.	BOMA, local U.S. Green Building Council (USGBC) chapter, municipalities (department dependent on town organization)
Identify and work with large building landlords on LI as pilots for adopting lease language.	USGBC
Work with jurisdictions to agree to require green leases for any new buildings they wish to lease.	Municipalities, Sustainability Institute at Molloy College

Strategy 2.4 Encourage energy conservation education for building owners, property managers and real estate community.

Description and Intent This strategy promotes existing and new training programs about energy efficiency credentialing and certifications for commercial and residential property manager, trade and related professional groups. Managers would be incentivized to participate because the sessions would offer prudent steps for containing operating and maintenance costs. The training would also promote existing LIPA and National Grid energy efficiency rebates and services, and help to grow an engaged constituency for implementing the energy efficiency strategies recommended in this plan.

Obstacles A funding stream is needed to support the training. Private public partnerships or sponsorships for providing the training could be pursued with appropriate energy efficiency technology or service companies.

Opportunities Outcomes from these trainings can complement numerous strategies and education needs identified throughout this plan including EPA Portfolio Manager and ENERGY STAR® certification.

Policy Mechanism Outreach/education; Voluntary

Target(s) Running of five training courses a year to reach a minimum of 100 building manager professionals per year across Long Island.

Recommended Actions	Key Stakeholders
Identify existing training programs available on the Island through BOMA LI, USGBC, etc.	BOMA, educational institutions focused on green skills and green jobs training
Develop outreach program on training to reach building owners, property managers and the real estate community.	BOMA, USGBC, educational institutions focused on green skills and green jobs training

Goal 3 Improve energy efficiency of new building stock.

Strategy 3.1 Promote adoption of more stringent local Energy Efficiency Construction Code by municipalities. (Home Energy Rating System for residential, International Green Construction Code for commercial).

Description and Intent Mandating buildings codes that require specific levels of energy performance can be most cost-effective and achieve significant GHG reductions when the codes inform the design and construction of new buildings. It is important that new homes are built as energy efficient as possible, given that they will be in place for an average of at least 50 years.

A number of towns have already successfully adopted a Home Energy Rating System (HERS) requirement (Babylon, Brookhaven, Hempstead and Huntington) or ENERGY STAR® for New Homes requirement. A Home Energy Rating requirement adopted by municipalities provides builders and home buyers with a minimum energy efficiency performance target for new homes. When builders are required by codes to meet standards that are closer to the level required by the voluntary ENERGY STAR Homes program and to engage a HERS rater for all homes they build, there is less of an incremental cost to meeting the ENERGY STAR standards and capturing the incentive provided by LIPA. This can spur participation in LIPA's rebate programs, encouraging builders to meet even greater efficiency. The rating can also promote market transformation as it enables comparison among different new homes. Although there is no similarly rigorous rating system for existing homes, requiring EPCs based on the U.S. DOE Home Energy Score at point of sale for both new and existing homes, as recommended in Strategy 1.1, will allow for homebuyers to make comparisons among all homes.

For commercial buildings, if the New York State Fire Prevention and Building Code Council completes approval and adoption of the International Green Construction Code (IgCC), then there is an option for municipalities to adopt the code individually.[9] Once adopted by the State, each municipality should ensure adoption and compliance with the updated code.

Obstacles Resistance from building industry is likely. Jurisdictions will need regulatory authority to ensure compliance with the new codes. Appropriate regulations and training can help overcome these obstacles.

Opportunity Adoption of these performance standards can expand green job opportunities for trained construction workers and HERS raters.

Policy Mechanism Mandatory

Target(s) Ten of thirteen towns on Long Island adopt more stringent codes for both residential and commercial construction by 2020.

GHG Emission Reduction Potential 98,652 MT CO_2e

Emission Reduction Assumptions Assumes 2012 IECC is 30% better than 2006 standard, and 2015 IECC is better than 2015 standard.

Recommended Actions	Key Stakeholders
Pass local laws adopting new code requirements.	Municipalities, municipal building engineers
Train town building department employees on new requirement.	Energy code trainers/ educator institution; LI-USGBC chapter
Education and training programs for building industry on new requirements to ensure that IgCC standards are compiled with adequately.	Energy code trainers/ educator institution; LI-USGBC chapter
Expand training opportunities for HERS raters.	Educational institutions focused on green skills and green jobs training

9 Note, if the IgCC is not adopted at the state level, local communities have the authority to adopt higher more restrictive standards than the state building code as authorized by Article 18 of the Executive Law, and more restrictive standards than the state energy code as authorized by Article 11 of the Energy Law. NYS Department of State Division of Code Enforcement and Administration's general review of the IgCC has found that there are some provisions that would fall under Article 18 of the Executive Law, some provisions that would fall under Article 11 of the Energy Law, and some provisions that would neither fall under Article 18 nor Article 11. Personal communication, Dorothy Harris, International Code Council, April 2013.

Strategy 3.2 Provide incentives (such as property tax waivers) for new homes that meet the Passive House standard.

Description and Intent Encouraging the construction of passive house or low-energy homes provides demonstration of building practices, materials, principles and technologies that can be implemented more widely. The passive house approach is one designed to optimize thermal benefit through thick insulation, solar gain and airtight construction that reduces a building's space heating demand. These demonstration activities also enhance a community of design and construction professionals and trades-people familiar with building high performance homes.

Demonstration of non-traditional, local building approaches can raise awareness of feasible building types for the LI region. Property tax waivers or reduced property tax assessments for homes meeting a passive house standard may incentivize low-energy new construction and transform the market to increase cost-effectiveness of passive house construction.

Obstacles Property tax waivers can be politically challenging to implement. However it should be noted that in mid 2012 Governor Cuomo signed legislation which authorizes local governments or school districts to provide a real property tax exemption for new green building or renovation projects by local law, ordinance, or resolution. A lack of local builders trained in passive house techniques can limit cost competitiveness.

Opportunities Promotion of passive house awareness-raising among the real estate and building communities may stimulate local demand which could create new jobs. A partnership could be created with New York Passive House (NYPH) a local organization set up to promote the Passive House building energy standard in NYS and the NYC metropolitan area, via public outreach, education, support of industry professionals and advocacy.

Policy Mechanism Outreach/education; Demonstration

Target(s)

- 5 Long Island towns or cities adopt programs to provide multi-year property tax waivers or other incentives for homes constructed to Passive House standards by 2020.
- 25 homes constructed to Passive House standards on Long Island by 2020.

Recommended Actions	Key Stakeholders
Pass local law providing tax waivers or other incentives.	Municipalities, NYPH
Train town building department employees on Passive House standard.	NYPH
Education and training programs for building industry.	NYPH

Strategy 3.3 Provide enhanced sustainable and energy conservation training of design professionals.

Description and Intent This strategy would promote existing and new training programs that enhance the sustainable design skillset of design professionals. The training would also promote existing LIPA and National Grid energy efficiency rebates and services for new construction.

Obstacles A nominal funding stream would be needed support training program.

Opportunities Industry sponsorship could be sought, alongside LIPA, NYSERDA, National Grid funding. Also, alignment with sustainability-focused education institutions in the region may provide productive training and design implementation partnerships.

Policy Mechanism Outreach/education; Incentive

Target(s) Conduct 2 training courses a year to reach a minimum of 30 building design professionals.

Recommended Actions	Key Stakeholders
Identify existing training programs available on the Island through USGBC, etc.	USGBC Long Island, AIA, ASCE and other professional and trade organizations, educational institutions focused on green skills and green jobs training
Develop outreach program on training to reach design professionals.	SUNY Stony Brook, Sustainability Institute at Molloy College, USGBC, educational institutions focused on green skills and green jobs training

Goal 4 Double local renewable energy generation by 2020.*

Strategy 4.1 Develop and encourage municipal adoption of "Solar ready" code requirements for new construction so that retrofitting photovoltaic or solar hot water is structurally easy and cost-effective.

Description and Intent Long Island's dependence on off-Island energy generation limits the region's resilience in the event of supply disruptions or increased fuel costs. Designing and constructing new buildings to be suitable for installing solar can make the retrofitting of solar more cost-effective and attractive, with little to no added cost to the builder. This strategy also builds upon LIPA's existing Solar Pioneer, Solar Entrepreneur and Feed-in Tariff (FIT) programs. Demand for participation in these programs demonstrates that there is a growing market for generation of solar energy on Long Island.

Obstacles Opposition from building industry is likely. Municipalities will need staff or funding support to develop the code.

Opportunities Solar industry sponsorship could be sought, alongside LIPA, NYSERDA, National Grid funding to develop a model code for the region which can be adopted and amended as necessary by local jurisdictions.

Policy Mechanism Mandatory

Target(s)

- One jurisdiction to have solar ready requirement in place within 2 years.
- Area containing 50% of LI population to have solar ready requirement in place within 5 years.
- Whole Island to have adopted solar ready requirement by 2020.

GHG Emission Reduction Potential 178,012 MT CO_2e (this figure includes savings from all renewables policies, including outreach regarding solar leasing etc.).

**Overall it has been assumed that the combination of strategies outlined will help progress the installation of residential systems and commercial systems, in combination with LIPA's Feed-In-Tariff, rebates for solar systems and the availability of third party leasing. It has been assumed there will be 24,000 residential systems installed by 2020, and an extra 100MW of commercial systems.*

Source: Molloy College

Emission Reduction Assumptions 2.5% single family homes will have a 6 kW systems by 2020 (currently 0.6% or approx. 6000 systems); an additional 100 MW in total systems for commercial (currently approx 50MW assumed to be in place).

Recommended Actions	Key Stakeholders
Establish suitable criteria for what should constitute 'solar ready' through researching best practices.	LI Clean Energy Task Force, LIPA, Renewable Energy Long Island
Learn about solar ready policy being developed by Brookhaven Clean Energy Task Force.	Brookhaven Clean Energy Task Force, LIPA, national association of home builders (LI program)
Pass local laws adopting "solar ready' requirements.	Municipal building/Permits and Zoning departments

Strategy 4.2 Call for municipalities to require a feasibility study of renewables and/or combined heat and power for new commercial development over 25,000 sq ft with the installation of a minimum 30% of electric demand (or equivalent) through renewables.

Description and Intent New commercial developments over 25,000 sq ft can benefit from diversified approaches to power and heating such as combined heat and power (CHP) and renewable systems. CHP generates electricity and heat more efficiently than the grid and can be a suitable technology for mixed-use developments that have a large relatively constant year-round heat load, particularly those being served by a district energy system (as opposed to individual building heating systems). This strategy calls for municipalities to require large commercial developments to conduct a feasibility study of energy options early in project design as this may identify cost-effective approaches that can reduce their dependence on fossil fuels.

This strategy also calls for new commercial development to meet at least 30% of the electricity demand (or equivalent) through renewable generation. Exceptions will be made where the feasibility study shows that the site or building make this requirement financially unfeasible. This strategy is seen as a market transformation strategy to get developers and their consultants to actively consider potential for renewables on Long Island and to consider using existing incentives such as rebates. Implementation could be phased in, in the first phase requiring only the feasibility study. Information gained from the studies could be used to develop the policy requiring the installation of renewable or CHP generation.

Obstacles The development community may likely resist as they may prefer to not add a requirement to the existing approval process. Upfront capital costs may constrain overall project feasibility.

Opportunities Designing new buildings for renewable energy and / or district energy can hedge against future fossil fuel price rises, and is generally much more cost-effective than later retrofits. Renewable Energy Long Island can support this strategy through education and training. It will also help upgrade skills of contractors and consultants in the field of renewable energy development.

Policy Mechanism Mandatory

Target(s)

- 1 jurisdiction to have clean energy feasibility and installation requirement in place within 2 years.
- 5 jurisdictions to have clean energy feasibility and installation requirement in place within 5 years.
- 10 jurisdictions to have adopted clean energy feasibility and installation requirement by 2020.

Recommended Actions	Key Stakeholders
Work with some pilot projects on LI to develop case studies on how to fulfill the requirement.	Renewable Energy Long Island, Municipal building/ Permits and Zoning departments
Develop best practice guidance.	Renewable Energy Long Island; IDEA; Municipal building/ Permits and Zoning departments
Pass local laws establishing the requirement.	Municipal leaders; Municipal building/ Permits and Zoning departments

Strategy 4.3 Standardize permit process for renewable energy commercial projects.

Description and Intent Providing unified requirements and costs for solar and wind power permitting removes administrative obstacles and time lags which can disincentivize commercial investments in renewables. There has been demonstrated success among Long Island communities in adopting a unified, streamlined residential solar permitting process (i.e. Babylon, Brookhaven, East Hampton, Huntington, Islip, Riverhead, Shelter Island, Smithtown, Southampton, Southold). This model should be expanded to wind and commercial solar projects.

Obstacles Commercial solar installation presents a more complex challenge than residential, because there is greater variety of building types and installations.

Opportunities With LIPA's Feed in Tariff, there will be increased interest in commercial solar installations. Providing a streamlined, unified process for permit approvals will accelerate and enhance the impact of this program. Based on the past effort to create a Unified Solar Code for residential installations, it will be necessary to bring together representatives of many building departments, perhaps with LIPA's leadership. Details of the code must maintain safety as a major concern, while streamlining the permit application process.

Policy Mechanism Incentive

Target(s)

- Unified commercial permitting process for solar systems adopted by all towns and cities.
- Unified wind permitting adopted by all towns with significant wind development potential.

Recommended Actions	Key Stakeholders
Organize task force of municipalities, LIPA and other stakeholders to develop agreement on process.	LIPA, Renewable Energy Long Island, municipal building/permits and zoning departments, Suffolk County Planning Departments
Review best practice in U.S. regarding streamlined permitting to inform taskforce.	Municipal building/permits and zoning departments
Pass local laws to adopt process.	Municipal leaders, municipal building/permits and zoning departments

Strategy 4.4 Encourage geothermal heat pump projects through education and incentives. Develop an incentive program for replacing fuel oil boilers with natural gas or ground source heat pumps (where no gas supply available) that leverages or enhances existing LIPA rebates.

Description and Intent Fuel oil for heating accounts for 14% of the region's emissions. Conversion of fuel oil systems to natural gas (where available) or ground source heat pump (GSHP) technology could provide significant GHG savings. Long Island's balanced heating and cooling load is optimal for GSHP, particularly where there is no access to grid supplied natural gas. This incentive program would focus on fuel oil boilers that are due for replacement. Accelerating the retirement of old, in-ground oil tanks will also reduce the threat to groundwater from oil leaks.

Obstacles Initial expense of systems and well drilling as well as lack of experience with ground source heat pumps in the LI region are key obstacles. Though less carbon intensive than fuel oil combustion, GSHP still requires electricity for powering the pump, so this conversion to GSHP would increase electrical energy use in winter months, while potentially lowering peak summer demand due to it more efficient operation of air conditioning. Funding is needed to incentivize this program and identify target participants.

Opportunities If the electricity to drive the heat pump is supplied from renewable sources then this heating and cooling approach can be considered net zero. GSHP, a newer technology for this region, has expanded considerably in Europe since 2000.

Policy Mechanism Voluntary / Incentive

Target(s)

- Reduction in use of fuel oil in homes on the Island by 15% by 2020.
- Conversion of 5 fuel oil boilers to GSHP within 2 years for incentive program starting in 2015.

GHG Emission Reduction Potential 589,680 MT CO_2e

Emission Reduction Assumptions Current ratio is 44% Natural Gas; 66% fuel oil; assumption is 10% conversion by 2020.

Recommended Actions	Key Stakeholders
Work with LIPA and National Grid on a pilot program for GHSP (see fuel oil boiler measure).	Renewable Energy Long Island, Long Island Geothermal Energy Organization (LI-GEO), National Grid, LIGH
Development of industry, through training.	USGBC, LI-GEO, educational and training institutions
Education of public on technology and existing incentives.	LI-GEO
Consider municipal incentives.	Municipalities
Expand outreach campaigns to encourage residents to switch to natural gas if they are considering upgrading their fuel oil boilers where gas network exists.	National Grid, LIGH Consortium, Renewable Energy Long Island
Work with National Grid to encourage extension of the gas network where possible and cost-effective.	National Grid

Strategy 4.5 Develop a series of regular conferences on adoption of renewable energy on Long Island.

Description and Intent This strategy calls for establishment of a conference/exhibition schedule that promotes adoption and installation of renewables by providing guidance and demonstrations to municipal officials, commercial and residential stakeholders. This annual or biennial forum would enable sharing among stakeholders of lessons learned for permitting, installation, maintenance and operations. Industry engagement would also enable knowl-

edge sharing about new technologies and policies being developed in other communities outside of the region.

Obstacle Leadership and up-front costs needed for hosting and organizing conference.

Opportunity Biennial renewable energy conference on Long Island could be sponsored by renewable industry entities and organized by the region's educational institutions, renewable energy coalitions and municipal leaders.

Policy Mechanism Outreach/education; Incentive

Target(s) Biennial conference on renewable energy on Long Island

Recommended Actions	Key Stakeholders
Review interest in island wide renewable energy conference.	Renewable Energy Long Island, Healthy Planet, Sierra Club, Citizens Campaign for the Environment
Set up steering committee.	
Identify funding/sponsors.	
Organize initial conference.	
Develop and maintain audience with regular contact and information between conferences.	

Source: Molloy College

Goal 5 Lead by example and improve energy efficiency of municipal buildings, fleets and other operations (20% by 2020).

Strategy 5.1 Promote and implement energy efficiency improvements in municipal facilities, including street lighting, traffic lights, parking lot and park lighting and wastewater facilities.

Description and Intent Efficiency improvements in municipal facilities reduce upward pressure on tax revenues as energy prices rise. These improvements also can be used as examples to promote energy efficiency to homes and businesses. Wastewater treatment facilities are among the region's largest single consumers of electricity. Given this magnitude of demand, energy efficiency upgrades integrated with adaptation retrofits to reduce the vulnerability of these plants to flooding may yield significant and cost-effective energy savings.

Street lighting efficiency improvements can yield cost-effective energy savings, often with full payback within five years. Replacing conventional lamps with more energy efficient lamps can reduce energy consumption by 50% per lamp while the addition of photo cells and other lighting controls can provide additional savings and extend the lamp's productive life. Also, lighting on streets and in public areas is highly visible and can increase public awareness and acceptance of efficient lighting technology such as LEDs.

Obstacles Different lighting fixture ownership and rate structure arrangements among municipalities may require a variety of contractual approaches to implementing energy efficient improvements.

Opportunities Bundling lighting retrofits among multiple municipalities can provide cost-effective capital investments through energy performance contracts, yielding savings and infrastructure upgrades for municipalities. Building upon the successful information-sharing efforts of the Long Island Clean Energy Leadership Task Force may help municipalities learn of approaches to overcoming implementation obstacles.

Policy Mechanism Voluntary

Target(s)

- Energy efficiency improvements saving an average of at least 20% throughout all municipal facilities by 2020.
- Conversion to more efficient lighting by 100% of Long Island municipalities by 2018.

Recommended Actions	Key Stakeholders
Identify financing and funding strategies for implementing widespread energy efficiency measures.	Clean Energy Leadership Task Force
Carry out audit of all wastewater treatment facilities to identify priorities for cost-effective energy efficiency improvements.	Municipalities, LIPA
Educate and raise awareness among municipal officials and staff on funding and financing strategies for efficiency improvements.	LIGHC, Clean Energy Leadership Task Force
Share information among municipalities on successes and challenges of implementing efficiency upgrades and lighting upgraded.	LIGHC, Clean Energy Leadership Task Force

Strategy 5.2 Promote and implement energy efficiency improvements across LI school buildings through cost-effective, shared services for audits and retrofits.

Description and Intent Taxes for supporting Long Island's 127 school districts are a significant contributor to the high cost of living on Long Island. Energy audits and efficiency improvements conducted across multiple districts could be cost-effective to implement and could contribute to reduced operational expenses. Adoption of energy efficiency measures in schools can also present opportunities to teach students and inform parents about sustainable energy use. According to LIPA, approximately 80% of Long Island school districts have already participated in at least one incentive program and may be receptive to more extensive efficiency upgrades.

Obstacles Capital cost of retrofits may be beyond capacity of school budgets. Facilities and maintenance staff need

appropriate level of understanding for how to maintain improved performance of school energy systems over time.

Opportunity Energy efficiency trainings for staff and students can provide additional benefit of informing residents about energy efficiency improvements and behavior changes that could also be implemented at home.

Policy Mechanism Voluntary / Education

Target(s) Energy efficiency improvements saving at least 20% carried out in 75% of LI schools by 2020.

Recommended Actions	Key Stakeholders
Organize cooperative programs that share costs among a few school districts.	School Boards & Superintendents, Sustainability Institute at Molloy College
Approach towns to develop programs that assist organizing school districts within their jurisdiction.	Sustainability Institute at Molloy College
Research opportunities for shared services and cooperative buying and ESCO type services	School Boards & Superintendents, BOCES, Towns, Sustainability Institute at Molloy College
Develop inter-district compacts for energy efficiency	School Boards & Superintendents, BOCES, Towns, Sustainability Institute at Molloy College
Develop and run training programs for school energy managers /janitorial staff	Sustainability Institute at Molloy College

The Town of Huntington has begun to use electrified Mini Coopers in their fleet.
Source: Vision Long Island

Goal 6 Increase market penetration of electric, plug-in hybrid, and other low-carbon alternative fuel vehicles (30% by 2020).

Strategy 6.1 Expand and develop electric vehicle charging and mapping infrastructure and enhance grid services to allow widespread charging capacity for electric vehicles.

Description and Intent Until a critical mass of electric vehicles (EVs) is achieved to make private investment in infrastructure profitable, multi-jurisdictional coordination is needed for identifying appropriate locations and installing charging stations. Integration with a New York City EV network will expand the region's range. Strategy 6.2 calls for these multi-jurisdictional efforts to create incentives/rebates for installation of private use charging and alternative fuel stations. In addition, this strategy calls for the development of mapping applications that accurately capture and communicate the location of charging stations for public fleet and private users. Mapping will also provide information as to where stations are most needed. Providing the public with easy access to charging locations can reduce range anxiety and increase security in adopting new technology.

Obstacles Up-front costs of installing stations and obtaining rights and access to high traffic areas are key challenges for a broad network. Expansion of public EV fleets faces perception challenges from municipal officials/fleet managers about reliability and range of EV/alternative fuel vehicles.

Opportunities Any EV efforts should engage the GLICCC, a leader in promoting alternative fuel technology with public and private users. GLICCC has already initiated a mapping of alternative fueling stations. In addition, coordinate EV charging infrastructure planning with the Advanced Energy Research and Technology Center, which is developing and piloting new technologies for energy and smart grid.

Policy Mechanism Outreach/education; Incentive

Target(s)

- Compile map of existing EV charging stations and alternative fuel fueling stations, publish online and as mobile application by 2014.
- Development of an adequate network of EV charging stations to enable journeys across LI and to/from popular destinations without fear of running out of charge – which equates to approximately one every 50 miles (according to the US Department of Transportation, an average American driver travels 29 miles per day by car, with an average single journey of around 12 miles).

This strategy also relates directly to:

- **Waste Strategy 4.1** Expand efficient management of municipal and private municipal solid waste fleets to include biodiesel and compressed natural gas vehicles.
- **Transportation Strategy 1.4** Increase the number of alternative fuel vehicles on Long Island by targeting municipal and private fleets and buses.

Recommended Actions	Key Stakeholders
Compile and maintain map and mobile app of current EV charging stations and alternative fuel stations on LI and in NYC boroughs.	GLICCC, Electric Auto Association, Farmingdale State College, NYIT, Plug-in America, LIPA
Municipalities coordinate on best placement of stations, following analysis completed to create maps of existing stations.	Municipalities, GLICCC, LIPA, AERTC
Review potential to create partnership with EV manufacturers for funding.	GLICCC, Electric Auto Association, Plug-in America, LIPA, AERTC
Municipalities prioritize and invest in infrastructure.	Municipalities, GLICCC
Encourage major employers and centers of employment where single occupancy car is main commute mode to survey workers on interest in alternative fuel or EV.	Electric Auto Association, NYIT, Sustainability Institute at Molloy College, Municipalities, LIPA, AERTC
Education campaign on cost-effectiveness of alternative fuel and EV.	GLICCC, Electric Auto Association, Plug-in America, LIPA, AERTC
Encourage partnerships between EV charging station manufacturers, EV manufacturers and major employers on LI.	GLICCC, Electric Auto Association, Plug-in America, LIPA, AERTC
Incentives could be a precursor to requiring an EV charging station for new commercial and multifamily housing developments.	Municipalities, LIPA

Recommended Actions	Key Stakeholders
Pass local laws providing incentives for private development of infrastructure.	Municipalities

Strategy 6.2 Create and promote incentives for electric vehicles and alternative fuel vehicles both for private sector and for municipal fleets.

Description and Intent Incentives and awareness-raising campaigns can encourage drivers to switch to EVs or other alternative-power vehicles. Reduced or waived regulatory fees, sales tax waivers, preferential parking, vehicle subsidies and publicly funded charging stations may help promote faster adoption of EV and alternative fuel technology. Converting municipal and private fleets also provides demonstration value as the technology is showcased to residents, and can help stimulate local demand. GLICC is taking a region-wide lead in assisting public and private fleet owners, focusing on waste management fleets, with subsidies for compressed natural gas (CNG) vehicle retrofits and charging stations. Also, making the fueling/charging infrastructure for municipal fleets available to the public makes private ownership of EV and alternative fuel vehicles more practical.

Obstacles Availability of funding to support incentives. Chicken and egg scenario relating to availability of fueling network and vehicle ownership. A large increase in electric vehicles will increase electric demand, change time of use patterns and may require infrastructure investments by LIPA.

Opportunities GLICCC is a local leader in promoting alternative fuel technology with public and private users. GLICCC is mapping alternative fueling stations. LIPA could help implement this strategy with their existing rebate program. Broad adoption of EVs would impact electric usage patterns, so time of use billing (i.e. lower nighttime rates) and new tariffs for vehicle charging stations could greatly lower cost of operation and encourage EV adoption.

Policy Mechanism Outreach/education; Incentive

Target(s)

- Counties, all towns and cities become GLICC stakeholders by 2015.
- Counties, all towns and cities adopt green fleet policies or plans for replacing existing fleets with greener vehicles by 2017.
- Counties, all towns and cities begin implementation of green fleet policies or plans for replacing existing fleets with greener vehicles by 2019.

GHG Emission Reduction Potential 4,258 MT CO_2e

Emission Reduction Assumptios 3.5% of new cars purchased in 2020 are electric with electric vehicle efficiency of 340 Wh/mile and average of 12,500 miles/year

Recommended Actions	Key Stakeholders
Develop cross-jurisdictional committee to review incentives that would stimulate alternative fuel vehicles in line with community income needs.	GLICCC, Clean Energy Leadership Task Force, CSC Regional Coordinator
Pass local laws (if required) adopting incentives.	Municipalities
Educate and raise awareness among municipal officials and staff on funding and financing strategies for investment in green fleets.	GLICCC, Electric Auto Association, Plug-in America
Share information among municipalities on successes and challenges of implementing green fleet policies.	GLICCC, Clean Energy Leadership Task Force

Goal 7 Encourage innovation and adoption of 21st century technologies that increase the capabilities of the electric grid.

Strategy 7.1 Encourage research and pilot programs to advance smart grid technologies, controls and improved renewable energy forecasting that can enhance the security and integrity of smart grid infrastructure.

Description and Intent Adopting smart grid technologies can improve the efficiency of energy delivery and use, and enhance efforts to incorporate more renewable power into the grid mix. Partnering in research and pilot programs to develop these technologies can accelerate the wide-scale adoption and installation of smart meters, smart appliances and home controls providing new business opportunities and job growth.

Obstacles Up-front costs of installing smart meters and other technologies can slow adoption. Security and other engineering issues must be resolved before the technologies can be widely adopted.

Opportunities There is currently a smart grid pilot program being carried out by LIPA, Stony Brook University and Farmingdale State College, in the Route 110 corridor. The presence of these research institutions, such as the Brookhaven National Laboratory, provides an outstanding resource for development and refinement of smart grid technologies.

Policy Mechanism Voluntary

Target(s) Pilot programs engaging 3 or more research institutions, in operation in at least three geographic locations, serving a diversity of consumer types, including residential, multi-family residential, office and retail, by 2015.

GHG Emission Reduction Potential 63,621 MT CO_2e

Emission Reduction Assumption Support of smart grid pilot projects assumes 75% roll out of smart meters by 2020. 10% of those with smart meters are motivated to reduce energy achieving 6.8% savings.

Recommended Actions	Key Stakeholders
Establish partnerships between LIPA, municipalities, research institutions and trade associations.	LIPA, municipalities, AERTC, NY Smart Grid Consortium, Stony Brook University, and Brookhaven National Laboratories
Develop pilot programs to develop and introduce smart grid technologies.	

Strategy 7.2 Support efforts to increase the efficiency, reliability, and resilience of the grid (transmission and distribution), including its capacity for self-monitoring and self-repair, and adapt to the challenges presented by the addition of electric vehicles as a new energy demand on the grid.

Description and Intent New grid technologies can enhance the efficiency of electric delivery and help make the grid more resilient by automating monitoring, rerouting and repair. As electric vehicles are adopted on a wide scale, they will increase and change electric demand in terms of geographic patterns and time of use. Steps should be taken to plan for these new patterns and upgrade the grid. LIPA will have to take the lead with support from municipalities, NGOs, research institutions and associations.

Obstacles Obstacles include the cost of installing smart meters, related infrastructure and cyber-security measures.

Opportunities Existing initiatives such as the Clean Energy Business Incubator Program, AERTC, and the ongoing smart grid pilot project provide good resources.

Policy Mechanism Voluntary

Target(s) Create a Long Island Chapter of the New York State Smart Grid Consortium to investigate, plan and collaborate on regional grid improvements.

Recommended Actions	Key Stakeholders
Establish a Long Island Smart Grid Consortium as a partnership between LIPA, municipalities, research institutions and trade associations and NGOs.	LIPA, municipalities, AERTC, NY Smart Grid Consortium, Stony Brook University, and Brookhaven National Laboratories

7 Transportation

Trends and Issues

How Long Islanders move around the Island is of primary importance when considering a more sustainable future. Over 30% of GHG emissions generated on Long Island are attributable to transportation, the second largest source by sector.[1] Most residents commute and meet their daily transportation needs by car, traveling on the Island's extensive network of parkways, expressways, highways and local roads. A smaller number use public transit systems exist – comprised primarily of the Long Island Rail Road (LIRR), NICE Bus in Nassau County, Suffolk Transit bus in Suffolk County, and HART bus in Huntington. Smaller local bus networks, ferry services and hired cars and taxis supplement these primary systems. While still small, there is a growing population of cyclists and a movement to make streets safer for those wishing to bike and walk more places.

In order to reduce GHG emissions, increase the viability of alternative transportation modes and cultivate Long Island's economy, the immediate transportation priorities should focus on expanding adoption of complete streets policies in towns and villages – which requires all road projects to consider the needs of motorists, transit users, pedestrians, and cyclists – and outreach to Long Island employers about providing commuting incentives. Both of these are established programs that involve adopting policies that have local support. In addition, improving and expanding alternative transportation options will allow transit to better serve all Long Island residents.

Roads & Bridges

The extensive network of roads on the Island and bridges that connect it to the greater region is critically important to the local economy, facilitating nearly all of residents' commutes. Over 87% of commutes are by residents driving in personal vehicles. Other transportation modes also rely on roadways and bridges, including regional bus systems and LIRR passengers, who use roadways to complete the so-called "last mile", connecting stations with homes – with 68% of passengers arriving at stations in a private vehicle.[2] Roadway congestion on the Island, particularly during peak hours, is notorious – Long Islanders drive an average of over 22 miles per day,[3] with over 78% of commuters choosing single occupant vehicles,[4] which disproportionately contributes to congested roadways.

Transportation Alternatives

The region's principal public transit systems – the 11-branch LIRR network, 49-route NICE Bus in Nassau County, 53-route Suffolk Transit bus system in Suffolk County, and 4-route HART bus system in Huntington – serve over 130 million riders annually.[5] This represents only 11% of Long Island commuters.[6]

The LIRR, whose service area covers the Island in a predominantly east-west alignment, focuses on providing access to New York City through branches serving the north, south and center of the Island. According to the Metropolitan Transportation Authority (MTA), 96% of all westbound AM peak trips are to destinations within the City Zone, with

1 *Long Island Carbon Footprint Project, 2005-2010 Comparison, February 2013. NYIT.*

2 *Schulman, Ronca, & Bucuvalas, Inc. for Long Island Rail Road, "Long Island Rail Road Origin & Destination Study Survey Results", 2006.*

3 *New York State Department of Transportation, Vehicle Miles Traveled by County, 2005.*

4 *Census Transportation Planner Package, 2000.*

5 *National Transit Database, Agency Profiles for Suffolk County Department of Public Works – Transportation Division, Huntington Area Rapid Transit, Metropolitan Suburban Bus Authority, MTA Long Island Rail Road, 2011.*

6 *American Community Survey 5-Year Estimates, 2007-2011 for Nassau and Suffolk County, Journey to Work data.*

79% to Manhattan.[7] A greater share of residents are commuting to Manhattan from Nassau County, with 60% of westbound AM peak trips originating from Nassau stations, up from 48% in 1998.[1] Off-peak, westbound travel is the strongest growing segment for LIRR, indicating a greater percentage of residents are using LIRR for recreational and leisure travel.[1]

Transit to and within Long Island is limited. Only 4% of westbound AM peak trips are to destinations within Nassau and Suffolk County – a smaller percentage than AM peak passengers traveling to New Jersey, at 5%. Reverse commute, or eastbound AM travel, represents the second fastest growing segment for LIRR. Despite this growth, infrequent service during off-peak hours for reverse commuters is a concern commonly raised by residents and organizations. The proposed "third track" project on the LIRR Main Line could provide the capacity and service reliability necessary to support frequent peak service in both directions.[8]

There are few reliable options for north-south connections to get more people to their various destinations. The demand and current land use patterns along major north-south corridors, however, would make efficient bus or rail service difficult to achieve economically,[2] but could be supported by shifts in land use.

Pedestrian/Bicycle Infrastructure

According to the American Community Survey, only 2.0% of Long Island commuters walk and 0.3% bike as their primary travel mode to work.[9] However, 23% of AM peak LIRR passengers walk from their homes to stations, making sidewalk infrastructure an important part of daily commuting.[1] An incomplete network of sidewalks and bike lanes connecting residential areas with downtowns and commercial areas makes walking and biking an unattractive and potentially unsafe mode choice, even for short trips. Tri-State Transportation Campaign's annual list of most dangerous roads for walking in the region included five Long Island roadways in its top 10 list in 2012.

Alternative Fuel Infrastructure

Currently, only 17% of jobs and 14% of housing units in the region are within walking distance of public transit. So, even if transit service became much more frequent and reliable, single occupancy vehicle (SOV) trips will continue to be a part of everyday life for many of the region's residents and workers. Increasing the number of alternative fuel vehicles (particularly electric and hybrid vehicles) and creating stronger vehicle fuel efficiency standards on traditional fossil fuel vehicles using the road network can significantly reduce vehicle GHG emissions. There are currently 13,088 Clean Pass vehicles on Long Island. Vehicles averaging 45 miles per gallon and meeting California Air Resources Board SULEV emissions standard can register with Clean Pass.[10] Existing alternative fueling/recharge stations and distribution networks do not provide comprehensive coverage across Long Island, limiting consumer use. More stringent vehicle fuel efficiency standards will decrease the GHG emissions from all vehicles on the road.

Freight Travel

Freight to Long Island is still largely delivered by trucks, which rely on a safe and reliable roadway network. Only 1% of freight delivered to Long Island is handled by rail, compared to a national average of 15%.[11] Increasing rail's share of freight transport on Long Island will reduce long-haul truck traffic on the Long Island Expressway. Expanding rail's share of freight transport on the Island will require support infrastructure, including warehousing and distribution facilities. The Brookhaven Rail Terminal, which opened in 2011, is the first inter-modal facility on Long Island.

Ferry Service

Travel by ferry is a transportation option for Long Islanders for both commuting and recreation. Planned commuter ferry service in Glen Cove, in addition the existing services in Port Jefferson, Orient Point and others, connect residents and visitors to destinations throughout the region.

Airports & Air Travel

Long Island MacArthur Airport is the sole commercial airport on Long Island. MacArthur is owned and operated by the Town of Islip and offers direct service to nine cities on the East Coast, from Boston to Fort Myers. The airport does not have a direct transit link, but passengers can take a Suffolk County Transit bus or an airport shuttle van from LIRR Ronkonkoma Station for a fee.[12] Republic Airport is a general aviation airport, primarily serving private and corporate planes, charter services, and flight training needs.[13]

7 Schulman, Ronca, & Bucuvalas, Inc. for Long Island Rail Road, 2006.

8 Regional Plan Association for Long Island Index, "How the Long Island Rail Road Could Shape the Next Economy", 2013.

9 American Community Survey 5-Year Estimates, 2007-2011 for Nassau and Suffolk County, Journey to Work data

10 New York State Department of Transportation, "New York's Clean Pass Program", 2013. https://www.dot.ny.gov/programs/clean-pass.

11 NYSDOT, "Proposed Long Island Truck – Rail Intermodal (LITRIM) Facility Project", 2004. https://www.dot.ny.gov/regional-offices/region10/repository/intermodal/background.html.

12 Long Island MacArthur Airport, http://www.flylima.com/.

13 Republic Airport, http://www.republicairport.net/.

Sustainability Indicators

Vehicle miles traveled (VMT) per capita
Reflects the region's priority to increase transportation options, including transit, walking, and biking, for all trips.

- **Baseline 2010** 22.25 miles per capita per weekday
- **Target 2020** 20 miles per capita per weekday

Number of registered alternative fuel vehicles
Reflects the region's priority to reduce GHG emissions associated with vehicle trips.

- **Baseline 2010** 13,088 Clean Pass registrations.
- **Target 2020** 25,000 Clean Pass registrations.

Walk score of downtown areas
Reflects the region's priority of creating more walkable communities and active downtowns.

- **Baseline 2010** 0.52 Walk score
- **Target 2020** 0.65 Walk score

Percentage of people commuting via alternative transportation modes (walking, biking, transit, and carpooling)
Reflects the region's goal to increase transportation options for commuters, including transit, walking, and biking.

- **Baseline 2010** transit 11.%, carpooling 8.1%, walking 2.1%, biking 0.26%.
- **Target 2020** , transit 14%, carpooling 10%, walking 4%, biking 0.75%.

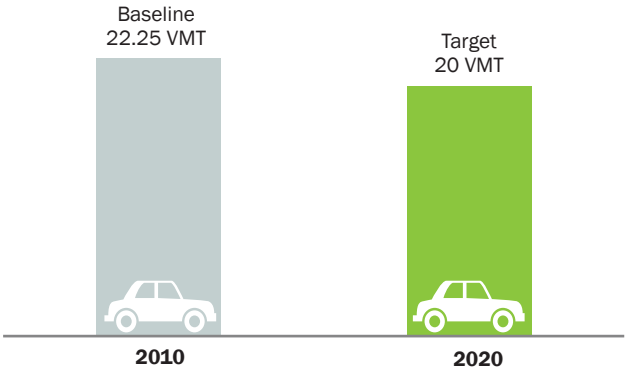


Figure 15 **Vehicle Miles Traveled per Capita**

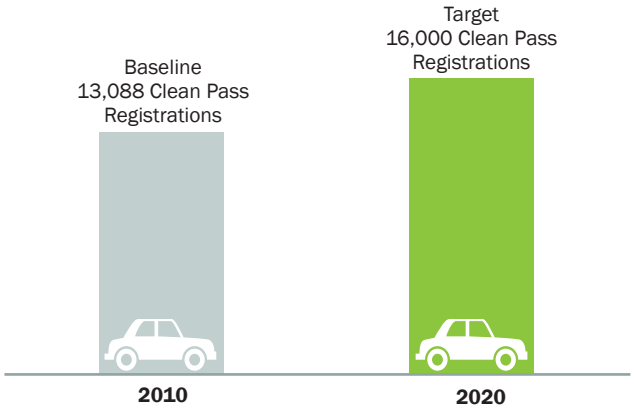


Figure 16 **Number of Registered Alternative Fuel Vehicles**

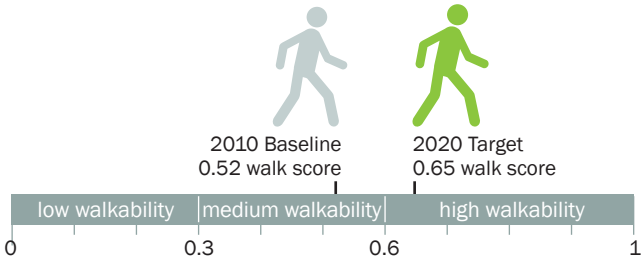


Figure 17 **Walk Score of Downtown Areas**

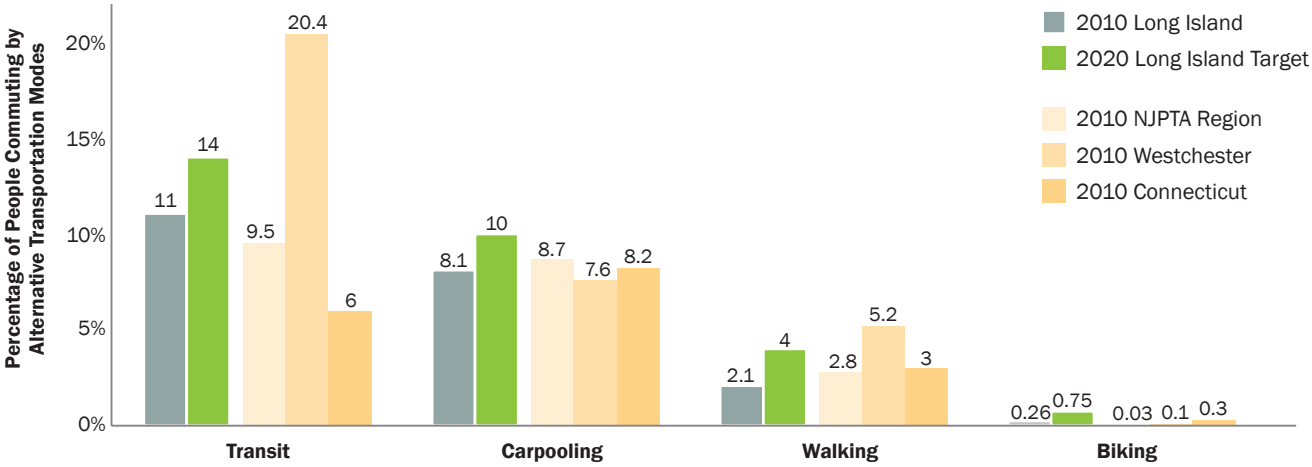


Figure 18 **Alternative Transportation Commuting throughout the Tri-State Region**
Source: NJ, Westchester and Connecticut data from ACS 2007-2011 5-year estimates.

Goals and Strategies

The following is a description of the transportation goals and the strategies selected to achieve the sustainability goals that were articulated by the Transportation Working Group in collaboration with the Steering Committee and the technical consultants. Strategies were prioritized through an iterative process into a short list that best represent the interests and ambitions of the communities.

Table 13 Transportation Goal and Strategies

	Align w/ LIREDC Goals	Adapt to Climate Change
Goal 1 Improve transportation options for all Long Islanders: reduce Long Island's vehicle miles traveled, fuel consumption and GHG emissions.		
Strategy 1.1 Expand and improve public transportation across the Island (rail and bus).	x	
Strategy 1.2 Increase the number of Long Island employers providing incentives/services to employees for VMT reduction.	x	
Strategy 1.3 Improve safety of streets for pedestrians and cyclists through implementation of Complete Streets, signal optimization, and a comprehensive bike plan.	x	x
Strategy 1.4 Increase the number of alternative fuel vehicles on Long Island by targeting municipal and private fleets and buses.		x
Strategy 1.5 Reduce long-haul truck traffic through improvements to rail freight system.	x	x

Goal 1 Improve transportation options for all Long Islanders: reduce Long Island's vehicle miles traveled, fuel consumption and GHG emissions.

Strategy 1.1 Expand and improve public transportation across the Island (rail and bus).

Description and Intent With its extensive rail network and county and local bus systems, Long Island has a strong public transportation foundation on which to build. Currently, the rail network does a very good job of bringing Nassau and Western Suffolk residents to New York City, but is limited for reverse and intra-Island commuting, and for those areas further from New York City. The Island's bus networks operate independently from the Long Island Railroad and are limited in their reach by budget shortfalls, but play a critical role in moving Long Islanders to jobs and destinations not on the rail network. By funding improvements and finding efficiencies within all of these networks, residents and visitors can have more options for getting around the Island, leading to an overall more positive commuting experience, while also reducing VMT and GHG emissions.

Obstacles Capital improvements to both rail and bus systems require significant amounts of funding, which often poses obstacles to implementation. Capital and operating budgets of transit agencies can often change with economic and political winds. Nassau County recently privatized its bus service due to disagreements with the MTA, which may make aligning services more difficult. Finally, local support for public transportation improvements varies depending on the project. Building new commuter rail infrastructure in some communities has been opposed because of the impact it can have on homes adjacent to the existing network of tracks. Transit improvement projects arranged within a public-private partnership can often leverage non-traditional funding sources. Encouraging interagency collaboration can provide more seamless service. Education and outreach to residents about the system-wide benefits of infrastructure improvements will help alleviate concerns.

Opportunities The LIRR system is one of the finest in the nation, but still has areas for improvement that would make it a more efficient service that moves more people to more places, opening up opportunities for reverse commute and for more frequent service to certain hubs. East Side Access – which will connect Long Island Railroad directly to Grand Central Station – and the Double Track Project on LIRR's Ronkonkoma Branch are both moving forward and will help to improve service and reliability for riders across the system. Communities – including Wyandanch, East Farmingdale, Riverhead, Farmingdale, Glen Cove, Patchogue and Huntington – are taking steps to leverage investments in transit. These successes can be built on and other capital improvements could be made on a number of the LIRR's branches. An improved LIRR system will attract more riders and reduce the number of commuters in cars.

Much can also be done to enhance bus service and make it more attractive to users, including providing more north-south connections. Enhanced bus treatments, including improved bus shelters and inter-modal hubs could attract more riders and get people to more places quickly, without the use of a car. Better aligning bus and train schedules so that riders can seamlessly move from one mode of transportation to another can allow for increased ridership on both bus and rail and lead to a more cohesive, efficient network. LIRR already provides coordinated timetables for 4 of the most popular bus lines; there is an opportunity to do this for more stations and bus lines.

Policy Mechanism Voluntary

Target(s)

- Increase LIRR ridership by 20% by 2020.
- Increase Island-wide bus ridership by 7.5%.
- Increase sale of UniTickets (combined bus and train tickets) by 10%.

Recommended Actions	Key Stakeholders
Invest in capital improvements to the LIRR system, considering such projects as: – Completing Double Track – MTA is planning to add a second track on the Main Line from Farmingdale to Ronkonkoma, with all segments estimated for completion by 2018. The second track will provide capacity for improved intra-suburban service and increase service reliability. – Republic Hub inter-modal station – MTA has identified that a key project to support economic development and regional mobility would be to construct an inter-modal hub at the site of the closed Republic Station. Together with bus service enhancements along the Route 110 Corridor, this project would bring LIRR service to this area and support intra-suburb commuting. – Main Line Third Track – LIRR has in the past proposed constructing a third track between Floral Park and Hicksville. East of Floral Park, there are four to six tracks available. However, the four branch lines operating between Floral Park and Hicksville currently share only two tracks, which limits capacity both for eastbound AM peak passengers and "reverse-peak" passengers. The project was removed from the MTA's 2005-2009 Capital Plan and has not been included in subsequent plans due to funding constraints and local political opposition. – East End and Oyster Bay Scoot – The MTA is planning to purchase "diesel multiple unit" (DMU) cars in 2014. DMUs are lighter and more cost-effective to operate over short distances than traditional diesel cars. By reducing operation costs on lines with lower ridership, LIRR will be able to provide more frequent, reliable service to these areas, supporting intra-suburb commuting. The East End Scoot would serve the North Fork and South Fork on the Island's East End. The Oyster Bay Scoot would serve the Oyster Bay Branch.	NYMTC, MTA/LIRR, business orginaizations, local planning and zoning ocmissions and private partners.
Conduct an Island-wide bus study that identifies corridors for targeted improvements, which could include some combination of off-board fare collection, preferential treatments, bus stops at safe road crossings, transit signal priority and other enhancements to increase the reliability and frequency of bus service on the Island.	NYMTC
Better coordinate bus and train schedules to align and develop more combined timetables, constructing convenient inter-modal connections.	NYMTC, NYS DOT, MTA/LIRR, Nassau County, Suffolk County, NICE Bus, Huntington HART Bus, LIRR Commuters Council, Bus Riders Union, AAA, Tri-State Transportation Campaign, East End Transportation Alliance and PCAC

Strategy 1.2 Increase the number of Long Island employers providing incentives/ services to employees for VMT reduction.

Description and Intent With over 1 million private sector jobs on Long Island, an education campaign targeted at private employers could have a large impact on VMT. Employee incentive programs that encourage carpooling, vanpooling, and shuttle services, including commuter tax benefits, help commuters save hundreds of dollars each year. Despite the services provided by 511NY Rideshare for promoting transportation alternatives, Long Island commuters primarily travel to work in a single-occupancy vehicle. Working directly with businesses to educate their employees and enhance on-site incentives will reduce VMTs across the Island.

Obstacles The benefits to a company of enrolling in a commuter benefit program are clear, but the time it takes to administer the program could make some companies wary. Some companies are unaware of these benefits. Providing on-site benefits such as preferred or free or reduced price parking require employer investment.

Opportunity An Island-wide education campaign can help employers to bring these options to employees. In 1998, Congress approved legislation (reaffirmed in 2012) that allows employees of corporations to pay for parking and transit (including vanpool) with pre-tax dollars. While a "Guaranteed Ride Home" program exists for carpool and vanpool participants, no such program exists on the Island for rail and bus commuters. The MTA offers this program on Metro North, that allowing commuters with a discounted UniTicket to have a free ride home via participating taxi companies when connecting shuttle service does not align with train schedules. Such a program could be tried on Long Island

Policy Mechanism Mandatory

Target(s) Increase employees enrolled by 100%.

Recommended Actions	Key Stakeholders
Develop education campaign that targets major employers to encourage car-pooling and transit use through Commuter Choice Tax Benefits and other car-pooling/alternative fuel and transportation benefits, including preferred parking, free or reduced price parking, and rewards programs	Local chambers of commerce, other business organizations, IRS, MTA/LIRR, local employers
Work with LIRR to implement "Guaranteed Ride Home" service on discounted UniTickets.	MTA/LIRR, LIRR Commuters Council, 511NY Rideshare Bus Riders Union, LI Chapter of AAA, Tri-State Transportation Campaign, PCAC, East End Transportation Alliance

Strategy 1.3 Improve safety of streets for pedestrians and cyclists through implementation of Complete Streets, signal optimization, and a comprehensive bike plan.

Description and Intent The design of streets and roadways can have a major role in determining whether people will drive, walk or cycle for different trips. Streetscapes can be designed in ways that encourage driving or encourage pedestrian and cycling activity. Complete Streets are streets that are designed to make walking and cycling safer while still accommodating vehicular traffic. Lower speed limits, signal timing optimized for pedestrians, well-lit sidewalks, landscaped medians, crosswalks and curb extensions are all design treatments that can foster Complete Streets. In 2011, New York adopted a statewide Complete Streets policy that directs transportation projects in NY to consider the convenient access and mobility of all users: motorists, pedestrians, cyclists, and transit users. At the same time, numerous municipalities on Long Island have also adopted Complete Streets policies – including Babylon, Brookhaven, Hempstead, Islip, North Hempstead, Southampton, and Suffolk County.[14] This established program helps garner state and federal dollars towards bike and pedestrian capital improvement projects and creates safer environments for all transportation modes.

14 Joseph Cutrufo, "Suffolk Adopts First County-Wide Complete Streets Policy on Long Island", Tri-State Transportation Campaign, December 2012.

Obstacles While the concept of Complete Streets is becoming more widespread and supported, there is a lack of clarity on how to adopt/implement Complete Streets at the local level. Adding to the complexity of implementation is a still-pervasive idea that streets are primarily intended for cars - versus a shared domain - which leads to safety concerns for pedestrians and cyclists. While gains have been made, better coordination between state and local agencies in implementing street safety measures will strengthen capital projects, increase public awareness of the benefits of Complete Streets, and build local support for bike and pedestrian improvements. Additional education of decision-makers and the public will help to change attitudes regarding use of the road.

Opportunity Complete Streets policies – if given clear pathways to implementation – will help to foster safer, more vibrant and pedestrian-friendly streets in communities across the Island. Working together with NYS DOT, the counties and local municipalities can determine which roadways should be enhanced with Complete Streets features and include such improvements as better optimization of walk and traffic signals. Given the growing demand for cycling on Long Island, a comprehensive approach that inventories existing good cycling amenities and necessary cycling improvements will make this alternative mode of transportation a real choice for more people.

Policy Mechanism Voluntary, though statewide Complete Streets policy directs transportation projects in New York to consider the convenient access and mobility of all users.

Target(s)

- 25 municipalities adopt Complete Streets policies.
- 15 Complete Streets projects implemented.
- 10 municipalities implement signal optimization.
- 250 miles of bike lanes added.

Recommended Actions	Key Stakeholders
Develop an Island-wide implementation plan for Complete Streets, including: – Priority list of locations/routes such as schools, train stations/bus stops, parks – Design guidelines – Implement a signal optimization plan to protect pedestrians that includes leading pedestrian intervals	NYMTC, NYS DOT, local officials, and local planning and zoning commissions

Recommended Actions	Key Stakeholders
Develop an Island-wide "Bike LI" plan, including: – Update and continue to promote the NYSDOT Long Island Bikeways & Trailways online and print maps of the bike lane/trail network – List of LIRR stations with bike lockers/racks – List of "bike friendly" companies that offer bike lockers/racks and/or shower facilities – Design guidelines for bike lanes on different types of roadways – Increase the number of bus lines that accommodate on-board bicycles – Incentivize bike share programs in appropriate locations	NYMTC, local elected officials, and bike advocates

Strategy 1.4 Increase the number of alternative fuel vehicles on Long Island by targeting municipal and private fleets and buses.

Description and Intent This strategy should be considered in conjunction with Energy Strategy 6.2. Recognizing that car use on Long Island will remain a primary means of transportation, it is important to find ways to increase the proportion of alternative fuel/low emission cars on the road. While it is very difficult to encourage large numbers of residents to switch to alternative/low emission vehicles, governments - whether at the State, County, town or local levels – own and operate a significant number of vehicles on the Island, from cars and school buses to sanitation trucks. Over time, fleets can be upgraded to alternative or low emission vehicles. Similarly, bus operators (whether public or private) can shift to fuel-efficient/alternative vehicles and have a large impact. This strategy will reduce GHG emissions, but also help reduce ongoing fuel costs, which can be difficult to budget for due to wide-ranging price fluctuations. Further, grant funds may be available to help offset the cost of new purchases.

Obstacles Funding for alternative fuel vehicle (AFV) incentive programs are lacking and the up-front cost of purchasing these vehicles is often greater than conventional vehicles, despite long-term economic benefits. While there are alternative fueling stations on Long Island, a comprehensive network is lacking, which deters consumer adoption. In general, there has been a resistance to changing from conventional vehicles to AFVs. The Greater Long Island Clean Cities Coalition has created a web-based map that displays alternative fuel stations and access has continued to expand. Education and outreach on the long-term economic payback from AFVs and the availability of fueling stations on Long Island and metropolitan region will help overcome resistance. Grant programs for fleet vehicles can help offset the up-front replacement costs.

Opportunity A strong foundation has been laid by the Greater Long Island Clean Cities Coalition to aid governments to upgrade their fleets to alternative fuel vehicles, as well as by mapping alternative fuel stations. These efforts should be further supported across the Island.

Policy Mechanism Voluntary

Target(s)

- Increase County-owned AFV fleets by 100%.
- Increase Town-owned AFV fleets by 50%.
- Increase Village-owned AFV fleets by 33%.
- Increase bus AF fleets by 50%.

Recommended Actions	Key Stakeholders
Create map of alternative fuel stations on Long Island; develop an application of the map	NYMTC, Long Island Clean Cities Coalition
Implement Green Fleet strategies. – Replace aging municipal/county fleets with alternative fuel vehicles. – Replace aging buses (public and private operators) with alternative fuel buses.	NYMTC, NYS DOT, Long Island Clean Cities Coalition, Nassau and Suffolk Counties, School Boards, chambers of commerce, and Long Island towns, villages and cities
Offer incentives to companies for car share/alternative vehicle use.	

Source: Smithtown

Strategy 1.5 Reduce long-haul truck traffic through improvements to rail freight system.

Description and Intent Freight transportation accounts for 7.8% of total GHG emissions in the United States,[15] with trucks emitting the majority of GHG. Long Island has long relied on trucks for goods movement, with a limited role for rail freight. As a result, Long Island's roadways are crowded with trucks that add to congestion. A shift towards freight rail would remove long-haul truck traffic from Long Island's roadways while reducing GHG emissions, as rail is more efficient than trucks.

Obstacles Freight rail requires inter-modal facilities for warehousing, distribution, storage and cross-docking goods to smaller trucks for "last mile" local delivery. Long Island does not have a sufficient number of these facilities to support a greater shift to rail. The public has been opposed to the siting of these facilities due to their impact on the environment, potential increase in local truck traffic, noise and general aesthetic issues. Freight rail can create conflicts with passenger rail, as they share right-of-way on Long Island. However, most freight is not time sensitive and can be temporarily separated, running overnight when passenger rail service is light or non-existent. The public has historically not supported increased freight rail traffic due to lack of transparency. Funding for freight rail expansion is also limited. Education and outreach on the benefits that freight rail can provide, in terms of reduced long-haul truck traffic on roadways, reduced GHG emissions, and job creation, could garner public support. Public-private partnerships for inter-modal facilities could help provide outside funding. Public input and a transparent process demonstrating community benefits can help increase public trust and support for additional freight rail.

Opportunity Enhancing Long Island's rail freight system by incentivizing the development of inter-modal facilities can help to reduce GHG emissions by reducing long-haul truck traffic, as well as reducing congestion and VMT, by relying on rail, which moves goods more efficiently than trucks. There may also be potential to coordinate with Brookhaven Rail Terminal.

Policy Mechanism Voluntary

Target(s) Increase rail freight delivery by 5%.

Recommended Actions	Key Stakeholders
Identify physical constraints on existing right-of-way that might limit some freight rail moves and develop an investment program to eliminate bottlenecks.	NYMTC, MTA/LIRR, Brookhaven Rail Terminal, railroad freight companies, Nassau and Suffolk Counties, and municipalities along the freight line
Identify potential sites with willing municipalities for small-scale intermodal facilities and warehousing.	
Identify possible sites for industrial development and siding reactivation, creating a more diverse market for the New York and Atlantic Railway, ensuring profitability, more frequent service and greater overall investment in freight infrastructure.	

15 *Pew Center on Global Climate Change, Center for Climate and Energy Solutions, "Freight Transportation", June 2010*

8 Land Use & Livable Communities

Trends and Issues

The way that our communities are designed and developed has a direct effect on transportation, GHG emissions and overall quality of life. Long Island Communities are committed to self-governance and the "home rule" system, but many lack the resources to address their local environment, energy and sustainability needs. Communities are actively planning and implementing downtown revitalization projects, but lack sufficient resources to provide public amenities, such as complete street and green infrastructure features.

Historically, Long Island developed around its extensive rail network with compact, transit-oriented communities centered on a local rail station. From the 1950s through 1980s, Nassau County and the western portion of Suffolk County developed in a sprawling, suburban land use pattern. Supported by certain regional transportation and economic development policies, as well as local zoning and land use regulations, this has contributed to the consumption of unprotected open space, increased traffic congestion, long driving distances and car dependence. This growth pattern also led to a predominance of single-family home neighborhoods, limiting opportunities for more focused, compact housing for those who do not want to own a house. The land use challenges facing these areas will center around replacement and renovation of existing housing stock and identifying appropriate opportunities for infill. The easstern portion of Suffolk County developed slowly in the 20th century, retaining much of its rural and agricultural character. However, as eastern portions of Long Island have approached their build-out, development pressure has increased. Towns and villages in eastern Long Island can choose to revise their zoning ordinances now to ensure that new developments meet community needs in the long-term.

Throughout Long Island, coastal areas and downtowns present additional challenges and opportunities. The desire for coastal views and access has led to the development of land that once served as a storm surge and flood protection buffer. These coastal communities are now at great risk in an age of more frequent and severe storms.

Land use change occurs on a long timescale, but development patterns are shaped early on in the design process by policy and zoning frameworks. Individual decisions in communities across Long Island have shaped the development pattern and by extension, the energy intensity of everyday life. Accordingly, land use underlies all of the chapters of this report. Each goal in this chapter identifies land use strategies and actions that address GHG emissions.

Suburban Development

80% of Long Islanders live in single-family homes.[1] This suburban way of life suits many who live here and is one of the Island's assets. However, the way in which Long Island has developed in recent decades has led to the development of cheaper land further from amenities and thus the reliance on the automobile and roadways to connect them. As a result, much of the open space on Long Island has been developed leaving the greatest opportunities for future development in already developed places with a mix of uses.

Sewer Service Area

Municipal sewers cover a relatively small percentage of Long Island – with only 59% of households using public sewers, as compared to 88% of households in Westchester

1 *American Community Survey 5-Year Estimates, 2007-2011 "Units in Structure" for Nassau and Suffolk Counties.*

and Rockland Counties.[2] Sewers help protect water quality and support compact residential development. Accordingly, expanding and maintaining sewer infrastructure has been identified as a critical issue by the Regional Economic Development Council (REDC) of Long Island. Suffolk County has created an annual fund of $200 million, to fund expansion projects through 2020.[3] Growth in Suffolk County is particularly constrained by a lack of sewer service, with less than 25% of the county served. In April 2013, Suffolk County announced $30 million in grant funds for sewer expansion projects. Funds come from the Asset Stabilization Reserve Fund and are available for projects consistent with existing plans.[4]

Open Space

Less than 9% of Long Island's land area is conserved open space.[5] High land costs mean conservation acquisition projects require significant funding. The need is particularly acute among coastal parcels, which have particularly high land values but can provide important services, including storm buffering and flood protection.

2 *Sarah Lansdale, "Sewers – The Pipeline to Progress", Networking Magazine, January 2011.http://www.sustainableli.org/blog/sewers-the-pipeline-to-progress-column-in-networking-magazine.*

3 *Long Island Regional Economic Development Council, "Long Island's Future Economy: A New Beginning for Nassau and Suffolk Counties", November 2011.http://regionalcouncils.ny.gov/themes/nyopenrc/rc-files/longisland/LongIslandsFutureEconomy.pdf.*

4 *County Executive, "Bellone Announces Suffolk County Sewer Infrastructure Program", April 2013. http://www.suffolkcountyny.gov/Home/tabid/59/ctl/details/itemid/1191/mid/2638/bellone-announces-suffolk-county-sewer-infrastructure-program.aspx.*

5 *Analysis using Land Use data in Nassau and Suffolk County, 2007.*

Sustainability Indicators

Land consumption per capita

Reflecting the region's priority to increase development intensity in existing downtowns and reduce greenfield development.

- **2010 Baseline** 0.17 acres per resident
- **2020 Target** 0.15 acres per resident

Available parkland per capita

Reflecting the region's priority to preserve open space.

- **2010 Baseline** 0.06 acres per resident
- **2020 Target** 0.09 acres per resident

Percentage of redevelopment of vacant buildings and sites

Reflecting the region's priority to develop in existing downtown areas/hamlets, utilize existing infrastructure and reflect the economic health of downtown areas.

- **2010 Baseline** unknown
- **2020 Target** future indicator once data becomes available.

Number of building permits issued in downtown areas/hamlet centers

Reflecting the region's priority to preserve open space and develop in existing downtown areas/hamlet centers and reflects the economic health of downtown areas.

- **2010 Baseline** unknown
- **2020 Target** future indicator once data becomes available.

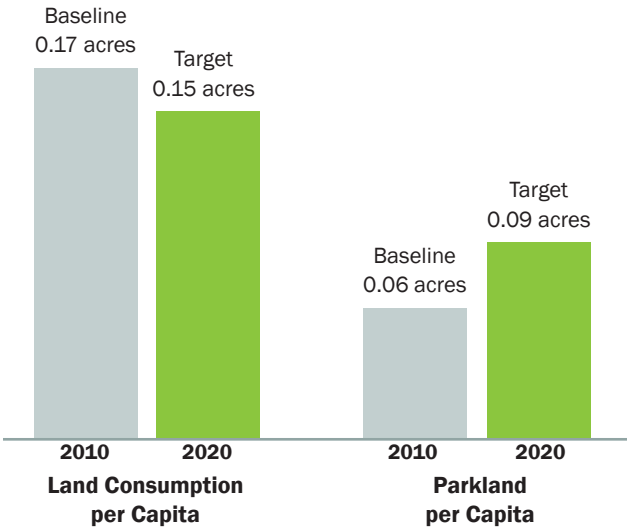


Figure 19 Land Consumption and Parkland per Capita

Goals and Strategies

The following is a description of the land use goals and the strategies selected to achieve the sustainability goals that were articulated by the Land Use & Livable Communities Working Group in collaboration with the Steering Committee and the technical consultants. Strategies were prioritized into a shortlist that best represent the interests and ambitions of the communities.

Table 14 Land Use & Livable Communities Goal and Strategies

	Align w/ LIREDC Goals	Adapt to Climate Change
Goal 1 Increase the number of communities with reduced auto dependence and increased livability on Long Island.		
Strategy 1.1 Increase mixed-use developments in Long Island downtowns and near LIRR stations by 100%.	x	x
Goal 2 Increase the amount of natural resources and protected open space on Long Island.		
Strategy 2.1 Permanently protect 10% of the Island's most critical unprotected open space and farmland.	x	x
Strategy 2.2 Preserve 10% of unprotected open space along the coasts to serve as a storm-resilient buffer.	x	x
Strategy 2.3 Restore the tree canopy on Long Island to pre-Superstorm Sandy conditions.		x
Goal 3 Increase the resiliency of coastal development.		
Strategy 3.1 Utilize best practices for the redevelopment of neighborhoods in coastal areas to become more resilient.	x	x

Goal 1 Increase the number of communities with reduced auto dependence and increased livability on Long Island.

Strategy 1.1 Increase mixed-use developments in Long Island downtowns and near LIRR stations by 100%.

Description and Intent Long Island Rail Road serves a vital role in connecting Long Island residents with jobs and other Long Island communities. Most stations are in downtown areas that offer grocery, retail, dining, and entertainment options. Redevelopment in downtown areas and around LIRR stations at the appropriate scale will accommodate a growing population, connect residents with jobs, and enhance downtown vibrancy, all while helping to preserve open space by reducing development pressure on those sites. Current residential housing demand trends show a need for mixed-use development in downtown areas, which is lacking in some Long Island communities.

Obstacles Support for higher-density housing developments has been limited in some areas. Residents have expressed concerns about preserving local character and about perceived tax increases to cover the impacts such developments would have on local schools and downtwon parking. Developers caution that downtown redevelopment projects have a higher cost than developing in outlying areas. In many parts of Long Island, the feasibility of redevelopment is limited by restrictions in local zoning ordinances, including limits on height, density, and mixed-uses. In western portions of the Island, aging water and sewer infrastructure lack the capacity to support a growing population. Eastern portions of the Island generally lack any municipal sewer service.

Public outreach will be critical in overcoming these obstacles. Identifying successful mixed-use redevelopment projects located in towns across Long Island can help residents see how such projects can blend with local character. Sharing studies showing that transit-oriented, mixed-use developments can actually have a net positive fiscal impact on a municipality can help to alleviate tax concerns.[6][7] Focusing on communities that are supportive of multi-family housing can improve the success rate of getting projects built. These communities are more likely to support changes to zoning and parking regulations in order to facilitate this type of development.

Some municipal regulations may not currently encourage development in existing downtowns. Utilizing model ordinances that promote transit-oriented design can streamline zoning ordinance revisions at the municipal level. Fast-tracking transit-oriented design projects that have community support through the permitting and approval process can help encourage such proposals and municipalities can negotiate with developers for compensation funds for capital improvements, including offsetting the cost of municipal sewer service. Having sewer projects in capital plans will help attract state funding for such projects.

Opportunities By focusing new residential developments in downtown areas, Long Island communities can offer housing that is rooted in the community and connected to the surrounding area – making walking, biking, and transit viable transportation modes, while reducing GHG emissions. Parking requirements can be revised to encourage a walkable, transit-friendly lifestyle in balance with demand for a car. Development in downtowns will help spur additional economic activity and bring new tax ratables to communities. Redevelopment in downtowns will mean a greater percentage of households in Long Island will be connected to sewers, which reduces contamination of surface and groundwater. Reusing existing buildings, coupled with green construction practices, helps to minimize the GHG emissions associated with the built environment, which currently accounts for over 35% of all GHG emissions on the Island.[8]

Policy Mechanism Voluntary

Target(s)

- Increase the number of multifamily units in downtowns/around LIRR stations by 100%.
- Increase the number of sewered areas on LI by 20%.

6 *Robert Lane, "Transportation Oriented Development: Possibilities and Realities", June 2012. http://pschousing.org/files/2012_PSC_6.15_IForum_LanePresentation.pdf.*

7 *Transportation Research Board, "Transit Oriented Development: Traveler Response to Transportation System Changes", 2007. http://www.fta.dot.gov/documents/Transit_Oriented_Development_-_Traveler_Response_to_Transportation_System_Changes_TCRP_Report_95.pdf.*

8 *ICLEI, "Long Island Carbon Footprint Project: 2005 Greenhouse Gas Emissions ", 2010.*

Recommended Actions	Key Stakeholders
Develop, upgrade, and repair sewer infrastructure to accommodate compact development in downtown areas using a combination of financing strategies. Include funds for sewer expansion in capital programs at the county, town, and village levels to be eligible for state funding.	Town Supervisors, Mayors, local planning boards, local chambers of commerce, business improvement districts, civic and community organizations, counties, LIRPC, LIREDC, NYS DOS, NYS DEC and MTA/ LIRR
Negotiate with developers to help fund sewer infrastructure improvements.	
Take a comprehensive approach to parking requirements in downtown areas and LIRR stations compiling best practices as guidelines for municipalities, including: – Encouraging a "park once" environment by ensuring parking is available in convenient, central locations – Encourage parking meters in appropriate downtown areas to manage parking – Using variable pricing and time limits in order to manage turnover based on proximity to downtown – Providing parking variances or waivers in downtown areas based on-street parking, parking lots, and transit access. – Increasing capacity for park-and-ride commuting	
Compile best practices and guidelines for local officials, planners, and developers to promote mixed-use developments in downtowns that meet local priorities. Such a compilation could include: – Design guidelines that preserve the character of Long Island's communities – Model zoning ordinances that accommodate urban-scale, mixed-use developments, including height restrictions, setbacks, density minimums, and allowable uses – Promote Location Efficient Mortgages (LEMs) that take into account the reduced transportation costs people living in walkable and transit-connected communities incur. Homebuyers qualifying for a LEM will qualify to borrow a greater percentage of their gross monthly income than under a traditional mortgage. – Create overlay districts, which can be applied to areas within a municipality, carry additional zoning regulations overlaid on the "base" zoning regulations. – Develop streetscape guidelines that promote pedestrian activity, including traffic calming measures, adequate lighting, sidewalk widths and landscaping. – Develop model incentive programs for mixed-use projects, including density bonuses and expedited permitting and review. Model ordinances and incentive programs for energy efficient building design (including elements from LEED-ND and LEED-NC Sustainable Sites) and operation (including ENERGY STAR equipment, efficient fixtures and motion sensors). – Create case studies comparing the net fiscal impacts of mixed-use projects and traditional projects like commercial, single family residential and multifamily residential.	

Goal 2 Increase the amount of natural resources and protected open space on Long Island.

Strategy 2.1 Permanently protect 10% of the Island's most critical unprotected open space and farmland.

Description and Intent Open space provides a number of benefits and services for Long Island residents, including recreational space, aquifer recharge, and natural stormwater management, in addition to serving as a carbon sink. Protecting open space before it is under threat of development is easiest and most affordable. Given the relatively small amount of available open space, taking action now is crucial. Farmland provides local produce and farm products, scenic views, employment, and tourism opportunities. Preserving farmland protects working lands from development pressures.

Obstacles Grants for open space protection are available at the federal and state level, but funding is limited and competitive. There is some concern from residents that removing large parcels from the tax rolls is not good for surrounding taxpayers. Methods for private ownership of protected space through transfer of development rights or other innovative practices can help both of these issues.

Opportunity Protecting more open space and farmland will also help to ensure that more sustainable development happens in already developed places, reducing sprawl and the added VMT and GHG emissions that result from it.

Policy Mechanism Voluntary

Target(s) Preserve at least 10% of the Island's land mass as open space and farmland by 2050.

Recommended Actions	Key Stakeholders
Identify and implement innovative funding strategies for open space and farmland preservation in critical areas, that consider the following in balance with costs: – Acquisition is a strategy for protecting open space by having a government or land conservation organization purchase property directly. – Transfer of Development Rights is a strategy that could be employed in select areas with community support by designating "sending" and "receiving" areas, in balance with the community's tax base. – Conservation easements limit or eliminate the development potential of a property in order to protect natural resources, while allowing the property to remain in private ownership. Private property owners donate or sell a portion of the housing units per acre permitted by-right in the zoning ordinance to a land trust or government entity in return for tax benefits.	Nassau and Suffolk County, NYS DEC, NYS DOS, local municipalities, local planning and zoning boards, Long Island Sound Study, land conservation organizations, LIRPC, onservancies, and land trust organizations
Increase public access to open spaces in ways that respect the area's ecology.	
Encourage development that conserves open space through infill, including planned unit development, and cluster zoning.	

Strategy 2.2 Preserve 10% of unprotected open space along the coasts to serve as a storm-resilient buffer.

Description and Intent An open space buffer along the shoreline can help coastal communities become more resilient to storm surge associated with severe weather events and sea level rise. Given the consciousness surrounding the severity of coastal storm surge in the wake of Superstorm Sandy, it is important to take advantage of public support and begin planning for such a coastal open space buffer.

Obstacles Grants for the preservation of open space are available at the federal and state level, but funds are limited and competitive. High property values on coastal properties exacerbate this issue. More careful analysis is needed to determine which open space parcels can best serve as effective buffers.

Opportunity Having an open space buffer along the shoreline can preserve coastal habitat and public access to the waterfront, while also providing a buffer to protect the built environment from the impacts of both storm surge and sea level rise. This will lead to reduced vulnerability and fewer impacts from future storm events.

Policy Mechanism Voluntary

Target(s) Preserve10% of unprotected coastal open space by 2020.

Recommended Actions	Key Stakeholders
Conduct a coastal open space analysis to determine the areas of priority, considering existing open space, unprotected open space, and FEMA flood zones.	NYS DEC, counties, local municipalities FEMA South Shore Estuary Reserve, and Long Island Sound Study
Develop storm resilient landscape guidelines for residential and commercial properties, including information highlighting native plant species, retaining old growth trees, and using a variety of plant species where new landscaping is planted.	
Develop and implement funding strategies for open space acquisition as needed.	

Strategy 2.3 Restore the tree canopy on Long Island to pre-Superstorm Sandy conditions.

Description and Intent Winds associated with Superstorm Sandy up-rooted trees and brought down heavy limbs, damaging public and private property. After the storm, additional trees have been removed as a precaution to prevent property damage in future storms. As a result, Long Island has lost significant tree canopy.

Obstacles Most trees are located on individual private lots and while some towns require permits for tree removal, there are no local canopy requirements in Long Island.

Opportunity Trees provide aesthetic benefits to neighborhoods and increase property values. They also help reduce the urban heat island effect, provide natural stormwater management, improve air quality, store carbon, and serve as habitats.

Policy Mechanism Voluntary

Target(s) Restore tree cover/ trees lost to pre Sandy condition

Recommended Actions	Key Stakeholders
Identify and utilize best practices for local towns and villages on maintaining tree canopies. This would include: – Best practices for maintenance of urban street trees in compact downtown environments – Model tree canopy programs in suburban areas – Incentive programs for developers to minimize site disturbance to retain natural landscape, preserve hydrologic flows, and minimize impervious surfaces when developing a site	Local environmental organizations, local municipalities, and the Urban and Community Forestry Program of NYS DEC
Education and outreach to homeowners on the benefits that trees provide.	

Goal 3 Increase the resiliency of coastal development.

Strategy 3.1 Utilize best practices for the redevelopment of neighborhoods in coastal areas to become more resilient.

Description and Intent Many neighborhoods in coastal areas were not designed to be resilient to storm surge and coastal flooding. In addition to a lack of natural buffers, the physical structures of homes and infrastructure make these neighborhoods vulnerable. In areas where a natural buffer is not possible, neighborhoods should be developed in a way to make them more resistant to future storm surges. In addition, coastal infrastructure is not always adequate to resist storm surges.

Obstacles Many residents and municipalities do not have the funds to make substantial improvements to homes, businesses, and infrastructure. Funding for infrastructure retrofits is also limited. In addition, some areas where houses have been elevated have created neighborhoods that are less pedestrian friendly than their "pre-elevated" state. Local zoning may have restrictions that prohibit resiliency measures, including elevating houses. The timing and location of future storms and resulting damages is unknown.

Opportunity Given the heightened awareness of the increased intensity of coastal storms, a new approach to development must be taken. There is an opportunity to learn from those best practices that have been implemented in other storm-prone areas to ensure that Long Island's communities are safe and resilient.

Policy Mechanism Voluntary

Target(s) 15% of coastal neighborhoods built to more resilient condition.

Recommended Actions	Key Stakeholders
Collect best practices of resilient coastal development from other areas around the country and adapt to local vernacular and conditions. This should include: – Align local building codes with National Flood Insurance Program best practices for flood plain management. – Enhance natural features, including dune strengthening, beach nourishment, and wetland protection – Adopt zoning ordinances that accommodate best practices for flood plain management, including height restrictions that permit elevating structures in flood zones, requiring residential and certain public safety uses to be at or above the base flood elevation, and shoreline hardening guidance	Counties, towns, municipalities, property owners, FEMA, NYMTC, LIRPC, and local building, zoning and planning departments.
Require future capital improvement projects to consider flood zones in the design.	

A park in the North Fork.
Source: Flickr user Nicole Marti

Related CGLI Strategies

Land use planning, design, and development have a direct effect on economics, transportation, energy use, GHG emissions, and overall quality of life of each community. This interrelationship is evident in a number of the strategies developed for the other subject areas that will also affect land use and livability as follows:

Economic Development & Workforce Housing

- **Strategy 1.1** Provide gap financing and technical assistance incentives for new and redeveloped buildings that are location efficient, affordable and green.
- **Strategy 5.1** Provide incentives for rebuilding greener and more resilient developments in areas impacted by the storm surge or encourage relocation locally outside the floodplain and develop and implement strategies for enhancing resilience and more rapid restoration of the electric grid.

Energy

- **Strategy 1.1** Require Energy Performance Certificates at point of sale or rental.
- **Strategy 1.2** Continue to develop, evolve, and expand outreach and education campaigns to promote energy efficiency and renewable programs and basic energy efficient behaviors (such as use of a comparative billing software).
- **Strategy 2.1** Require annual energy benchmarking for all non-residential buildings over 25,000 sq ft (approximately 3,500 existing buildings).
- **Strategy 2.2** Require energy audits every 5 years for all non-residential buildings over 25,000 sq ft (approximately 3,500 buildings).
- **Strategy 3.1** Promote adoption of more stringent local Energy Efficiency Construction Code by municipalities. (Home Energy Rating System for residential, International Green Construction Code for commercial).
- **Strategy 3.2** Provide incentives (such as property tax waivers) for new homes that meet the Passive House standard.
- **Strategy 4.1** Develop and encourage municipal adoption of "Solar ready" code requirements for new construction so that retrofitting photovoltaic or solar hot water is structurally easy and cost-effective.
- **Strategy 4.2** Call for municipalities to require a feasibility study of renewables and/or combined heat and power for new commercial development over 25,000 sq ft with the installation of a minimum 30% of electric demand (or equivalent) through renewables.
- **Strategy 4.3** Standardize permit process for renewable energy commercial projects.
- **Strategy 4.4** Encourage geothermal heat pump projects through education and incentives. Develop an incentive program for replacing fuel oil boilers with natural gas or ground source heat pumps (where no gas supply available) that leverages or enhances existing LIPA rebates.
- **Strategy 5.1** Promote and implement energy efficiency improvements in municipal facilities, including street lighting, traffic lights, parking lot and park lighting and wastewater facilities.

Water Management

- **Strategy 1.4** Curb pesticide usage.
- **Strategy 2.1** Reduce potable water consumption due to excessive irrigation.
- **Strategy 2.2** Show water use trends on water bills.
- **Strategy 3.1** Conduct a feasibility study to convert septic systems in priority areas to cluster treatment facilities with better treatment capabilities.
- **Strategy 3.2** Incentivize the replacement or retrofit of failing septic systems.
- **Strategy 4.1** Increase the development of green infrastructure in the public and private realms.

Land Use – Zoning, Site Plans, Infrastructure

- **Transportation Strategy 1.3** Improve safety of streets for pedestrians and cyclists through implementation of Complete Streets, signal optimization, and a comprehensive bike plan.

Adaptation

- Promote cool roofs; Retrofit/waterproof; and Use corrosion-resistant materials Prioritize infrastructure investments in low-risk areas; Incentivize cluster development in low-risk areas; Expand urban forest and green infrastructure; Enhance or construct dunes and nourish beaches; Build/raise levee, floodwall, or berm; Integrate water sensitive urban design techniques into the urban form; Improve drainage; Create rolling easements; Elevate existing equipment and raise elevation standards for new projects; Retrofit/waterproof; and Use corrosion-resistant materials.

9 Waste Management

Trends and Issues

One of the primary challenges facing Long Island is the significant volume of municipal solid waste (MSW) generated per capita on an annual basis. Since the 1950s, expanding population and residential growth across the region have exponentially increased waste generation and restricted the land area needed for landfill development. The MSW generated per capita is 0.8 tons per person per year, totaling 2.6 million tons of solid waste for the region in 2012. 41% of the population is serviced by municipal collection, 58% by private haulers and 1% by self-haul. 41% of waste generated is exported to landfills outside of Long Island.

There has been some progress towards the reduction of waste. Per the Long Island Greenhouse Gas Inventory (baseline 2010), 0.13 tons per person per year of solid waste was diverted to recycling and composting. The region recycles 16% of materials via municipal and private collection streams and 62.5% of organic waste was transported to four on-island waste-to-energy facilities.

Landfill Capacity

Existing Long Island landfills accepting municipal solid waste have been capped and are in process of closure due to NYSDEC regulations. Municipalities across the Island must address alternate disposal options for the waste that cannot be composted, recycled or incinerated.

Export

Exporting waste off Long Island has become another waste management approach but the hauling of waste long distances is extremely costly, impacts communities and the road network, and creates excessive GHG emissions.

Rail Freight

The use of rail freight to reduce the amount of trucking waste off Long Island is limited. Municipalities and environmental groups have prioritized efforts to reduce the volume of waste through recycling and composting goals to avoid the need to develop further off-island hauling programs. However, waste shipping via rail could be appropriate in certain circumstances, such as long haul shipping to specialized landfills or recycling plants. See Transportation Strategy 1.5 for further discussion on rail freight opportunities.

Waste Reduction

The municipal waste management priority is to reduce the amount of municipal solid waste generated. To that end, there are intentions to develop localized facilities to reduce the volume of organics transported to landfills and increase the amount of non-organics that is locally recycled.

Recycling

Communities are pursuing more efficient ways of managing non-organics and increasing local recycling rates. Discussion includes a market feasibility assessment for regional facilities to recycle plastics (expanding to #3 through 7) and other wastes and cross-municipality and operator discussion on upgrades to incinerator facilities to optimize energy capture from waste.

Composting

More towns are exploring and instituting small-scale composting programs to help divert organics from the waste stream. Backyard composting can cause odor and rodent problems when dairy products, fats, oils and meat scraps

are added, so education and trainings are needed to promote successful processing.

Waste-to-Energy

While more energy is conserved by reducing and reusing materials than by combusting them, the establishment of four on-island waste-to-energy facilities has created new opportunities to capture increasing amounts of energy from solid waste. Contracts between municipal waste combustion facilities and municipalities can disincentivize waste reduction efforts as municipalities are obligated to deliver minimum amounts of waste.

GHG Emissions

Waste management activities represent 3% of Long Island's GHG emissions (1,039,531 MT CO_2e). In addition to energy capture from organic and non-organic waste, there is keen interest in promoting the use of clean-burning, more fuel-efficient waste management fleet vehicles to further reduce GHG emissions.

Sustainability Indicators

Total solid waste generated per capita
Reflecting the region's goal to reduce the volume of waste generated.

- **2010 Baseline** 0.8 tons municipal solid waste generated per capita per year
- **2020 Target** 0.6 tons per capita per year

Solid waste diverted (i.e. not landfilled or exported) per capita per year

- **2010 Baseline**
  - Recycling and composting equals 0.13 tons per capita per year
  - Waste to energy equals 0.5 tons per capita per year
- **2020 Target**
  - Recycling and composting equals 0.16 tons per capita per year
  - Waste to energy equals 0.4 tons per capita per year

Figure 20 **Waste Generated per Capita per Year**

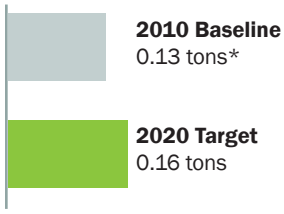


Figure 21 **Recycling and Composting per Capita per Year**

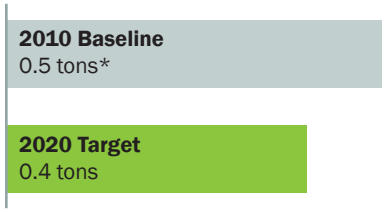


Figure 22 **Waste to Energy per Capita per Year**

**NYS DEC 2008; Long Island GHG Inventory (2012) (baseline 2010), produced by NYIT*

Goals and Strategies

The following is a description of the waste management goals and the strategies selected to achieve the objectives articulated by the Waste Management Working Group in collaboration with the Steering Committee and technical consultants. Strategies were prioritized to identify key strategies that represent the interests and ambitions of the community. The waste management goals and strategies are summarized on Table 15.

Table 15 Waste Management Goals and Strategies

	Align w/ LIREDC Goals	Adapt to Climate Change
Goal 1 Reduce the amount of municipal solid waste generated.		
Strategy 1.1 Promote public procurement policies that allow elimination of waste at source.		
Strategy 1.2 Develop regionally-shared education programs and waste audits to promote waste reduction opportunities in residences, government offices, schools and large institutions.		
Strategy 1.3 Expand pilot testing "Pay As You Throw / Save Money and Reduce Trash" programs to evaluate impact of cost incentives and provide lessons learned.		
Goal 2 Develop localized facilities to the reduce volume of organics transported to landfills and increase energy capture.		
Strategy 2.1 Expand New York State pilot program to test viability of food waste to biogas on Long Island.	x	x
Strategy 2.2 Create new and/or expand existing yard waste compost facilities to serve most municipality and commercial needs.		
Goal 3 Increase the amount of locally recycled non-organics.		
Strategy 3.1 Initiate market feasibility assessment for regional facility/ies to expand capacity to recycle plastics waste.	x	
Goal 4 Promote energy efficiency throughout waste management processes and systems.		
Strategy 4.1 Expand efficient management of municipal and private municipal solid waste fleets to include biodiesel and compressed natural gas vehicles.	x	x
Strategy 4.2 Initiate cross-municipality and operator discussion on upgrades to incinerator facilities that would optimize energy capture from waste.	x	x

Goal 1 Reduce the amount of municipal solid waste generated.

Strategy 1.1 Promote public procurement policies that allow elimination of waste at source.

Description and Intent The objective of this strategy is to support the NYS Beyond Waste goals by reducing the volume of waste through procurement and purchasing policies. Municipalities and the private sector can influence product procurement through the use of model green purchasing guidelines and shaping of product stewardship. Long Island municipal governments and educational institutions are encouraged to follow the lead of New York State agencies and authorities through Executive Order 4 (EO4) by setting paper use reduction goals, adopting green procurement lists and identifying sustainability coordinators to implement waste prevention programs. This strategy also encourages regional engagement with NYS DEC and the New York Product Stewardship Council to explore education and policy efforts to reduce product packaging materials shipped to Long Island. It is recommended that the region begins stewardship efforts in the near term as it can take time for changes to influence product packaging.

Obstacles Strong local community identity tends to limit interests in cross-municipality efforts. Modification of procurement lists to include more recycled content and recyclable products can face perceived concern by maintenance and janitorial staff that greener goods cost more and are not as effective as traditional brands. Items on many procurement lists for institutions and municipalities are determined by cost and performance without regard for recycled content and waste generation.

Opportunities In addition to the benefits of eliminating waste at the source, the promotion of high recycled-content and recyclable products can stimulate new markets and material re-use. Utilize the NYS green procurement lists as starting points for designing green procurement guidelines which are suited to the local context. Establish conferences and trainings that convene solid waste management commissioners and staff from across the region to exchange best practices for green procurement among Long Island institutions.

Policy Mechanism
Voluntary adoption / Mandatory requirements

Target(s) Increase in the number of green procurement policies adopted by municipalities and public institutions which can support waste reduction and diversion.

Recommended Actions	Key Stakeholders
Municipal waste officials could partner with NY Product Stewardship Council to promote reduction in volume of packaging.	NYPSC, NYS DEC, municipalities
Generate and circulate model procurement policies that can be adopted by municipalities in the updated MSW plans.	MSW Commissioners
Increase relations between municipalities via LI Sanitation Association and/ or an annual LI municipal solid waste management conference.	Waste Reduction and Management Institute at SUNY Stony Brook

Strategy 1.2 Develop regionally-shared education programs and waste audits to promote waste reduction opportunities in residences, government offices, schools and large institutions.

Description and Intent Promotion of waste programs and audits for schools, institutions and municipal facilities as well as expansion of education and awareness programs in schools using shared-educators across districts may be among the most cost-effective approaches to managing the region's exposure to future waste management costs. Waste audits will educate consumers about the sources, volume, and stream of waste generated. Programs such as "recyclemania" and "trashion" activities (Town of North Hempstead school programs) promoted by municipal offices and education institutions can raise awareness about waste generation patterns that can lead to behavior changes. Furthermore, auditing an institution's waste stream can illustrate ways to reduce disposal costs through re-use or recycling.

Obstacles Limited coordination across municipalities and school districts as well as quick turnover of some waste management commissioners could frustrate ability to share waste auditors and educators. The resistance to being the first to roll-out an unproven program could be a limiting factor for some municipal participants.

Opportunities Waste auditors and educators shared across towns and school systems could extend the reach of waste reduction practices throughout the region while keeping with minimal marginal cost increases to each municipality. Community festivals and Master Recycler trainings can showcase best practices for residential waste reduction and celebrate community building. Also, Master Recycler programs utilize best practice activities for engaging communities and residents in waste prevention and reuse. These activities can also be viewed as ways to reduce the longer term taxpayer cost burden as less waste generated will mean less waste to be collected, transported and disposed. Engagement of schools in waste reduction, building upon programs such as the Town of North Hempstead, can reduce overall waste management and recycling costs. Changes in behavior can take time as children learn best practices when young and carry those teachings through life. The sooner programs are initiated the sooner benefits can be realized.

Policy Mechanism

Voluntary adoption / Mandatory requirements

Target(s) Increase the number of LI school districts implementing solid waste reduction and recycling education programs 50% by 2020 which supports waste reduction and diversion indicators.

Recommended Actions	Key Stakeholders
Form committee to work with school districts to initiate school programs on waste reduction.	LI School Districts
Identify resources to pilot offering of residential waste audits, track impacts.	Municipalities
Promote community-based events such as garbology festivals, trashion shows, etc.	Municipal solid waste commissioners

Strategy 1.3 Expand pilot testing "Pay As You Throw / Save Money and Reduce Trash" programs to evaluate impact of cost incentives and provide lessons learned.

Description and Intent While more than 400 communities in NYS use a form of "Pay As You Throw" (PAYT) or "Save Money and Reduce Trash" (SMART) programs to finance solid waste collection and recycling, only a handful of communities on Long Island are using this approach. PAYT programs treat trash collection similar to other utility services in that consumers pay for the level of services used. Evaluation and development of PAYT/SMART models, which more directly align volume of waste collected with fees charged to residents and businesses in Long Island, could lead to more cost-effective waste management. In addition, sharing lessons learned and demonstrating successes of PAYT/SMART programs within the region may further support the waste goals. Municipalities can reference the broader guidelines of NYS Beyond Waste when developing policies for adoption and updating solid waste management plans.

Obstacles Concerns about illegal diversion and equity for special populations may be a barrier to local acceptance. Some towns have existing contracts with waste to energy facilities and waste haulers that require guaranteed provision of minimum volumes of waste, reducing the cost incentive for towns to limit waste generation. Also, waste haulers and waste to energy facilities would likely resist significant waste reduction efforts as less waste generated would mean less waste for transport and disposal.

Opportunities Pilot programs should structure the program to address illegal diversion by creating incentives through recycling and composting. "When properly structured, the full system costs (including recycling, composting and waste prevention programs) are included in the waste disposal fees, while recycling and composting collections are provided for free."[1] The needs of special populations such as senior citizens and disabled residents as well as low-income households should be considered when designing and evaluating the program. The US EPA provides a tool kit to assist communities in program design.[2] Alignment of waste services with volumes generated can incentivize individuals to reduce waste and can reduce municipal tax burden. Waste haulers that diversify and integrate with waste diversion such as recycling and compost

1 Beyond Waste: A Sustainable Materials Management Study for New York State, NYS DEC, 12/27/2010, see: http://www.dec.ny.gov/docs/materials_minerals_pdf/frptbeyondwaste.pdf

2 http://www.epa.gov/osw/conserve/tools/payt/

programs may be able to sustain future business by maintaining material volumes for transport. Local coordination of integrated waste management services among a few municipalities may generate economies of scale that can reduce costs while increasing value of waste, recycling and compost hauling services. Heightened awareness of incentive-based waste programs in the near-term can inform the next round of municipality waste management contract renewals, ensuring a greater chance that incentives align with waste reduction goals.

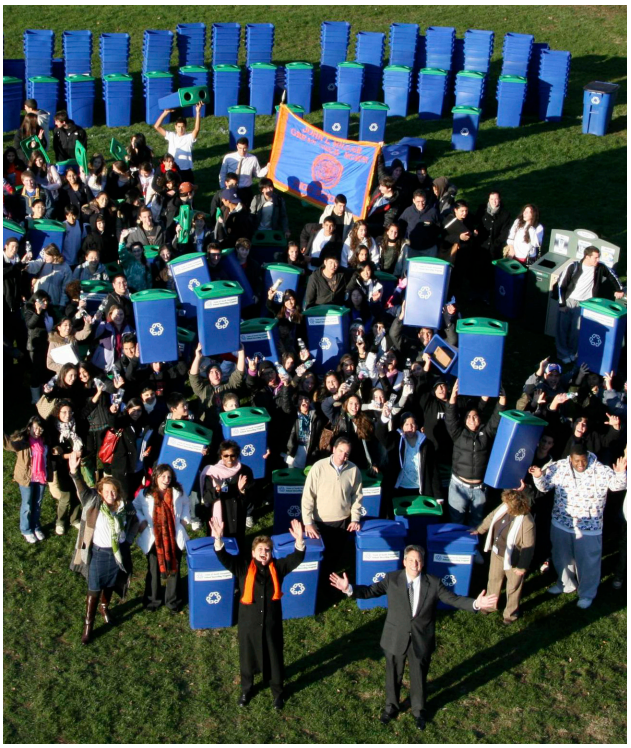
Policy mechanism Voluntary/incentivize

Target(s)

- Increase number of municipalities implementing PAYT/SMART programs.
- Reduce volume of MSW disposed.
- Increase in volume of waste recycled.

Project examples to demonstrate feasibility Southold, LI

Recommended Actions	Key Stakeholders
Identify lessons learned (cost savings, recycling improvements, etc.) from existing PAYT programs.	NYS DEC, Municipal solid waste commissioners
Advocate for PAYT in an annual municipal officials' meeting on solid waste management issues.	NYS DEC, solid waste commissioners, environmental advocacy groups
Develop public awareness campaign on benefits to program.	Municipal Solid Waste commissioners, schools, environmental advocacy groups



Town of North Hempstead School Recycling Partnership Program – Pictured: Great Neck School District.
Source: Town of North Hempstead

Goal 2 Develop localized facilities to the reduce volume of organics transported to landfills and increase energy capture.

Strategy 2.1 Expand New York State pilot program to test viability of food waste to biogas on Long Island.

Description and Intent Food waste comprises a significant portion of municipal solid waste (MSW) generated at campuses, hospitals, and schools that requires transport for landfill or incineration. The establishment of regional anaerobic digesters can convert food waste and other complex organics into a biogas resource and reduce the volume of organics transported to landfills. Biogas can provide heat for buildings and power for waste management vehicles while residual liquids and solids can be applied to land as a soil fertilizer. As a result, this facility can reduce the amount of GHGs generated from food processing by reducing the distance food waste is shipped. This re-processing can also lead to lower GHG emissions than food waste that is landfilled. Showcasing other NYS pilot food waste projects can help demonstrate viability to LI institutions for pilot testing a local facility. A LI-based pilot will enable local demonstration of how anaerobic digestion in a space-efficient facility accepts food waste and converts it into biogas. This strategy will require identifying and securing funds, locating a facility, and obtaining regulatory approvals.

Obstacles Costs and identification of implementation funds could limit initiation of a pilot activity. There is also a lack of awareness, locally that this approach is technically feasible, and there are concerns about location of facility and odors. Until an Island demonstration is set up, it may be challenging for institutions to consider investments in food waste to energy systems.

Opportunities There are a number of successful pilot models that demonstrate the viability of this technology in NYS, such as the program funded by NYSERDA at Clarkson University and the NYC cafeteria waste programs, along with a full-scale facility in Toronto, Canada. For instance, Toronto's demonstration plant for residential food waste was installed in 2002 and a second plant is under construction. There are more than 180 plants in Europe. Viability of this process locally can enable replication of anaerobic digestion processing at institutions throughout Long Island. In addition to the values of an Island-based demonstration, early testers and adopters may find a greater availability of grants and subsidies than once these facilities become more common in the region.

Policy mechanism Voluntary

Target(s)

- Successful operation of a pilot anaerobic digestion system on-Island to increase diversion rates.
- Implementation of program of small-scale facilities located at many institutions throughout Long Island.

GHG Emission Savings Potential 6,276 MT CO_2e

Emission reduction assumptions Assumes that facilities for processing food and other compostable wastes are online for serving 10% of the residential market and 25% of the commercial market.

Recommended Actions	Key Stakeholders
Develop plans for pilot to test size and scale; identify pilot location, target users (i.e. schools, municipality, university, hotel, etc.); assess financial feasibility.	MSW Commissioners, Waste Reduction and Management Institute at SUNY Stony Brook , NYPSC, NYS DEC,
Coordinate pilot with NYS DEC to allow permitting or emerging waste management as technology evolves.	NYPSC, NYS DEC,
Identify potential pilot for biodiesel fuel for municipal waste management vehicles.	MSW commissioners, Greater LI Clean Cities Coalition

Strategy 2.2 Create new and/or expand existing yard waste compost facilities to serve most municipality and commercial needs.

Description and Intent This strategy seeks to increase diversion of yard waste from the waste stream by providing a composting facility(s) for municipal and commercial needs. The strategy includes conducting a study of whether centralized facilities for Island-wide service or smaller facility(s) serving a few towns would be optimal. This will require securing funds, identifying facility locations, and obtaining the necessary regulatory approvals. Note that under current regulations, the facility must receive NYS DEC permits as a

solid waste facility authorized to accept yard waste. Further integration with curbside collection programs would help to promote residential participation in yard waste composting.

Obstacles Obstacles can include a lack of availability of initial capital funds. Land area needed for location and siting of multiple facilities may be challenged by not-in-my-back-yard (NIMBY) issues. Odor concerns may trigger resistance while conflicts in the regulatory definitions of MSW and residential yard waste facilities may complicate permitting activities.

Opportunities One centralized facility may be easier to implement rather than multiple locations due to NIMBY, odor and trucking concerns. Managing compost on-site would limit the amount of trucking. Municipalities can refer to NYS Beyond Waste Organic Waste Diversion in development of program.

Policy mechanism Voluntary

Target(s) Increase organic waste diversion rates.

GHG Emission Savings Potential 3,451 MT CO_2e

Emission reduction assumptions Assumes that 45% of the residential market and 50% of the commercial market participate in composting yard waste.

Recommended Actions	Key Stakeholders
Explore viability with NYS DEC regulators.	MSW Commissioners, NYS DEC
Identify potential location(s) for facilities.	NYSDEC with Municipalities
Develop information/education campaign program targeting potential of facility by municipal residents, waste haulers and governments.	NYSDEC with Municipalities

Source: Town of North Hempstead

Goal 3 Increase the amount of locally recycled non-organics.

Strategy 3.1 Initiate market feasibility assessment for regional facility/ies to expand capacity to recycle plastics waste.

Description and Intent The strategy addresses the need to increase inorganic waste diversion by conducting a feasibility study to explore expanding recycling of plastics (to include #3-7 plastics). While plastics #1 and #2 are able to be recycled locally, most of #3-7 plastics require a separate recycling process which is not conducted locally. As a result, most of the region's #3-7 plastics are transported to incinerators or landfills. This strategy calls for a feasibility study to explore whether there is a market to support a locally-established plastics #3-7 recycling facility. If an on-Island facility is not feasible, then the study should consider whether there is an off-Island location within a reasonable distance to minimize vehicle miles for transport.

Obstacles Strong local community identity may limit interests in cross-municipality efforts to establish a facility. Up-front start up costs to assess market feasibility will be needed, but may be challenging to obtain.

Opportunities There is the potential for transformation of the plastics recycling market if many towns/businesses collaborate to provide #3-7 recycling as it would create enough supply to make a facility cost-effective. If the study determines it is not cost-effective to establish a facility, then an opportunity would be to consider diversion of plastics to high energy capture plastics incineration. Waste to energy facility operators on Long Island should be engaged in these feasibility assessments.

Policy mechanism Mandatory

Target(s)

- Completion of a feasibility assessment of establishing a facility to recycle #3-7.
- Establishment of a #3-7 action plan which increases the amount of #3-7 diversion.

Recommended Actions	Key Stakeholders
Engage Brookhaven in their Materials Recovery Facility (MRF) expansion.	NYSDEC and municipalities that have recycling available, private recycling facility operators
Engage private operators in conversations about facility expansion needs.	NYS DEC and municipalities

Source: Town of North Hempstead

Goal 4 Promote energy efficiency throughout waste management processes and systems.

Strategy 4.1 Expand efficient management of municipal and private municipal solid waste fleets to include biodiesel and compressed natural gas vehicles.

Description and Intent By "Greening" solid waste management fleets, municipalities and private haulers can test and demonstrate the viability of new auto fuel technologies while contributing to the reduction in GHG emissions. Municipalities will be called on to replace low MPG commercial and residential waste trucks with more fuel efficient vehicles. This strategy calls for pilot tests to integrate food-waste-to-biodiesel with an anaerobic digestion facility and expanding compressed natural gas (CNG) infrastructure. The GLICCC, Smithtown, and Hempstead are currently piloting projects to switch to CNG waste management vehicles.

Obstacles Resistance to new technology and concerns of cost impact by both municipalities and private haulers may contribute to slow adoption of CNG equipment. Lack of available CNG infrastructure may delay greening of fleets.

Opportunities Expanding CNG infrastructure will help to promote the use of the vehicles in other sectors. Greater Long Island Clean Cities Coalition has demonstrated success converting diesel waste management vehicles to CNG through leveraging outside grant money in addition to municipal fleet investments. Also, a coalition of organized CNG customers (municipalities, private operators) seeking infrastructure investment with the utility may find cost-sharing advantages and influence over location selections if part of the early phase roll-out, rather than waiting until the utility or others begin infrastructure layout. There is also the opportunity to coordinate with actions recommended in the transportation strategy 1.4.

Policy Mechanism Voluntary/incentivize

Target(s) Reduce number of low MPG commercial and residential waste trucks and replace with more fuel-efficient vehicles for supporting GHG reduction indicators.

Recommended Actions	Key Stakeholders
Explore systems that can enable more efficient refueling at multiple locations throughout the region.	Solid waste commissioners from multiple municipalities
Provide model contracts which promote greener waste management vehicles and operations.	Greater Long Island Clean Cities Coalition; interested municipalities
Identify/align pilot-testing fleet partners with pilot organic anaerobic digestion facility.	Partners of the food to energy pilot; interested municipalities

Strategy 4.2 Initiate cross-municipality and operator discussion on upgrades to incinerator facilities that would optimize energy capture from waste.

Description and Intent The objective is to promote the upgrade of existing facilities on-Island that optimize energy extraction by more efficiently processing waste that cannot be recycled. This includes exploring viability for pilot on-site modular facilities to capture energy from waste that currently needs to be trucked and landfilled .

Obstacles Implementation of this strategy may be slowed by limited access to capital funds; location and siting concerns as well as permitting complications.

Opportunities New and expanded sources of energy, technological development. Modular facilities promote localized approach to sustainable waste management including on-site management of waste, reducing truck traffic and long distance transfer of waste, thereby reducing GHGs.

Policy Mechanism Voluntary

Target(s)

- Reduced rate of non-recyclable ending up in landfill.
- Increased rate of diversion of non-recyclable to efficient energy generation facilities.

Recommended Actions	Key Stakeholders
Conduct feasibility study to advance on-site energy capture facility pilot.	Waste to Energy facility operators; DEC
Identify potential partners such as technology companies, local medical and campus institutions to explore new ideas for non-recyclable plastics.	Private waste to energy operators

10 Water Management

Trends and Issues

While the preservation of waterways and potable water sources is an important issue in every community, Long Island is unique among the planning regions in New York State as it is surrounded by water (the Long Island Sound and the Atlantic Ocean) and almost all the water supply is drawn from three major aquifers underlying the area. The aquifers are among the most prolific in the country. Nassau and Suffolk counties utilize more than 375 million gallons of ground water per day for public, domestic, industrial, and irrigation uses.

Potable Water

The aquifers supplying Long Island drinking water are threatened by contamination and over-pumping yet the low cost of water on Long Island does little to encourage conservation. The plethora of government agencies and regulatory bodies in Long Island make water management and the development of consistent protections and regulation very challenging. There is very little coordination amongst the sixty-five water districts, hundreds of non-community water districts, and thousands of private well owners although they are using the same limited resource.

Water consumption

Water consumption Island-wide varies from less than 100 gallons per day (gpd) per capita to over 1,000 gpd per capita and is heavily concentrated in summer months. While residents in Nassau County average 149 gpd and those in Suffolk only average 122 gpd. These averages are considerably higher than the approximate US average of 80 – 100 gallons per person per day. Due to the nature of the homes on Long Island and the differing densities of communities, the discrepancy in water use roughly correlates to the size of personal properties and the use of potable water for landscaping in the summer months. While comprehensive water consumption reductions are encouraged, the Working Group targeted curbing landscaping usage because this seasonal demand stresses on the overall aquifer system.

Wastewater

The majority of Nassau County is tied into municipal sewer systems. Seventy-five percent of Suffolk County is served by individual septic systems and cesspools that are harder to monitor and are a major source of groundwater and surface water pollution. The Working Group recognized that tackling septic systems is a large task to take on as compared to focusing on existing centralized wastewater treatment plants. However, it is clear from numerous studies that the water quality in Suffolk County is deteriorating at a faster rate due to these decentralized septic systems and real changes need to take place to help stem the deterioration of both the drinking water and surface water quality.

Stormwater

While Long Island is largely suburban, it is characterized by often dense communities and a large amount of paved surface area, leading to a high percentage of runoff into the Long Island's bays. Long Island is particularly susceptible to flooding and this vulnerability will expand as the region experiences projected increases in rainfall and other extreme weather events. Following the events of Superstorm Sandy in Fall 2012, the Working Group indicated the need for improved stormwater control and flood abatement. Green infrastructure is a natural, flexible, sustainable approach to stormwater control that has the dual benefit of reducing runoff and flooding, while recharging the Island's aquifers.

Sustainability Indicators

Water demand per capita

Reflecting the region's goal to preserve its aquifer and drinking water supply for future generations while also reducing energy associated with water consumption.

- **2010 Baseline** 135 gallons per day per capita
- **2020 Target** 120 gallons per day per capita

Total number of impaired waterways

Reflecting the region's priority to protect the health of its coastal waters for tourism, recreation, fishing, environmental health, and community pride.

- **2010 Baseline** 67 impaired waterways
- **2020 Target** 64 (5% reduction in number of impaired waterways)

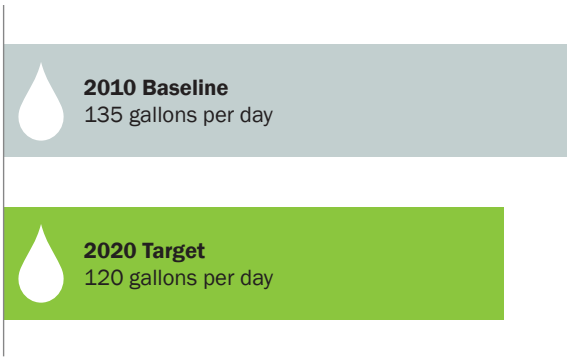


Figure 23 Water Demand per Capita

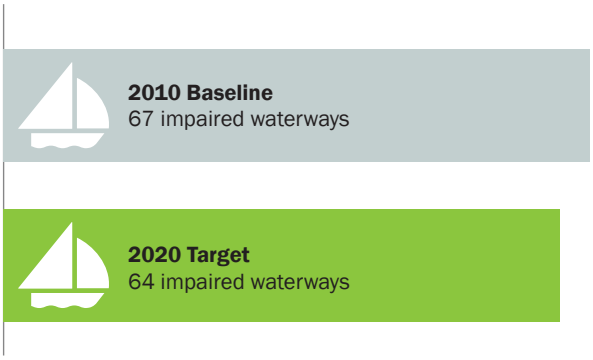


Figure 24 Number of Impaired Waterways

Goals and Strategies

As noted in the introduction, water demand per capita across Long Island is significantly higher than the US average. Although it is difficult to estimate in certain terms how much of the landscaping potable water use is excessive, it is thought that most uncontrolled in-ground systems overwater by as much as 50%. If all excessive watering were eliminated, the water demand per capita could be reduced to 100 gallons per day per capita and significantly reduce the stress on the aquifer system during summer months. Because many of the strategies described in this chapter will take time to be fully implemented, a reasonable reduction in per capita water consumption to approximately 120 gallons per day per capita has been established as the 2020 goal.

Currently, there are 67 impaired waterways on Long Island, split almost evenly between Nassau and Suffolk counties, that are affected by nonpoint source pollution. Most of the strategies included in this chapter will result in some positive benefit to the region's surface water bodies. However, it will be require a long process to see appreciable improvement to impaired waterways. Halting pollution is the first step and the target of many strategies, but the ecological bounce-back after the water quality improves will take time. With this in mind, the Working Group has set a goal of 5% reduction in impaired waterways by 2020.

The following is a description of the water management goals and the strategies selected to achieve the sustainability goals that were articulated by the Water Management Working Group in collaboration with the Steering Committee and the technical consultants. Strategies was prioritized into a shortlist that best represent the interests and ambitions of the communities.

Table 16 Water Management Goals and Strategies

	Align w/ LIREDC Goals	Adapt to Climate Change
Goal 1 Work together to preserve the region's sole source aquifer and maintain it in a sustainable way.		
Strategy 1.1 Develop a regional entity to coordinate management of the aquifer system.	x	x
Strategy 1.2 Continue water monitoring by the U.S. Geological Survey in Suffolk County and obtain funding to re-establish monitoring in Nassau County.	x	
Strategy 1.3 Provide educational program about the aquifer to Fourth Grade students.		
Strategy 1.4 Curb pesticide usage.	x	x
Goal 2 Reduce water consumption.		
Strategy 2.1 Reduce potable water consumption due to excessive irrigation.	x	x
Strategy 2.2 Show water use trends on water bills.		
Strategy 2.3 Conduct a rate study to provide more uniform water rates across the region that are commensurate with the environmental cost of the resource.		
Goal 3 Increase wastewater pollution control.		
Strategy 3.1 Conduct a feasibility study to convert septic systems in priority areas to cluster treatment facilities with better treatment capabilities.	x	x
Strategy 3.2 Incentivize the replacement or retrofit of failing septic systems.	x	x
Goal 4 Control flooding and surface water pollution from stormwater runoff.		
Strategy 4.1 Increase the development of green infrastructure in the public and private realms.	x	x

Goal 1 Work together to preserve the region's sole source aquifer and maintain it in a sustainable way.

Strategy 1.1 Develop a regional entity to coordinate management of the aquifer system.

Description and Intent A regional entity would provide a framework for the sixty-five water districts, hundreds of non-community water districts, and thousands private well-owners to significantly strengthen the region's water resource management through coordinated usage, conservation, and protection.

Obstacles It will be challenging to align the numerous and independent districts around common best practices. Likely points of opposition are localities resistant to the loss in autonomy required for collaboration.

Opportunities The Long Island Commission for Aquifer Protection (LICAP) is a newly formed regional group that works across all water districts in Suffolk County. The Greater Port Washington Peninsula Aquifer Committee (PAC), is comprised of representatives from local civic group Residents For A More Beautiful Port Washington (RFMBPW), United States Geological Survey (USGS), the Town of North Hempstead (ToNH), Nassau County and State government, Local Villages and Water Districts on the peninsula. The PAC was formed in 2000 to model and study a specific portion of Nassau's water system and is now using its predictions to create a conservation plan with definitive pumping goals and strategies to reduce, reuse and recharge the aquifer system to ensure a long-term sustainable water supply.

Expanding these collaborations to include all water districts in Nassau County, large private well owners and other stakeholders would provide an opportunity to significantly strengthen the region's water resource management of coordinated usage, conservation, and protection.

Policy Mechanism Mandatory

Target(s) None established.

Recommended Actions	Key Stakeholders
Establish an initiative to promote and draw support for a regional entity through the LICAP and PAC structures.	Water Districts, private water service providers
Create a steering committee to work with NYS DEC to coordinate activities that could result in the long-term sustainable management of the aquifer system.	

Strategy 1.2 Continue water monitoring by the U.S. Geological Survey in Suffolk County and obtain funding to re-establish monitoring in Nassau County.

Description and Intent There is considerable agreement that collection of region-wide data is important for the management and protection of the aquifers. The U.S. Geological Survey (USGS) operates the most highly regarded water data collection system on Long Island including groundwater, stream flow, precipitation and other parameters and the information goes into a national, publicly accessible data base. They systematically collect groundwater level data and stream data at varying measurement frequencies to define the spatial distribution of the water table and potentiometric surfaces within the three main water-bearing units underlying Long Island—the upper glacial, Magothy, and Lloyd aquifers. They also collect water quality samples for both well water and surface water and test them for nutrients, pesticides, wastewater pollutants, and other contaminants. This work is extremely important for Long Island given the region's complete dependence on its aquifer system and the delicate balance the region must maintain to keep the system free of additional contamination and saltwater intrusion.

While Suffolk County continues to fund this work, funding from Nassau County to the USGS was terminated in 2010 and data collection stopped in Nassau. A small program in Port Washington was locally funded (necessitated by issues with saltwater intrusion) and data collection continued in that small area. The data collected by USGS was invaluable to Port Washington and aided them in determining which wells would provide high yields without drawing the water table down too far. USGS data collection in Nassau was

partially restarted with one-year funding from some water utilities in October 2012. Although some groundwater data is also collected by Nassau County DPW, the collection protocols are not consistent with USGS standards and the collected data is not routinely reported to the public.

Restoring funding to this program will help the region get a full picture of its water resources and an understanding of how best to use and preserve them.

Obstacles Lack of funding is an obstacle which could impede implementation.

Opportunity This strategy can further the creation of a data bank serving the water interests of the region.

Policy Mechanism Mandatory

Target(s) Re-establish monitoring in Nassau County by 2015, an aggressive target that underscores the importance of continuing this monitoring.

Recommended Actions	Key Stakeholders
Work with budget offices to re-establish funding or seek an outside funding source.	County and municipal governments

Strategy 1.3 Provide educational program about the aquifer to Fourth Grade students.

Description and Intent Many Long Islanders do not know the source of their water or the limited capacity of the resource. We cannot expect the population to conserve without arming them with an understanding of why it is important and how they can make a difference. The water cycle is typically taught to fourth grade students in Long Island schools; coupling education about the aquifer system and the need for a sustainable approach will expand the knowledge base of the larger community over time.

Obstacles There may be resistance in school districts to the perceived expansion of existing curriculums. To overcome this obstacle, it important that the program be integrated as best as possible within existing curricula requirements. Well-developed teaching material can aid educators in delivering this new content. Also, an engaging and interactive approach to this localized water cycle lesson may help students grasp the lessons so they can share knowledge more broadly through the community.

Opportunity The next generation of water users can be engaged through school water resource curriculum to promote strong stewardship of the limited water supply.

Policy Mechanism Voluntary

Target(s) 20% of school districts by 2020 and 50% of school districts by 2025.

Recommended Actions	Key Stakeholders
Establish a committee to coordinate with school districts.	Long Island School Districts
Explore adaptation of the existing aquifer education program offered by Suffolk County Water Authority and the Cornell Cooperative Extension to meet school curriculum requirements.	
Create interactive tools, such as "water footprinting" to help students understand how much water they use and what steps they can take to conserve the resource.	

Strategy 1.4 Curb pesticide usage.

Description and Intent Pesticides were first detected in Long Island's drinking water in 1979. In a report published in 2001, it was reported that pesticides or pesticide-related compounds were detected in over 50% of the Eastern Suffolk drinking water wells sampled. That study found that of the 52 pesticide related compounds found, 13 had exceeded the drinking water Maximum Contaminant Levels (MCLs). There have been bans on several pesticide chemicals through the years in both Nassau and Suffolk Counties, but the slow breakdown of these compounds in groundwater means that the contamination remains persistent years after their discontinued use. Although there have been efforts to curb agricultural use, commercial and residential use are on the rise. Curbing pesticide usage may also contribute to a reduction in waterway impairment, depending on the type of pesticide and amount of concentration.

NYS DEC issued a draft Long Island Pesticide Pollution Prevention Strategy (LIPPPS) earlier this year. LIPPPS calls for extensive study of Long Island's pesticide issues. Understanding that the agricultural community depends on pesticide use to some extent, it is clear that careful consideration must be undertaken before action is taken. However, it is also clear that the action taken must be strong and a more sustainable approach to land management is necessary.

Obstacles Anticipating resistance in agricultural community to further restrictions, it is important that sound, fact-backed information be provided to farmers that show the deleterious effects of unsustainable agricultural practices on the water supply and environment, and alternative methods be presented that will help their businesses adjust to the new regulations.

Opportunity The LIREDC Strategic Plan called for enhancing environmental stewardship on the Island in order to reduce the impacts of agricultural pesticide and fertilizer application on ground and surface waters. The adoption of best management practices by farmers will help with this effort. A sustainable, natural approach to pest management for non-critical applications and a more conservative approach to pesticide application in agriculture can curtail pollution and help ensure a safe drinking water supply into the future.

Policy Mechanism Voluntary

Target(s) There is no specific target for this goal, but success could be measured in the eventual reduction of pesticide concentrations in drinking water over time.

Recommended Actions	Key Stakeholders
Monitor NYS DEC's Long Island Pesticide Pollution Prevention Strategy and actively work with environmental groups to push for the most toxic pesticides to be restricted or banned.	NYS DEC, environmental groups, Long Island Commission for Aquifer Protection, a regional group that works across all water districts in Suffolk County, would be well-suited to follow DEC's work and provide valuable input.)

Source: AECOM

Goal 2 Reduce water consumption.

Strategy 2.1 Reduce potable water consumption due to excessive irrigation.

Description and Intent Long Island's average water consumption of approximately 135 gallons per capita per day varies from district to district, with consumption rates ranging from under 100 gallons per capita per day in more densely populated areas, to over 1,000 gallons per person per day in others. This disparity is largely driven by irrigation demand that is concentrated during summer months. During the summer the water demand increases up to fourfold, putting tremendous stress on the region's sole-source aquifer system.

While it is large recognized that the implementation of certain water conservation measures (e.g., low-flow toilets and shower heads, more efficient washing machines) have considerably reduced in-home residential use of potable water since the 1970s, it appears that the use of potable water for landscaping has increased over the same time period, particularly due to the proliferation of in-ground automatic irrigation systems.

Obstacles Landowners' perceived need and insistence on more frequent and heavier irrigation could be a significant challenge to reducing water consumption. Educational outreach is a very important component to this strategy because there are many misconceptions about both the abundance of the region's water supply and the value to the landscape from over-watering. If citizens and local decision-makers better understood the limits of our water supply resources and the importance of preserving its health for future generations, coupled with a better understanding that over-watering does not improve the appearance of the landscape, excessive water consumption could be reduced significantly.

Opportunity Given the disproportionate demand on the aquifer during the summer, major improvement can be realized through education and technological innovation of landscaping practices.

Policy Mechanism Voluntary

Target(s) Reduce consumption rates from 135 gpd per capita to 115 gpd per capita and significantly reduce peak demand.

Recommended Actions	Key Stakeholders
Increase outreach to educate local decision-makers and the public on the importance of not overwatering lawns. This outreach could be accomplished by various groups, including Town governments as part of their public outreach campaigns, and local water districts with the long-term interest of preserving the asset of the aquifer system.	Water districts, landscape water users (i.e. golf courses, large landowners, homeowners), Town governments
Create programs to educate homeowners about the use of water-efficient plants (xeriscapes) and the benefits of minimizing turf-based landscapes. Again, this outreach could be accomplished by various groups, and may be most effective if it is addressed by several different types of groups, such as Town governments, local water districts, and the landscaping industry.	
Promote the use of Smart Water Application Technologies (SWAT)-approved weather sensitive "smart" irrigation controls, pressure reducing valves, and rain barrels. Make "smart" irrigation controls mandatory on all new irrigation systems. Incentivize the purchase of rain barrels, following the success of Town of North Hempstead's program.	

Strategy 2.2 Show water use trends on water bills.

Description and Intent Showing water use trends on water bills is an effective means to show water customers how much water is used and how consumption fluctuates seasonally. The chart could be accompanied by suggestions of how to curb water usage.

Obstacles The strategy would require a change in standard bill formats or the inclusion of an extra insert page with data that could encounter resistance from water dis-

tricts. The information may be ignored by users if not properly highlighted.

Opportunity A pilot of IBM smart cities in Dubuque, Iowa, found that arming users with detailed information was enough to curb water use by up to 6.6%.[1] Greater results were found when information was benchmarked against others in the community.

Policy Mechanism Mandatory

Target(s) Include in water bills in 10 water districts by 2016. and in 25 water districts by 2020.

Recommended Actions	Key Stakeholders
Conduct outreach to water districts to encourage and support development of program.	Water districts, large landscape water users (i.e. golf courses, large landowners), homeowners

Strategy 2.3 Conduct a rate study to provide more uniform water rates across the region that are commensurate with the environmental cost of the resource.

Description and Intent There are 65 separate water districts across Long Island, serving populations ranging from a few hundred people within some small village systems, to Suffolk County Water Authority's system which serves approximately 1.2 million people. In addition, there are hundreds of non-community water districts, serving very small local populations. Water rates vary widely across these systems, with some Long Islanders served by privatized systems paying up to four times more per gallon of water than residents of neighboring areas served by public systems. Rate structures also vary widely, with some charging a flat rate per gallon, while others have tiered rates structures.

The Working Group noted that many of the public water systems believe their mandate is to serve the best possible water at the lowest price. While this is reasonable and expected from a public utility, and the rates they charge cover operating costs, rates are not commensurate with the environmental cost of the resource. By paying such low water rates, there is no economic incentive to conserve water.

A rate study would provide water districts the data necessary to adjust water rates to be more uniform across the region and commensurate with the environmental cost of the resource. Because this rate study will require cooperation and coordination among many interested parties, it is envisioned that it be conducted by a regional entity, such as LICAP or PAC. Higher costs in a tiered structure will disincentivize use and additional funds collected can be put towards system efficiency improvements, water conservation efforts, and wastewater treatment improvements.

Obstacles Some districts have caps for increasing rates. Rate increases can be politically unpopular. Discussions on where the revenues generated will reside and how it will be used can be contentious. Nearly all water suppliers hold the position that their mandate is to serve the best possible water at the lowest price.

Opportunities Exploration of water service pricing is likely to reveal efficiencies in pricing and low-cost opportunities for water system investments.

Policy Mechanism Voluntary

Targets None identified

Recommended Actions	Key Stakeholders
Conduct a comprehensive rate study through a regional entity, such as LICAP or PAC, as described in Strategy 1.1.	LICAP or the regional entity
Develop a fair way of implementing a price change that will encourage conservation and raise funds for water-related projects. One approach would be to have water suppliers examine the per capita water use in their system and publicize the inconsistent levels of use.	

1 *http://www.cityofdubuque.org/DocumentCenter/Home/View/3116*

Goal 3 Increase wastewater pollution control.

Strategy 3.1 Conduct a feasibility study to convert septic systems in priority areas to cluster treatment facilities with better treatment capabilities.

Description and Intent Less than 25% of Suffolk County is served by sewage treatment plants, as compared to 90% in Nassau County. Septic systems are a large source of non-point pollution and are partially responsible for the degradation of both surface and drinking water quality in Suffolk County. In addition, a nine year study recently completed by Louisiana State University determined that nutrient loading (specifically nitrogen and phosphorus) is a primary contributor to the extensive depletion of salt marches along the East Coast.[2] These salt marshes are invaluable for Long Island, having historically been used as a natural buffer to protect land masses during large storms by storing flood water and providing surge protection. They also serve essential roles in carbon sequestration.

Septic systems are also a significant source of GHG emissions in the form of fugitive methane emissions. Targeting high priority areas (i.e., near coastal water, high groundwater table, densely populated areas) for cluster treatment will help reduce the overall environmental toll.

Obstacles Much of the region is serviced by septic systems and lacks strategic planning and investment to upgrade to municipal sewer systems. Converting from decentralized system to a centralized system is expensive. Land must be identified to the site the cluster plant. There will be resistance to sewering due in part to the fear it will encourage development. However, there should be minimal obstacles at the feasibility phase, just the need for support, data, and funding from local municipalities. Implementation is the difficult and costly phase.

Opportunities In 2011, Peconic Green Growth developed a planning methodology for identifying the need for centralized wastewater treatment in Suffolk County. With this methodology in place, build on the work of the Suffolk County Smart Growth Committee to encourage the establishment of new sewer districts and reduce sewer connection fees in targeted Smart Growth areas to encourage development and redevelopment. Deer Park, Hauppauge, and the tri-hamlet region (Shirley, Mastic, and Mastic Beach) are moving toward creating or expanding sewer districts to more areas.

Policy Mechanism Voluntary

Target(s) Conduct feasibility study by 2018.

Recommended Actions	Key Stakeholders
Building on the work of Peconic Green Growth and the Suffolk County Smart Growth Committee, the Town of Southampton could expand its ongoing work with local universities and experts to conduct feasibility study which requires access to GIS technology and planning data/info, and expertise.	Town of Southampton, Suffolk County, local universities, some small coastal areas in Nassau County served by septic systems (e.g., Glen Cove)

Strategy 3.2 Incentivize the replacement or retrofit of failing septic systems.

Description and Intent The existing decentralized septic systems found in many communities are the primary source of the nitrogen pollution. Nitrogen pollution has multiple deleterious endpoints, most notably with impacts to drinking water quality, the proliferation of algal blooms, and the destruction of salt marshes and eelgrass. Nitrogen levels have increased up to two-fold in the primary drinking water aquifers and, in some instances, have exceeded the MCL of 10 mg/L nitrogen. Algal blooms have been destroying the region's surface water ecology, which has resulted in catastrophic losses to local shellfish populations. Salt marshes, historically one of Long Island's richest ecosystems and greatest protection against extreme storms, continue to be depleted. Eelgrass, which acts as a natural buffer, was once common on the East End of Long Island, but now can only be found at the eastern portion of Shelter Island.

Ultimately, the existing systems must be retrofitted or replaced with upgraded systems in order to reduce pollution.

2 *Deegan et al. "Coastal Eutrophication as a driver of salt marsh loss," Nature, October 18, 2012, pp 388 – 392*

The cost of converting all of Suffolk County's septic systems to cluster treatment (see Strategy 3.1) is prohibitively high. However, the current cost of retrofitting septic systems for nitrogen removal is also very high. Developing lower cost solutions to adequately treat wastewater fed to septic systems is of critical importance to the region's drinking and surface water.

Obstacles The cost of providing incentives is seen as a primary obstacle for this strategy.

Opportunities The Peconic Institute is partnering with the Town of Southampton to focus on identifying/developing affordable technology to retrofit or replace currently approved systems in order to meet a more stringent nitrogen standard. Though headquartered in Southampton Town, it would service all of Long Island to address this pressing issue. Also, the East Quogue GEIS calls for on-site wastewater systems to utilize innovative systems that maximize nutrient removal. It is estimated that more than half of existing septic systems are performing below optimal performance or are failing altogether. Providing incentives for the inspection and replacement of septic systems using more stringent treatment standards will go a long way in controlling nitrogen pollution.

The anticipated improvements to both drinking water and surface water quality will translate to increased health of the population and the economy. The LIREDC Sustainability Plan calls for continued improvement to water quality on the Island, indicating that it will increase the economic potential and employment opportunities of fisheries and aquaculture.

Policy Mechanism Voluntary

Target(s) None specified. Success could be measured in reduced ambient nitrogen levels in the groundwater.

Recommended Actions	Key Stakeholders
Monitor work of the ongoing partnership for selection of preferred affordable technology.	Towns, cities, villages and sewer districts
Work with Towns toward developing incentive programs for inspecting and replacing failing septic systems.	

Goal 4 Control flooding and surface water pollution from stormwater runoff.

Strategy 4.1 Increase the development of green infrastructure in the public and private realms.

Description and Intent Long Island continues to develop and, as a result, continues to increase its impervious surface area. Impervious surfaces prevent stormwater from seeping into the ground, causing surface water contamination and depleting the natural recharge of the region's aquifers. Southern Nassau County, being amongst the most densely populated segments of the region, is estimated to have close to 30% impervious surface area, based on digitized aerial maps and field reconnaissance. The Long Island Sound Study estimates that northern Nassau County has between 10 – 20% impervious surface area. Although impervious surface cover is lower in Suffolk County (~5%), the rate of development is faster, resulting in a faster rate of increase in impervious surface area.

Green infrastructure is intended to improve water quality through extensive management of stormwater runoff. By controlling stormwater at the source, green infrastructure reduces stress on traditional water drainage infrastructure. Also, it has the added benefit of recharging the region's aquifers, which are particularly stressed during the summer months. Green infrastructure is particularly important due to climate change, with intense storms and flooding expected to increase.

Three sub strategies were identified by the Working Group as particularly appropriate for Long Island:

- Create a requirement that all new developments offset the portion of new impermeable surfaces with techniques to route rainwater to the ground to recharge the aquifer. Because Long Island already has substantial impervious surface coverage, it is important to stop new impervious surface area from increasing the problem.
- Implementing porous pavements, a system that allows storm water to permeate through the pavement cross-section, for sidewalks, plaza, and parking areas creates land area that would otherwise be impermeable and allows rainwater to filter into the ground and recharge the aquifer. With a population of 2.8 million people, the need for sidewalks, plazas, and parking areas is great. Having these areas act as permeable surfaces that capture stormwater would help reduce the overall water drainage load on roadways and catch basins.
- Construct vegetated-swales adjacent to sidewalks to store rainwater and allow it to infiltrate into the ground, minimizing discharge to storm sewers. Long Island's extensive road system is vulnerable to flooding, particularly in low-lying areas adjacent to open water. Capturing and storing rainwater will help reduce flooding impacts in the most vulnerable areas.

Obstacles In general, it is anticipated that there will be some resistance from the status quo. More specifically, there may be resistance to porous pavement and sidewalk swales due to maintenance concerns. Earlier versions of porous pavement lacked resilience, causing negative perceptions of about maintenance needs (vacuuming) and repair. Recent studies show that a high level of maintenance is not necessary and the permeability of the material becomes steady after the initial phases. For sidewalk swales, choosing inappropriate plant species could require to excessive maintenance; careful selection of hardy native plantings will minimize maintenance needs.

Opportunities The Town of North Hempstead has had success with the requirement to offset all new impervious surfaces on commercial developments. Drawing on this successful implementation, provide other municipalities with a model code and lessons learned.

The porous pavement sub strategy can support and expand on the intention of recently passed NYS legislation to incentivize building to LEED or National Green Building Standards through tax exemptions that would include porous pavement and other green infrastructure. There are successful model porous pavements installations, including San Francisco, Philadelphia, and New York City.

Sidewalk swales and rain gardens utilizing native plantings and other water-saving best practices can reduce costs, maintain landscapes and ensure a sustainable water supply.

Policy Mechanism Mandatory for offsetting impervious surfaces and porous pavement; voluntary for sidewalk swales and rain gardens.

Target(s) All new non-road commercial and municipal development and areas particularly prone to flooding.

Recommended Actions	Key Stakeholders
Develop committee to work with local governments to develop and implement new code to offset new impervious surfaces.	Municipalities, development and construction industry, public
Work with local governments to change codes and develop design standards to make porous pavement mandatory on new non-road commercial and municipal developments.	
Develop committee to work with local governments to develop and implement new code for siting sidewalk swales.	
Conduct public outreach to educate about benefits and generate support for these practices	

Related CGLI Strategies

Related strategies in the CGLI plan which also contribute to green infrastructure implementation include: Land Use Goal 2; Land Use Goal 3; and, numerous Adaptation Chapter recommendations.

11 Governance & Implementation

Trends and Issues

Long Island's population of 2.8 million residents is governed by many overlapping units of local government. The region has more than 700 units of general or special purpose local governments including 2 counties, 2 cities, 13 towns, and 97 incorporated villages, as well as many special taxing districts that provide water, sewer, sanitation, parks, fire protection and other services to residents. Education and related services are provided through 127 school districts, 110 library districts, and 3 BOCES districts.

Long Islanders value and consistently support New York's local 'home rule' system that addresses their needs through accessible government. Each local government is challenged to address environmental, energy and sustainability services during a period of high property taxes, weak revenue, and high local unemployment.

Long Island has already undertaken or is currently engaged in significant regional sustainability planning initiatives that provide models for further regional approaches. These include the Sustainable Strategies for Long Island 2035 Plan and the Comprehensive Economic Development Strategy (CEDS) developed by the LIRPC, the Long Island Carbon Footprint Project developed by ICLEI, the Long Island Power Authority Plan, and the NY-CT Sustainable Communities Initiative.[1]

The Long Island Regional Economic Development Council (LIREDC) adopted a Strategic Economic Development Plan for the Long Island Region that provides a cohesive vision for the future of Long Island's economy. The LIREDC plan not only identifies transformative projects but provides the resources to seed implementation. The LIREDC has four working groups: Innovation and Industry Clusters, Infrastructure, Natural Assets and Workforce and Education.

Local government and public participation in state and regional planning and funding initiatives are important to

1 Regional Plan Association is leading this metropolitan effort. Nassau and Suffolk Counties, the LIRPC, and Vision Long Island are participating on behalf of the Long Island region.

Table 17 LIREDC Working Groups Linkage to CGLI Plan Subject Areas

	LIREDC Working Groups			
	Innovation & Industry Clusters	Infrastructure	Natural Assets	Workforce & Education
Economic Development and Workforce Housing	x	x	x	x
Energy	x	x		x
Transportation		x		
Land Use & Livable Communities		x	x	
Waste Management	x	x	x	x
Water Management		x	x	x

Long Island communities. The CGLI planning effort has served as a model for incorporating local input into larger regional decision-making. This model could be replicated for public participation for other state and regional planning efforts.

Round II funding will provide a much needed opportunity for local government, businesses and organizations to apply for grants to assist in implementing their sustainability projects. Project implementation will require coordination between NYSERDA, CGC Working Groups, LIREDC Working Groups, local municipalities, businesses and organizations.

The LIREDC will serve as the governing body for the adoption of the plan and funding for Phase II. In order to facilitate participation in CGC funding, the CGC Consortium will convene workshops to provide education and outreach to prospective applicants help facilitate the process for the LIREDC.

Sustainability Indicators

Number of CSC communities
The number of certified Climate Smart Communinties (CSC) municipalities demonstrates progress in promoting energy efficient communities that seek to reduce cost of living amidst rising energy costs and mitigation toward long -term impacts of climate change.

- **2010 Baseline** 0
- **2020 Target** 1 County, 8 Towns, 4 Villages, 1 City

Goals and Strategies

The following is a description of the governance and implementation goal and strategies selected to achieve identified sustainability goals.

Table 18 Governance and Implementation Goal and Strategies

	Align w/ LIREDC Goals	Adapt to Climate Change
Goal 1 Promote regional coordination of sustainability planning and implementation.		
Strategy 1.1 Support the continuation and expansion of the Long Island Green Homes Consortium in sustainability education, outreach and planning.	x	x
Strategy 1.2 Facilitate plan implementation by coordinating public engagement, outreach and workshops on behalf of NYSERDA and the LILIREDC for prospective CFA funding applicants. Participation would include a wide group of stakeholders including local governments, businesses and organizations.	x	
Strategy 1.3 Increase the number of Climate Smart Communities and certified Climate Smart Communities.	x	x

Goal 1 Promote regional coordination of sustainability planning and implementation.

Strategy 1.1 Support the continuation and expansion of the Long Island Green Homes Consortium in sustainability education, outreach and planning.

Description and Intent Municipalities on Long Island have been working cooperatively to address their needs through consensus-based planning and implementation. The Long Island Green Homes Consortium (LIGH Consortium) was established to facilitate energy efficiency programs, on Long Island and to bring to scale residential home efficiency improvements throughout Long Island. Funded primarily by the NYSERDA Better Buildings Grant, the LIGH Consortium provides outreach and marketing for NYSERDA and LIPA homeowner and small business efficiency programs. Many of the towns participating in the LIGH Consortium also took the Climate Smart Communities pledge.

Obstacles Funding

Opportunities The LIGH Consortium has helped in ramping-up energy efficiency programs on Long Island and could serve as a local resource to implement strategies set forth in this plan. Expanding the LIGH Consortium to include more municipalities, NGOs and community partners could be a cost-effective method of reaching residents and businesses throughout Long Island.

Policy Mechanism Voluntary

Recommended Actions	Key Stakeholders
Identify resources to continue the Long Island Green Homes Consortium.	LIGH Consortium members, NYSERDA, LIPA, National Grid, interested municipalities
Identify new municipalities and organizations interested in participate.	
Develop an outreach plan for 2013-2014.	

Strategy 1.2 Facilitate plan implementation by coordinating public engagement, outreach and workshops on behalf of NYSERDA and the LILIREDC for prospective CFA funding applicants. Participation would include a wide group of stakeholders including local governments, businesses and organizations.

Description and Intent The CGLI Plan addresses governance issues within each subject area cahpter. In general, the planning process has served to enhance regional cooperation through the development of far-reaching sustainability goals and implementation strategies. Communities are welcome to adopt strategies within this plan (i.e. participation in Climate Smart Communities).

Obstacles The number of municipal entities on Long Island make it difficult to reach them all to promote participation in new and innovative programs.

Opportunities LIGH joined with the Clean Energy Leadership Task Force and the Smart Growth Working Group to develop the Long Island Cleaner, Greener Sustainable Communities Grant. Through the Cleaner, Greener Sustainable Communities program, the Consortium has grown to include most of the towns, the cities and other municipalities along with non- governmental organizations and businesses.

Policy Mechanism Voluntary

Recommended Actions	Key Stakeholders
Coordinate with the LIREDC on information for public outreach for the upcoming CFA.	LIGH Consortium, Clean Energy Leadership Task Force, Smart Growth Working Group, NYSERDA Regional Outreach Coordinator, LIREDC, LIRPC, CGLI Consortium, Nassau Town Supervisors Association, Suffolk Town Supervisors Association, Nassau County Village Officials Association, Suffolk County Village Officials Association
Develop outreach material for the Long Island Region.	
Coordinate outreach events, venues and social media.	
Provide interested leads to the LIREDC or NYSERDA EDGE Regional Outreach Coordinator.	

Strategy 1.3 Increase the number of Climate Smart Communities and certified Climate Smart Communities.

Description and Intent Any New York town, city, village or county can join Climate Smart Communities, without cost. To join, an interested community would adopt the Climate Smart Communities Pledge. Formally adopting the Climate Smart Communities Pledge initiates a community's commitment to GHG emission reduction and climate adaptation. The Climate Smart Communities Pledge includes all the elements of a successful local climate program. By reducing GHG emissions and preparing for a changing climate, local climate programs protect public health and safety, and support a secure economic future. Local legislative bodies can adopt the pledge as it appears on DEC's website, or can add their own legislative findings or pledge elements.

Obstacles Long Island has so many communities that it is difficult to reach them to educate them on this type of program and continued funding of the program is unclear.

Opportunities Long Island is a Climate Smart Communities Pilot. The planning process for the Cleaner, Greener Plan was coordinated with outreach for the Climate Smart Communities program. Cameron Engineering is the regional CSC Coordinator and an active member of both the Planning Team and Working Groups. Working with the Sustainability Institute at Molloy College, the CSC Coordinator works with communities interested in becoming a Climate Smart Community, developing a climate smart plan and receiving certification.

Policy Mechanism Voluntary

Target(s)

- Increase number of Climate Smart Communities to 2 counties, 10 towns, 8 villages and 2 cities
- Increase number of Certified Climate Smart Communities to 1 county, 8 towns, 8 villages, and 1 city

Recommended Actions	Key Stakeholders
Communities take the climate smart pledge.	Climate Smart Community Coordinator – Cameron Engineering, Sustainability Institute at Molloy College, LIGH Consortium
Communities develop climate action plan.	
Communities implement strategies in plan.	
Certification process (guidance is pending).	

Related CGLI Strategies

- **Energy Strategy 2.1** Require annual energy benchmarking for all non-residential buildings over 25,000 sq ft (approximately 3,500 existing buildings).

12 Adaptation to Climate Change

Superstorm Sandy and other extreme weather events in the past and in probable futures make it clear that Long Islanders must take action to reduce risks, make better plans for rapid recovery and ensure that all capital and operational investments combine to improve life/safety outcomes and reduce harm in the future. The CGCLI Plan provides the basis for communities to develop plans to take and highlights strategies to address energy, land use, transportation and other regional systems in an integrated manner, promoting a more resilient and sustainable future, thus ensuring that scarce resources are invested as prudently as possible.

Changes in climate patterns as the cause of extreme weather events is well-recognized by the NYS Legislature and the Office of the Governor. Under NYSERDA and other organizations, ongoing research is documenting the patterns of change and projecting the likely impacts expected across a broad array of economic, social and environmental activities. Much work is also being done by NYS to identify steps to reduce climate-related risks, providing a great resource for Long Island.

Adaptation to climate change must be cross-cutting; adaptation strategies will need to address and be integrated within each of the subject areas selected for this study. The summary list of goals and strategies in the Executive Summary and in each subject area chapter indicate those strategies with direct co-benefits for adaptation.

This chapter addresses the following additional issues:

1. Projected climate change on Long Island
2. Anticipated impacts of climate change
3. Ongoing adaptation to anticipated impacts of climate change
4. CGLI Plan strategies with adaptation benefits
5. Adaptation strategies for Long Island strategies that can be considered for Long Island in adaptation planning
6. Demonstration of a tool to prioritize vulnerable areas

Projected climate change in Long Island

Climate science and global climate models are continually being refined both globally and locally, and Long Island jurisdictions have considerable information available to track the updates issued by the state and elsewhere to ensure they are up-to-date with the latest predictions. The following is a summary of the trend sin key climate bariables found in *Responding to Climate Change in New York State*[1] (see Table 19).

Temperature Increase and Heat Waves

The average annual temperature for the Long Island region of 53° F is expected to increase approximately 3 to 5°F by the 2050s and 4 to 7.5° F by the 2080s.

While the region has historically averaged 19 days annually over 90°F, by the 2020s the days over 90°F could be from 20 to 42 days annually, and by the 2050s could number from 24 to 58days. The number of days over 95°F could increase from the baseline average of 4 days per year to 4 to 15 by the 2020s, and 6 to 28 days per year by the 2050s. The number of heat waves per year, defined as three or

1 *Rosenzweig, C., W. Solecki, A. DeGaetano, M. O'Grady, S. Hassol, P. Grabhorn (Eds.). Responding to Climate Change in New York State: The ClimAID Integrated Assessment for Effective Climate Change Adaptation. Technical Report 11-18. NYSERDA. 2011.*

more consecutive days with maximum temperatures at or above 90°F, is anticipated to rise from a baseline of 2 heat waves to 4 to 15 by the 2020s, 3 to 7 by the 2050s and perhaps 4 to 9 by the 2080s. The number of days below 32°F is also expected to change, reducing from 72 to a range of 48 to 66 days in the 2020s and 31 to 56 days by the 2050s.

Precipitation Changes

By the 2050s, average annual precipitation for the region is anticipated to increase very slightly (0 to +5%) with more precipitation occurring in the winter and spring but less precipitation in the summer and fall. The number of downpours and larger overall rainfalls is also expected to increase leading to the potential for widespread localized flooding.

Sea Level Rise

Sea level rise is anticipated to increase the intensity, frequency and duration of coastal flooding associated with high tides and storms. At a minimum, sea level rise by the 2020s could be 2 inches, 7 inches by 2050s and 12 inches by the 2080s. These predictions account for a range of variables including anticipated future greenhouse gas concentrations and the rate at which polar ice caps may melt. The model-based sea level rise projections are characterized by greater uncertainty than the temperature projections, largely due to the possibility that future changes in polar ice sheets may accelerate melting beyond currently projected levels; this possible change is not captured by global climate models. The probability that sea level rise will be lower than the Global Climate Model (GCM)-based projection is very low, but the probability that sea level rise will exceed the GCM based projection is higher.

Anticipated Impacts of Climate Change

The impacts of more extreme heat and precipitation as well as sea level rise are already affecting communities and infrastructure throughout the Long Island region. Vulnerability to these impacts and capacity to adapt are uneven across the region and it will require detailed analysis to understand those at most risk.

Transportation Infrastructure

As demonstrated by Superstorm Sandy's landfall in November 2012, low-lying transit systems, roadways and bridges near the coast are at risk of flooding from storm surge and heavy rainfall events. Inland, more frequent and intense rainfall events could also cause travel disruptions due to flooded intersections, roadways and rail lines. Such disruptions to the flow of goods and commuters can have significant economic consequences as well as cause public safety issues if ambulances and other emergency services cannot reach communities in need. Extreme heat could cause materials to fail in transportation infrastructure not currently designed to withstand high temperatures, such as rail lines buckling and road surfaces melting.

Table 19 Summary of Climate Variables

Extreme event	Baseline	2020s	2050s	2080s
Temperature				
Number of days per year with maximum temp exceeding 90°F	19	20 to 42	24 to 58	31 to 80
Number of days per year with maximum temp exceeding 95°F	4	4 to 15	6to 28	9 to 47
Number of heat waves /year	2	4 to 15	3 to 7	4 to 9
Average duration of heat waves	4	4 to 5	5 to 6	5 to 8
Number of days per year with min. temp. at or below 32°F	72	48 to 66	31 to 56	22 to 56
Precipitation				
	47"	0 to +5%	0 to +10%	+5-10%
No. of days per year with rainfall exceeding 1"	14	11to 16	11 to16	11 to 17
No of days per year with rainfall exceeding 2"	3	2 to 5	3 to 5	2 to 5
Sea level rise				
Sea level rise	N/A	2 to 5 in	7 to 12 in	12 to 23 in
Sea level rise with rapid ice-melt scenario	N/A	5 to 10 in	19 to 29 in	41 to 55 in

Source: Rosenzweig, C., W. Solecki, A. DeGaetano, M. O'Grady, S. Hassol, P. Grabhorn (Eds.). Responding to Climate Change in New York State: The ClimAID Integrated Assessment for Effective Climate Change Adaptation. Technical Report 11-18. NYSERDA. 2011.

Energy Infrastructure

Higher temperatures, particularly during heat waves, will increase energy demand for air conditioning. This could lead to an overloading of the electricity grid and frequent outages such as experienced during the heat wave experienced in Chicago in the mid 90s and in Europe in 2003. In the more densely developed areas of the region, such as western and southern Nassau County, this will be particularly acute as the concentration of buildings, asphalt and concrete will limit the ability of buildings to cool off at night (a phenomena known as the heat island effect). In addition to impacts from increased temperature, power lines, transformers and other electric utility infrastructure located in low lying areas will face increasing likelihood of inundation from sea level rise or precipitation-based flooding with the potential for extended outages.

Water Infrastructure

Heavier downpours in built-up areas could cause flash flooding if stormwater systems are overwhelmed, resulting in polluted runoff into rivers and the sea affecting water quality and local ecosystems. Waste water treatment plants could also become inundated through sea level rise and extreme rain events, further worsening local pollution. During Superstorm Sandy, the Rockaway Wastewater Treatment Plant, located adjacent to Nassau County on the Rockaway Peninsula in Queens, was completely inundated. The plant began discharging raw sewage when it lost power the evening of the storm and remained off-line for two days, while effluent flowed without full secondary treatment into the ocean[2].

Ecosystems and Biodiversity

Gradually over time, sea level rise may become a dominant stressor on vulnerable salt marshes, which provide a critical adaptation role in floodwater absorption and nutrient cleansing as well as providing valuable habitat for flora and fauna. Sea-level rise may also contribute to erosion of barrier islands and sand formations which currently protect coastal beaches, dunes and wetlands from direct wave and storm impacts. More frequent and intense coastal storms could carve inlets out of beaches, level a vegetated sand dune complex or erode coastal bluffs, such as the Nor-Ida storm of November 2009 which removed a 10,000 foot length of shoreline along Robert Moses State Park.

2 January 16, 2013 Testimony of Carter H. Strickland, Jr. Commissioner, New York City Department of Environmental Protection before the New York State Assembly Committee on Environmental Conservation The Environmental Causes and Effects of Extreme Weather Events.

The longer growing season could enable expansion of invasive plants species in forests, shrublands and grasslands that outcompete native plants and alter forest composition over time. Freshwater streams, wetlands and ponds may see expansion of aquatic invasives such as Broadleaf water-milfoil and Eurasian water-milfoil which can impact recreation and water bodies by forming dense weed beds on the surface that crowd out native plants and impair habitat for fish and other aquatic species.

Marine ecosystems could see population shifts as warmer ocean temperatures may push colder water species such as lobster away from Long Island.

Agriculture

More frequent coastal saltwater flooding, heavy downpours and storm surges could damage agricultural crops and soils, such as Superstorm Sandy's impacts to North Fork farms[3]. Over the longer-term, sea level rise could compromise farm-dependent groundwater supplies through increased saltwater intrusion. Sea level rise as well as temperature changes in marshes may also alter shellfish and fishery productivity.

Water management will become increasingly critical as heavier rains in late winter and spring may inundate soils and crops or delay planting while less summer and fall precipitation could stress soils and crops nearing harvest. Temperature increases may alter preferred crop selection while longer growing seasons may also increase management needs for controlling invasive plants and pests.

Vulnerable Populations

Across the region, the impacts of climate change will affect diverse population groups differently. The very young, very old and those on lower incomes tend to be generally more at risk.

More frequent extreme heat days may compromise the health of young, elderly and sick due to their vulnerability to heat stress (due to a reduced internal capacity to regulate body temperature), particularly those without access to air conditioning, or cannot afford the cost of extended usage. Higher temperatures in urban areas with high concentrations of vehicles can lead to poor air quality, and heightened ozone levels which increase the risk of asthma- related hospital visits.

3 "Months Later, Hurricane Sandy Now Putting Long Island Farm Industry in Danger Fields Inundated By The Storm Now Have Soil Soaked With Saltwater" March 12, 2013. CBS News

Flooding from heavy precipitation and storm surges can cause immediate dangers for those who are less mobile and able to evacuate such as the elderly, socially isolated and health-compromised. Transit disruptions from flooding can cause significant impacts to low-income and elderly communities who have limited mobility options and tend to be more dependent on mass transit. These populations are also more susceptible to waterborne diseases and mold that the recession of flood waters can leave behind in flooded houses and property.

Ongoing Adaptation to Impacts of Climate Change

A number of entities operating within the region are already engaged in non-structural (planning and governance) and structural approaches (i.e. dune creation, floodwalls) for adapting to anticipated climate change impacts of coastal storm surge, increased flooding and sea level rise. These activities are summarized below.

Although structural defenses may be the first adaptation strategy that comes to mind when considering climate adaptation, there are many governance and planning strategies relating to land use policy and regulations, and building codes that can provide the first steps in developing resiliency. For example comprehensive plans could be updated to affirm that high risk flood areas will not be developed with critical infrastructure and that lands will be conserved to absorb floodwaters and therefore protect community infrastructure from rising sea levels.

Flood and Sea Level Rise Maps The Biggert-Waters Flood Insurance Reform Act of 2012 established dramatic changes to the National Flood Insurance Program (NFIP) administered by the Federal Emergency Management Agency (FEMA). As this Regional Sustainability Plan goes to print, modifications to NFIP are under development and not yet finalized. However, these will likely influence local land use decisions. It is essential for municipal leaders and property owners to be aware of changes to FEMA's programs and rule making with particular regard to the following key components:

1. **Updated Flood Insurance Rate Maps (FIRMs)** FEMA is in the process of updating Flood Insurance Rate Maps (FIRMs) for the region that provide an official depiction of flood hazards and properties at high flood risk. The maps can assist communities and homeowners to identify and mitigate flood risks.
2. **Flood insurance rates** The National Flood Insurance Program (NFIP) sets rules and rates for those properties eligible, based on FIRMs, for federal reimbursement of costs due to flood damage.
3. **Rebuilding or remodeling considerations** Decisions to rebuild or re-model damaged properties should consider updated NFIP rules regarding base flood elevations required for structures within high-risk areas.
4. **Community Rating System (CRS)** The CRS is a volunteer program for participants with the NFIP. Communities that adhere to a set of flood risk reduction requirements can lower NFIP insurance rate premiums.

Despite the enrollment requirement, initial studies of Superstorm Sandy impacts on Long Island's residential communities shows that only a portion of those homeowners required to enroll in NFIP prior to Sandy, had purchased a policy from National Flood Insurance Program[4].

New York State Activities

New York State is actively assessing climate change impacts statewide and providing adaptation guidance for municipal, institutional, commercial and non-governmental decision-makers through key documents:

- ***Responding to Climate Change in New York State (2011) (NYSERDA)*** This integrated assessment of climate change science and adaptation strategies provides decision-makers with guidance about what impacts to anticipate and what steps can be taken to effectively respond to climate change. The report identifies impacts specific to the Long Island region.
- ***NYS 2100 Commission: Recommendations to Improve the Strength and Resilience of the Empire State's Infrastructure (2013) (NYS Office of the Governor)*** Prepared in response to recent severe weather events, this report evaluates key vulnerabilities in the State's critical infrastructure and recommends actions to improve resilience, including detailed strategies of great relevance to Long Island.
- ***New York State Sea Level Rise Task Force (2010) (NYS Legislature)*** This document identifies specific impacts from sea level rise and actions that local and state decision-makers can take to manage social, economic and environmental risks.

4 *FEMA: Flood Insurance to be Required in Zone. January 1, 2013. Newsday.com*

Regional Activities

There are several climate adaptation planning initiatives underway in Long Island that provide models for other communities:

Long Island South Shore Estuary Reserve Council
The Long Island South Shore Estuary Reserve Council (SSER) is composed of representatives from the Town of Hempstead, Town of Southampton, other municipalities and key businesses, recreation and environmental stakeholders engaged in the South Shore Estuary Reserve. The Reserve covers approximately 170 square miles of bays, tidal marshes and beaches of southern Nassau and southwest Suffolk County. The SSER Council is teaming with the NYS Department of State to develop policies and recommendations as part of the State Coastal Management Program that increase the region's resilience to climate change.

Town of East Hampton, NY: Coastal Management Element
The Town of East Hampton has included reference to sea level rise in its comprehensive plan. The town's Local Waterfront Revitalization Program forms the Coastal Management component of its comprehensive plan. It includes the language: *"Future planning efforts should examine the likely effects of global warming, including increasing sea level rise and storm and hurricane activity on the town's coastline. Beginning to plan for these effects, assessing potential damage to public resources and infrastructure, and evaluating methods of protection and associated costs are vital for future coastal management."* In addition, the town, alongside four other Long Island municipalities (including Southold, see below), is part of a program that requires an additional 2% tax on houses over a certain price. This tax increase has provided additional resources to spend on wetland conservation and sea level rise mitigation.

Town of Southold[5]
To improve the connection between Southold's comprehensive plan update and the Town's hazards and climate resilience strategy, The Nature Conservancy, the Association of State Floodplain Managers, and the National Oceanic and Atmospheric Administration (NOAA) Coastal Services Center participated in one-day workshop with local elected officials, planning board members and staff to introduce a process for assessing and planning for hazards and climate vulnerability. The Coastal Resilience tool is being used to provide data to help inform this process, particularly to integrate ecosystem-based adaptation approaches.

5 *http://www.csc.noaa.gov/digitalcoast/stories/longisland*

Southold has also partnered with private landowners and numerous agencies and organizations to purchase farmland and open space to ensure preservation of the town's rural community character, to maintain resilience to coastal flooding and safeguarding water quality. Through protecting lands from development, native vegetative cover and pervious land is protected, retaining its ability to absorb stormwater and reduce flooding. It is also hoped that the protection of the land will allow dunes and coastal marshes, which buffer against storms, to migrate inland as sea levels rise and the coast sees more frequent storms.

Finally, Southold is participating in a Seagrant funded research project that is building from The Nature Conservancy Coastal Resiliency project entitled: Climate Change Adaptation and Ecosystem Service Resilience in Northeast Coastal Communities: Quantifying Economic Values and Tradeoffs for Regional Decision Support. This project will enable users to evaluate economic benefits, costs and tradeoffs of adaptation strategies, including ecosystem service values and other natural and social science data (rather than just infrastructure and engineering costs). This project is anticipated to be complete at the beginning of 2014.

Town of Southampton, NY: Tidal Floodplain Overlay
Southampton's Tidal Floodplain Overlay District aims to minimize damage from coastal storms by establishing subdivision requirements for lot layout on the barrier beach. Setbacks are required for ocean beach water frontages in accordance with the town's Coastal Erosion Hazards ordinance. Structures on other water frontages must be set back at least 75 feet from the upper edge of the tidal wetland.

CGLI Plan Strategies with Adaptation Benefits

The subject area chapters present strategies to achieve the sustainability goals that have been articulated through this undertaking. Many of the strategies address benefits focused on primary goals for greenhouse gas emissions reduction and economic development. The strategies also have substantial adaptation benefits such as:

- Mitigation of increasing temperatures in the urban core
- Promotion of systems which diversify and add redundancy to energy and transportation systems
- Reducing peak electricity load during very hot days
- Protection against storm surge, flooding and impacts of sea level rise

Table 20 highlights those strategies from the subject areas of the CGLI PLan that also provide adaptation benefits.

Sustainability Indicators

The CGLI Plan includes sustainable indicator for each subject area that establish a baseline upon which to measure progress. Monitoring indicators from the Plan will also provide tracking of adaptation resilience, particularly those strategies identified in Table 20 that provide benefits for adaptation. In addition, two indicators have been selected for tracking the region's measure of resiliency for adapting to climate change:

- The number of communities participating in the National Flood Insurance Program's Community Rating System (CRS).
- The total number and frequency of customer interruptions of utility services (System Average Interruption Frequency Index (SAIFI).

As noted previously, the Community Rating System (CRS) is a voluntary program which enables communities to reduce flood insurance rates by reducing community-wide flood risks. The 2020 CRS target is to increase the number of communities participating in this program to 100% of LI municipalities by 2020.

Table 20 CGLI Strategies with Adaptation Benefits

	Adaptation Benefits			
Strategies from the CGLI	Mitigates urban heat island effect	Develops redundancy through decentralized systems or alternative fuel sources	Reduces peak load demands	Protects against storm surge, floods and sea level rise
All energy strategies promoting energy efficiency and grid resiliency.		X	X	
All energy strategies promoting use of renewable energy and alternative fuel rebates and sources.		X	X	
Transportation Strategy 1.1 Expand and improve public transportation across the Island (rail and bus).		X		
Transportation Strategy 1.2 Increase the number of Long Island employers providing incentives/services to employees for VMT reduction.		X		
Transportation Strategy 1.3 Improve safety of streets for pedestrians and cyclists through implementation of Complete Streets, signal optimization, and a comprehensive bike plan.		X		
Transportation Strategy 1.4 Increase the number of alternative fuel vehicles on Long Island by targeting municipal and private fleets and buses.		X		
Transportation Strategy 1.5 Reduce long-haul truck traffic through improvements to rail freight system.		X		
Land Use Strategy 2.1 Permanently protect 10% of the Island's most critical unprotected open space and farmland.	X			X
Land Use Strategy 2.2 Preserve 10% of unprotected open space along the coasts to serve as a storm-resilient buffer.	X			X
Land Use Strategy 2.3 Restore the tree canopy on Long Island to pre-Superstorm Sandy conditions.	X			
Land Use Strategy 3.1 Utilize best practices for the redevelopment of neighborhoods in coastal areas to become more resilient.				X
Waste Strategy 2.1 Expand New York State pilot program to test viability of food waste to biogas on Long Island.		X		
Waste Strategy 4.1 Expand efficient management of municipal and private municipal solid waste fleets to include biodiesel and compressed natural gas vehicles.		X		
Waste Strategy 4.2 Initiate cross-municipality and operator discussion on upgrades to incinerator facilities that would optimize energy capture from waste.		X	X	

While most of the adaptation strategies suggested in this section will help maintain the functionality of a range of utility services, electricity service resilience will be tracked via SAIFA, an indicator regularly reported by LIPA. SAIFI is the average number of interruptions that a customer would experience.

Potential Adaptation Strategies for Long Island

Responding to and preparing for the impacts of climate change can be a challenging task for most municipalities as their land use patterns have evolved over decades and cannot be easily reversed. Solutions to reduce risk, such as retrofitting or relocating structures, may require significant costs. The unknown time frames of future impacts can cause difficulties when trying to secure political support and allocate scarce resources. However, there are also strategies particularly around developing community networks, that could be low-or-no-cost. Many adaptation strategies have multiple co-benefits, or are themselves co-benefits from other climate mitigation strategies, and overall will contribute to a long-term more sustainable, better quality of life on Long Island.

A first step for all communities is to carry out an assessment of the likely impacts to local communities and infrastructure and to identify which assets are most vulnerable to the different climate variables. There are a number of different tools which can assist communities in carrying out risk assessments to climate change such as baseline data about project impacts (TNC's Coastal Resiliency Map and FEMA FIRMs) and process planning tools (NOAA's Coastal Service Center or ADAPT by ICLEI). A municipality can also integrate climate change adaptation into an updated version of its Hazard Mitigation Plan. Communities need to choose the approach most aligned with their budgets and asset assessment needs.

The following is a list of strategies that address anticipated climate change impacts that may be experienced on Long Island. They were not developed through the working groups and public engagement process. However, they are included in the plan as a reference for the communities to consider as they develop adaptation plans to reduce risks and guide investment decisions.

Strategies to Address Higher Temperature

Increasing temperatures and more frequent heat waves could increase energy demand and heighten economic and health risks for low income, elderly, urban and health-compromised populations. In addition to strategies identified in the plan, below are additional strategies which can serve as guidance for municipal officials, business owners, managers, residents and other key decision-makers for coping with temperature impacts of climate change.

Strategy 1.1 Conduct vulnerability assessments and establish communication plans.
Identify clusters of populations at-risk to heat stress (i.e. elderly, disabled and low income) to determine where to establish cooling centers and outreach efforts during extreme heat events. Community social networks can reduce fatalities during heat waves.

Strategy 1.2 Establish more efficient, diverse and segmented energy and fuel sources.
Investment in a range of energy sources will enhance the resilience of the region to cope with supply and service disruptions. The diversification of fuel sources through investments in on-Island renewables can also reduce the region's risk to energy cost increases (NYS 2100).

Strategy 1.3 Manage energy demand.
Voluntary and mandatory load reduction programs can reduce the risk of brownouts and blackouts during periods of high air conditioning usage. Programs can enable remote control of air conditioning units by customers and the utility.

Strategy 1.4 Promote cool roofs.
Highly reflective roofs called "cool roofs" can help decrease cooling required for a building. If installed across a number of buildings, these roofs may be able to reduce the urban heat island effect.

Strategy 1.5 Expand urban forest and green infrastructure.
Expansion and enhancement of street trees and parks as well as engineered systems like green roofs, permeable pavement and roadside bioswales can help reduce localized ambient temperatures, reduce energy needed for cooling and promote stormwater management.

Strategies to Address Flooding, Storm Surge and Sea Level Rise

Strategies to address flooding, storm surge and sea level rise will need to respond to the specific conditions and con-

text for each location. Communities will need to establish their own parameters and criteria to address site-specific impacts to determine whether protection or inundation is the most appropriate solution for dealing with sea level rise. For this reason, strategies to promote adaptation are organized below according to a specific outcome: protection, functional inundation, or inundation. For example, strategies such as relocating an asset or building a levee would protect an asset against inundation, while conducting partial/temporary closure or providing an alternative transportation mode would allow for temporary inundation of an asset.

Protection Strategies

Focus on protecting infrastructure and property from impacts of flooding, storm surge and sea level rise through structural and non-structural approaches.

Strategy 2.1 Expand the comprehensive planning process to include a sea level rise assessment and plan.
For municipalities and/or institutions likely to experience sea level rise impacts to multiple assets, the creation of a plan that assesses risk and vulnerability and develops appropriate adaptation strategies represents a comprehensive, proactive approach. Comprehensive sea level rise plans can also be created at the regional level for multiple jurisdictions or partnerships, which may facilitate creative solutions and cost-sharing for any new investments.

Strategy 2.2 Promote community engagement in National Flood Insurance Program's Community Rating System program.
Flood risk reduction and reduced insurance rates can be achieved through voluntary community-level activities such as public information sharing about flood preparedness; enforcement of watershed protection and floodplain protection standards that exceed NFIP requirements; and, flood damage reduction actions like flood proofing buildings and acquiring land in flood-prone areas.

Strategy 2.3 Create hazard mitigation plans.
Mitigation plans should be created that identify policies and actions that can be implemented over the long-term to minimize risk and the loss of life and property. FEMA requires a hazard mitigation plan as a condition for granting non-emergency funds to a local jurisdiction. Hazard mitigation plans should contain a high level of community participation and address sea level rise and coastal flooding.

Strategy 2.4 Update comprehensive plans, building/design codes and zoning restrictions.
Local jurisdictions should consider amending their zoning codes or create specific shoreline zoning ordinances to limit development (i.e., designate open space or low-density residential), require that developers meet specific conditions to obtain a permit to develop or specify design requirements in areas subject to coastal flooding.

Strategy 2.5 Incentivize cluster development in low-risk areas.
This strategy involves the use of incentives (e.g., density bonuses, reduced development impact fees, tax incentives, streamlined permitting) to focus development in areas not expected to be regularly inundated by sea level rise.

Strategy 2.6 Create rolling easements.
Rolling easements establish a boundary from the shoreline that moves inland as sea levels rise, allowing wetlands and beaches to migrate inland. This strategy allows development along the coast but transfers the risk to property owners, requiring the removal of certain structures as the shoreline moves landward over time.

Strategy 2.7 Prioritize infrastructure investments in low-risk areas.
Local jurisdictions can guide new development away from areas at risk of inundation from sea level rise by prioritizing investments in supporting infrastructure (e.g., municipal sewer) in lower-risk areas. Transportation agencies can adopt a similar approach, focusing first on the planning and construction of new projects that are not subject to sea level rise.

Strategy 2.8 Elevate existing equipment and raise elevation standards for new projects.
This strategy involves elevating the surface or grade of existing energy equipment and establishing standards for new projects (e.g., local roads, railroad tracks, waste water treatment facilities, electrical sub stations, buildings, structures, etc.) above the storm surge and expected sea level rise inundation levels. Upgrade sewer and stormwater infrastructure to accommodate larger peak storm volumes and minimize occurrence of overflows and back-ups.

Strategy 2.9 Relocate.
Permanently relocate to lower risk areas those vulnerable municipal assets, structures and functions that are at high risk of inundation from potential storm surge, flooding and sea level rise.

Strategy 2.10 Enhance or construct dunes and nourish beaches.
Vegetated sand dunes are a natural form of protection that maintain coastal lands. These can shift with wave action and wind and can become less stable when dune grasses are trampled. Sand dunes in Bradley Beach, NJ minimized Sandy damage. The US Army Corps of Engineers is constructing dunes to protect Long Beach, NY from future coastal storms. The ongoing replenishment of sand from off-site locations can preserve beaches and maintain a barrier between rising sea levels and homes, roads and other community infrastructure.

Strategy 2.11 Build/raise levee, floodwall or berm.
Building a new levee or raising the elevation of existing levees or floodwalls is a form of engineered flood protection designed to protect inland areas from inundation and erosion resulting from sea level rise. Berms are non-engineered earthen structures that provide protection from wave erosion and provide flood protection to inland development and infrastructure.

Functional Inundation Strategies

The following strategies focus on physical and operational measures designed to allow projects to continue to function with flooding and sea level rise. Some of them may be appropriate in the short-term strategies while longer-term strategies are developed. A number of these strategies are also suitable for dealing with localized flooding from heavy rain events inland:

Strategy 3.1 Increase maintenance at flooding hotspots.
Infrastructure that is allowed to flood frequently is likely to experience greater wear and tear and therefore, have greater maintenance needs. This strategy entails planning for an increased level and/or frequency of maintenance in targeted areas of electrical, transportation and municipal projects that are anticipated to flood regularly.

Strategy 3.2 Retrofit/make waterproof.
Retrofit Long Island Rail Road infrastructure with high walls around low-lying equipment, ensure electrical utility boxes have rubber seals and upgrade other structures to withstand periodic inundation and continue to function, either in conjunction with sea level rise or following storm events.

Strategy 3.3 Use corrosion-resistant materials.
Some materials are more resistant to the corrosive effects of saltwater, and incorporating them into certain types of infrastructure that are likely to be permanently inundated, such as bridge touchdowns or building foundations, may prolong asset life.

Inundation Strategies

The strategies below plan and allow for inundation, focusing on alternatives when assets experience flooding from sea level rise or storm surges. A number of these strategies are also suitable for dealing with localized flooding from heavy rain events inland These strategies could also be short-term solutions while longer-term, more capital-intensive solutions are identified.

Strategy 4.1 Construct low-water crossings.
For roads likely to flood frequently from sea level rise or extreme tide levels this strategy offers an alternative to raising road elevations. The creation of low-water crossings acknowledges access limitations due to frequent inundation, and the crossings can be designed to avoid blocking drainage pathways.

Strategy 4.2 Integrate extreme flood events into emergency management plans.
Municipalities and campus-based institutions are encouraged to develop emergency management plans that consider extreme coastal flood events. Include planning to address location of temporary debris piles and identify waste transfer approaches if fuel is in short supply.

Strategy 4.3 Improve drainage.
A number of structural strategies can be employed to facilitate drainage and mitigate the impacts of temporary inundation associated with heavy rain storms, extreme tide events and storm surge on energy and transportation assets, structures, and infrastructure.

Strategy 4.4 Integrate water sensitive urban design techniques into the urban form.
Employing techniques such as permeable paving, rain gardens, bioswales, green roofs, street trees and soft landscaping can increase the permeability of the ground, slow run off and therefore decrease the likelihood of overloading the stormwater system during heavy rain storms.

Strategy 4.5 Build causeways.
Causeways represent an alternative for roads or rail tracks likely to be regularly inundated, as they typically traverse open water or wetlands on elevated embankment. While some causeways are designed to avoid all inundation, others may function only at low tide.

Vulnerable Area Prioritization Tool

The Nature Conservancy[6] has created a web mapping tool as part of the Coastal Resilience[7] project for New York and Connecticut to provide communities with data that can inform their planning, zoning, acquisition, and permitting decisions. While this mapping can inform gross-level impact discussions, more precise mapping is essential for ensuring accuracy of any land use or policy actions. The tool provides information spatially on a wide range of assets and impacts including ecological, economic, land use management, marsh protection and critical facilities. In addition, the project lays out a variety of potential adaptation strategies. The tool is a valuable resource for Long Island jurisdictions starting to understand the risks their communities face and to develop adaptation strategies. However, it should not replace detailed, on-the-ground vulnerability assessments for areas or populations considered most at risk.

Use of the mapping tool is demonstrated here with a range of potential future scenarios to illustrate how it can help to inform general decisions by the region or a municipality when allocating scarce resources for reducing risks of climate change. Two climate change scenarios and a number of variables have been selected for review.

Existing building replacement cost.

- Figure 25 shows the cost of replacing existing buildings. Darker colors indicate greater cost of replacement.
- While the highest cost categories are generally concentrated along the mid and northern sections of Nassau and eastern Suffolk counties, there are concentrations of higher replace cost tracts along the southern shore.

Scenario 1 2050 conditions under a Category 3 storm for areas of high social vulnerability.

- Figure 26 shows that southwest Nassau and northeast Suffolk Counties both face significant inundation impacts from a Category 3 storm.
- In addition, northeast Suffolk's areas of projected impact also have high social vulnerability, suggesting that this region is among the most at-risk from a storm.
- Southwest Nassau's inundation areas also have high pockets of social vulnerability.
- High value building replacement cost areas could be innudated in southwest Nassau and northwest Suffolk counties.

Scenario 2 2080 conditions under a Category 3 storm with sea level rise (includes cost of building loss)

- Figure 27 reveals that south shore communities and the north fork could face higher loss of buildings than other areas of the region during a Category 3 storm under future sea level rise conditions.
- Also, when compared to the building cost replacement map, the south shore areas of loss do contain a number of high value building replacement cost concentrations.

Overall conclusions from these future scenarios

The south shore of Nassau County, portions of the southwest shore of Suffolk and the Greenport area are most at risk of coastal flooding under future climate change scenarios. Socially vulnerable populations are also concentrated in these high-risk areas. Significant building value is also located in these areas. From a regional perspective, adaptation strategies should prioritize reduction of risk in these areas and for these populations.

6 In partnership with the National Oceanic and Atmospheric Administration's Coastal Services Center, the Association of State Floodplain Managers, the Columbia University Earth Institute/NASA Goddard Institute for Space Studies, Pace University's Land Use Law Center, the University of Southern Mississippi, and the University of California at Santa Barbara.

7 The Coastal Resilience project for New York and Connecticut (http://coastalresilience.org/geographies/new-york-and-connecticut)

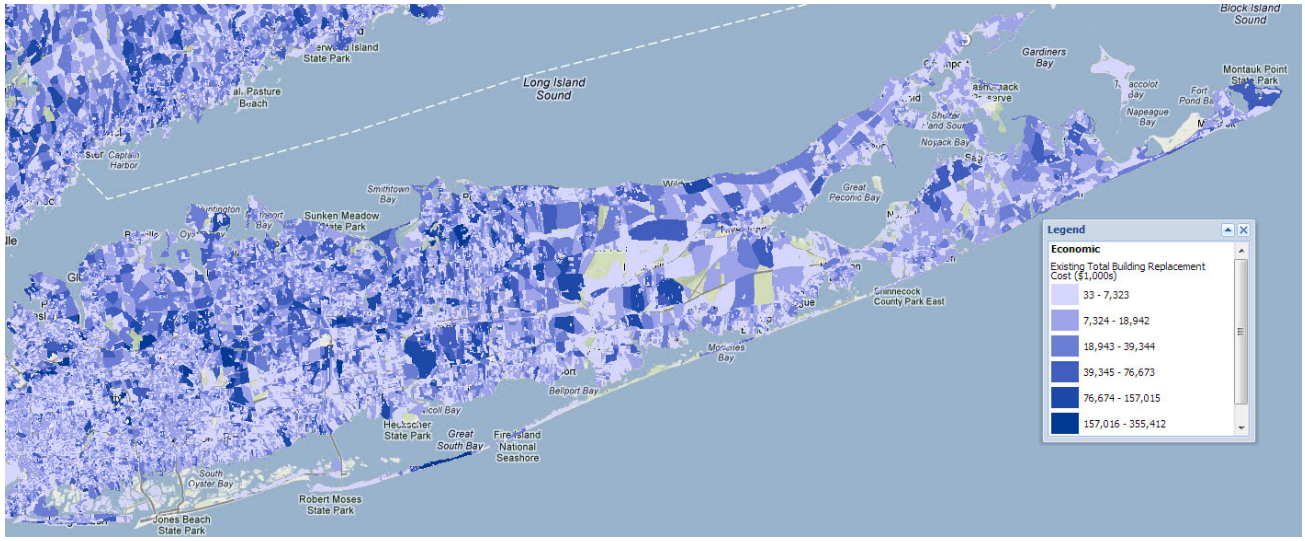


Figure 25 Existing Building Replacement Cost
Source: Nature Conservancy web mapping tool at http://coastalresilience.org/geographies/new-york-and-connecticut/future-scenarios-map

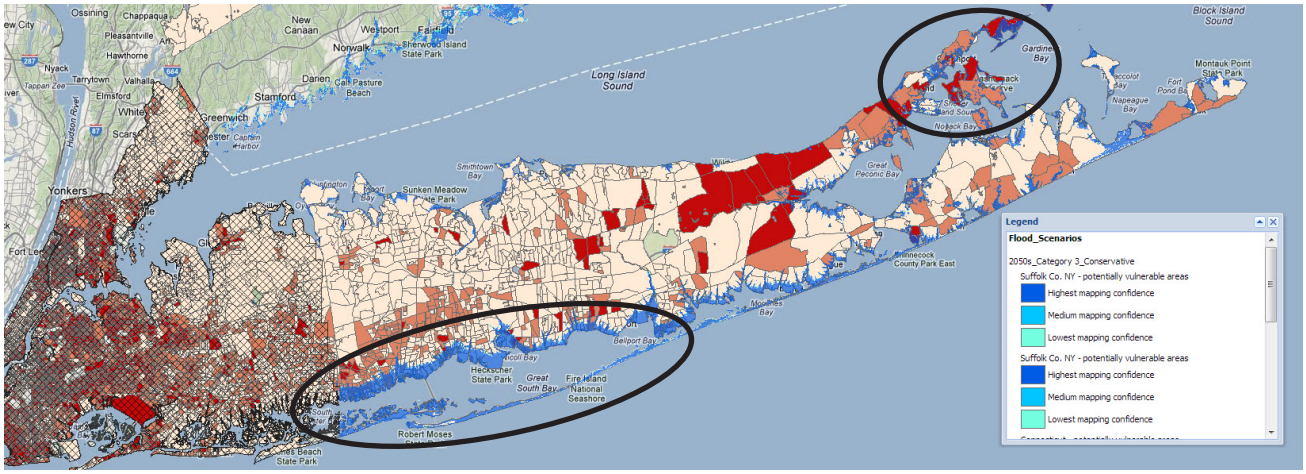


Figure 26 Scenario 1: 2050 Impacts from Category 3 Storm + Areas of High Social Vulnerability
Source: Nature Conservancy web mapping tool at http://coastalresilience.org/geographies/new-york-and-connecticut/future-scenarios-map

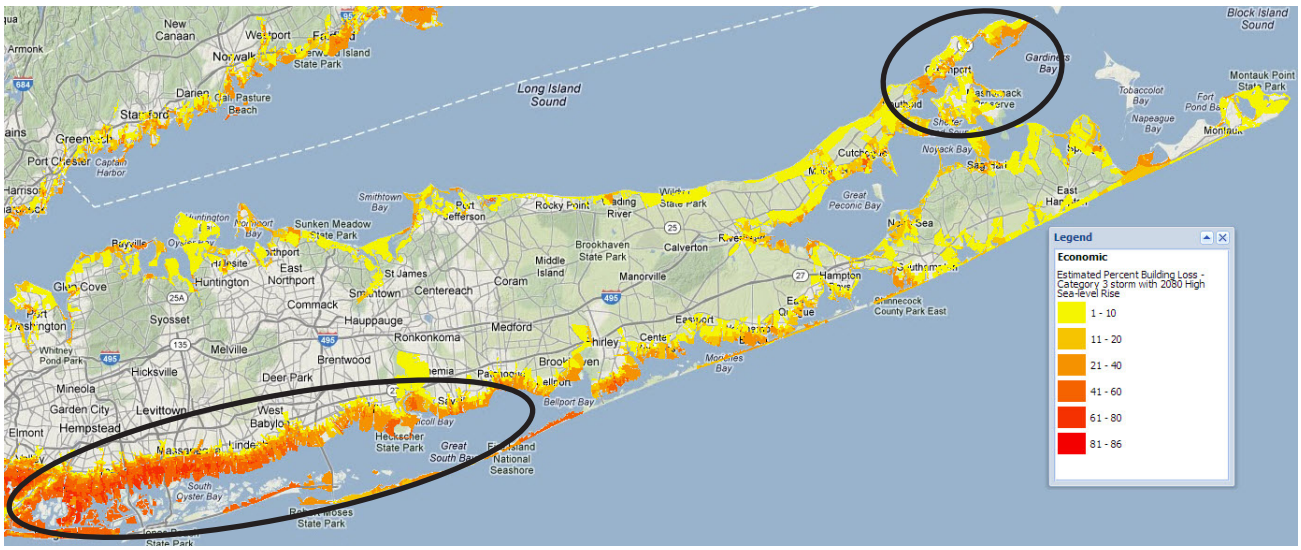


Figure 27 Scenario 2: 2080 High Sea Level Rise from Category 3 Storm with Estimated % of Building Loss
Source: Nature Conservancy web mapping tool at http://coastalresilience.org/geographies/new-york-and-connecticut/future-scenarios-map

13 Conclusion

Every development decision that communities across Long Island make – what land to build on, what street to pave, what energy to use – affects the economic and environmental health and well-being of the entire region. The Cleaner Greener Long Island Plan is envisioned as a resource to support the decision-making of partnering municipalities as they face the obstacles and opportunity that have been addressed in this report. The CGLI Plan provides a framework to inform land use policies, guide public and private investment in infrastructure, and promote energy, sustainability, and climate adaptation policies and practices. Communities can make smart development decisions and implement the projects that will significantly improve both economics and environmental well-being.

The subject areas included in the plan are key informants to the community and regional planning process. Planning solutions that promote systems-integration and optimization are essential for the development of sustainable communities. The strategies and projects that are identified in the plan are envisioned to improve energy efficiency throughout the community, promote renewable energy and reduce carbon emissions that will benefit adaptation to climate change. At the same time, the CGLI Plan is well-aligned with regional economic development goals and aims to foster communities that have lower costs, more business activity and jobs, and improved quality of life.

Long Island communities can realize many benefits as they implement the policies, practices and programs that are recommended in the CGLI Plan. They include

- Reduced costs to municipalities
- Reduced tax burden
- Reduced cost of doing business on Long Island
- Reduced road congestion
- Reduced economic disturbances from major storms
- Added resiliency to energy supply and other utilities to withstand extreme weather events
- Promotion of job growth
- Enhanced real estate values
- Enhanced public safety
- Enhanced environmental quality
- An aware citizenry

The CGLI Plan is intended to serve as a common point of reference for local governments, non-governmental organizations, business, and residents. It will support the inter-municipal dialogue and integrated solutions to the large scale issues that transcend individual municipalities and are essential to a more sustainable future for Long Island.

Sustainability Indicators and Targets

Greenhouse Gas Emissions

Total GHG Emissions

- **Baseline 2010** 36,107,459 MT CO_2e per year
- **Target 2020** 30,691,341 MT CO_2e per year (15% reduction from baseline)

Economic Development and Work Force Housing

Housing and Transportation Affordability Index[1]

A tool that measures the affordability of housing and transportation costs for households.

- **Baseline 2010** Housing and transportation affordability index equals 96%
- **Target 2020** Housing and transportation affordability index equals 90%

Employment by Sector

Databases prepared by the Bureau of Labor Statistics as well as the NYS Labor Department measuring change in employment within non-farm sectors.

- **Baseline 2010** See Table 21
- **Target 2020** Reverse the decline of employment in key employment sectors such as Construction and Manufacturing.

1 *http://htaindex.cnt.org/*

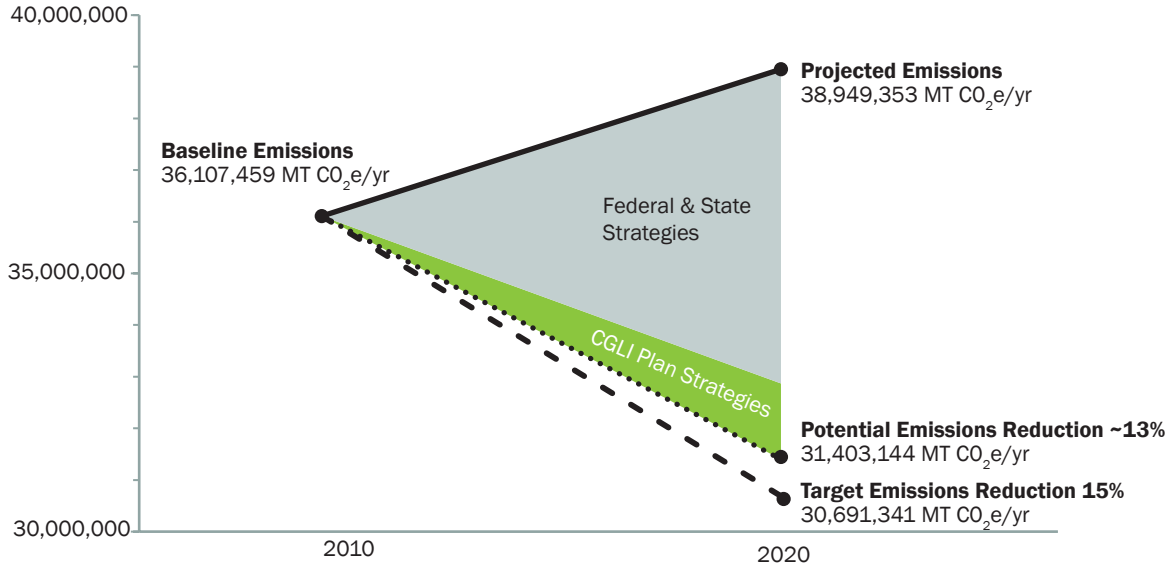


Figure 28 Long Island GHG Emissions Potential for 2020

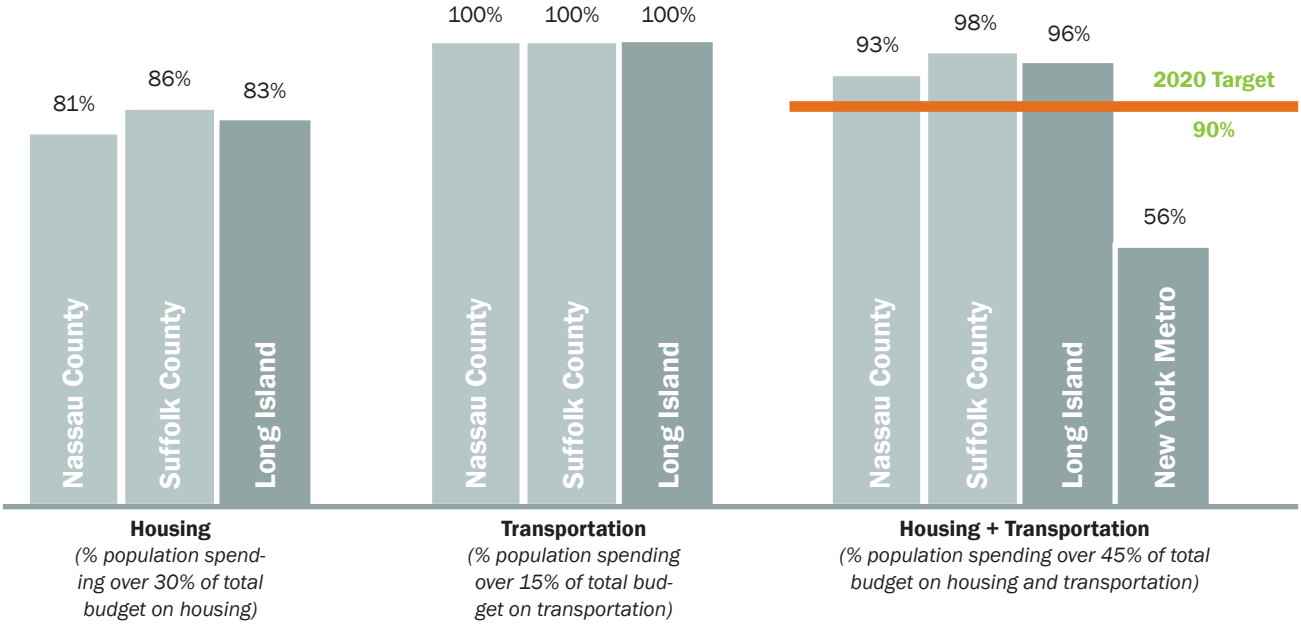


Figure 29 Housing and Transportation Affordability Index
Source: http://htaindex.cnt.org/

Table 21 Long Island Employment by Non-Farm Sector (2012)

Sector	2012 Employment	% Change over 2011	2012 Sector Employment as % of Total
Total Private	**1,058,100**	**0.80%**	**84%**
Goods Producing	**126,900**	**-3.00%**	**10%**
Natural Resources, Mining and Construction	55,600	-4.10%	4%
Manufacturing	71,300	-2.10%	6%
Service-Providing	**1,136,100**	**0.60%**	**90%**
Private Service-Providing	**931,200**	**1.40%**	**74%**
Trade, Transportation, and Utilities	271,300	0.60%	21%
Information	23,900	-2.00%	2%
Financial Activities	75,700	5.30%	6%
Professional and Business Services	164,800	1.90%	13%
Education and Health Services	242,600	2.30%	19%
Leisure and Hospitality	97,500	-2.00%	8%
Other Services	55,400	2.60%	4%
Government	204,900	-2.90%	16%
Total Nonfarm	**1,263,000**	**0.20%**	**100%**

Source: Bureau of Labor Statistics, NYS Labor Department

Sustainability Indicators and Targets

Energy

GHG emissions per dollar of gross regional product

- **Baseline 2010** 0.27 kg CO_2e/$ gross regional product (GRP) MMBtu per capita[2]
- **Target 2020** 0.23 kg CO_2e/$ gross regional product (GRP) MMBtu per capita (15% reduction from baseline)

Regional electricity grid fuel mix

- **Baseline 2010** Gas 43%, Nuclear 11%, Energy Efficiency 4%, Refuse 4%, Renewables 3%, Residual Oil 2%, Distillate Oil 1%, Purchases (ISO-NE, NYISO, PJM) 32%[3]
- Municipalities on Long Island do not have direct control over grid fuel mix, so targets for most sources are not being proposed. LIPA has not adopted official targets for efficiency and renewables as a percentage of their grid mix, and is not covered under the State Renewable Portfolio Standard (RPS), but they have set a goal of reducing peak demand by 520 MW through these measures by 2018. Targets are proposed for increasing renewables to 16.5%, and efficiency to 10%.

Reduction in annual energy use per end use

- **Baseline 2010** 155,203 Mega-Watt hours (MWh) (saved through LIPA rebate programs for electricity only). Savings for oil/gas associated with 2 programs expected from LIPA.[4]
- **Target 2020** 776,000 MWh (Based on LIPA Efficiency Long Island (ELI) target for 2018, combined with Plan strategies.)

Regional energy consumption per capita

- **Baseline 2010** 384.39 MMBtu per capita
- **Target 2020** 345.99 MMBtu per capita (10% reduction from baseline)

2 *Regional Tier II LI GHG Inventory, baseline 2010 (2012)*
3 *LIPA Energy Plan (2010)*
4 *LIPA Efficiency Long Island Annual Report 2011*

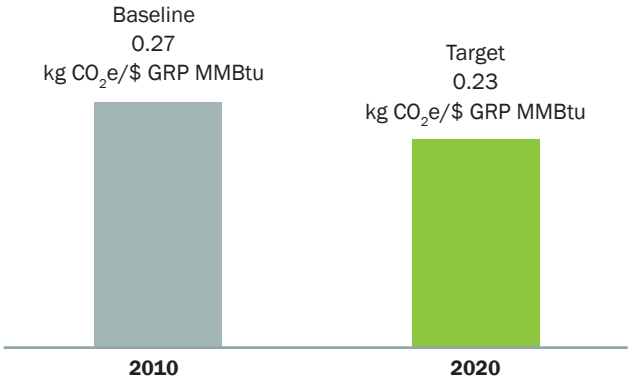


Figure 30 GHG Emissions per Dollar of Gross Regional Product

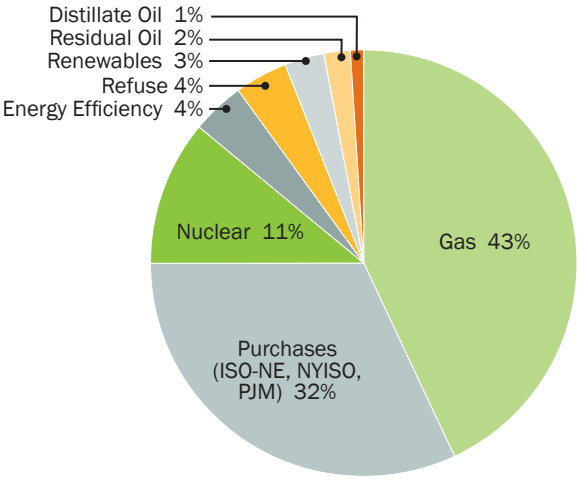


Figure 31 2010 Regional Electricity Grid Fuel Mix

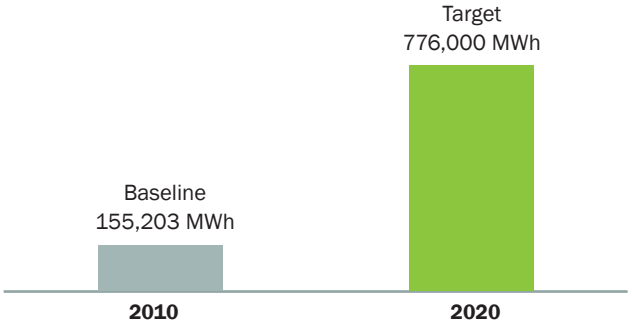


Figure 32 Reduction in Annual Energy Use

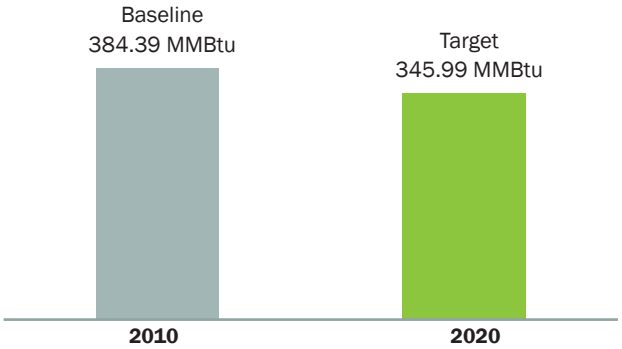


Figure 33 Regional Energy Consumption per Capita

Transportation

Vehicle miles traveled (VMT) per capita

Reflects the region's priority to increase transportation options, including transit, walking, and biking, for all trips.

- **Baseline 2010** 22.25 miles per capita per weekday
- **Target 2020** 20 miles per capita per weekday

Number of registered alternative fuel vehicles

Reflects the region's priority to reduce GHG emissions associated with vehicle trips.

- **Baseline 2010** 13,088 Clean Pass registrations.
- **Target 2020** 25,000 Clean Pass registrations.

Walk score of downtown areas

Reflects the region's priority of creating more walkable communities and active downtowns.

- **Baseline 2010** 0.52 Walk score
- **Target 2020** 0.65 Walk score

Percentage of people commuting via alternative transportation modes (walking, biking, transit, and carpooling)

Reflects the region's goal to increase transportation options for commuters, including transit, walking, and biking.

- **Baseline 2010** transit 11.%, carpooling 8.1%, walking 2.1%, biking 0.26%.
- **Target 2020** , transit 14%, carpooling 10%, walking 4%, biking 0.75%.

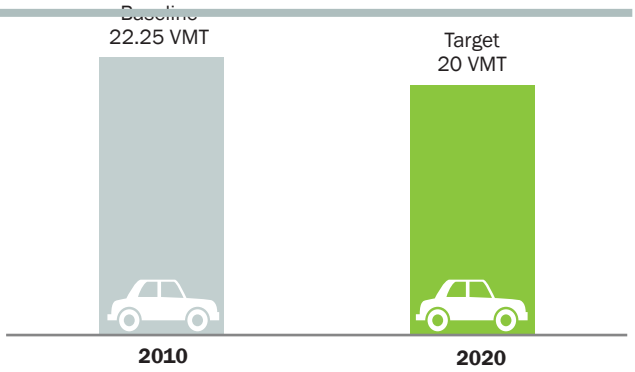


Figure 34 **Vehicle Miles Traveled per Capita**

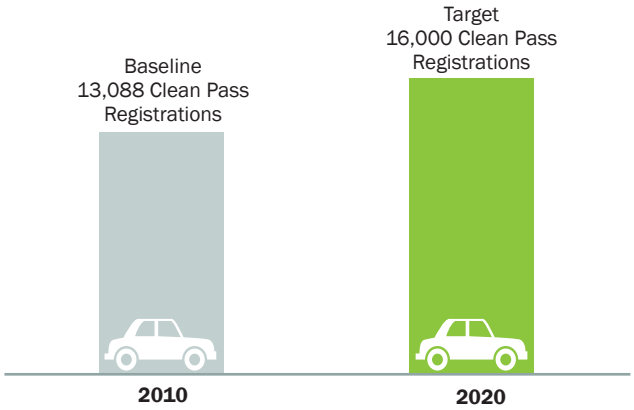


Figure 35 **Number of Registered Alternative Fuel Vehicles**

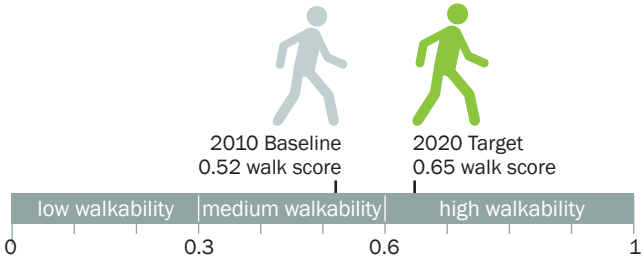


Figure 36 **Walk Score of Downtown Areas**

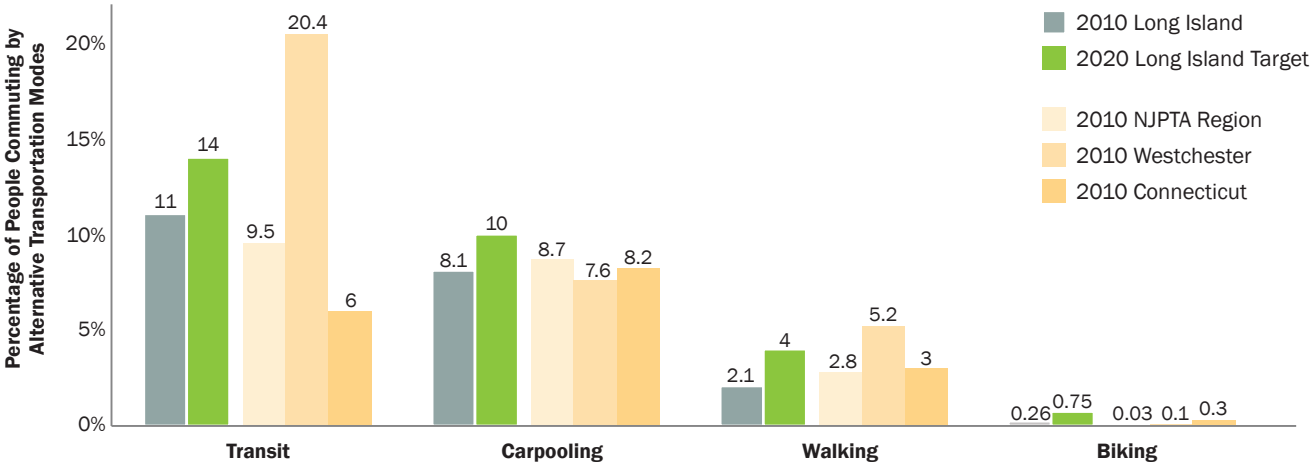


Figure 37 **Alternative Transportation Commuting throughout the Tri-State Region**

Source: NJ, Westchester and Connecticut data from ACS 2007-2011 5-year estimates.

Sustainability Indicators and Targets

Land Use and Livable Communities

Land consumption per capita
Reflecting the region's priority to increase development intensity in existing downtowns and reduce greenfield development.
- **2010 Baseline** 0.17 acres per resident
- **2020 Target** 0.15 acres per resident

Available parkland per capita
Reflecting the region's priority to preserve open space.
- **2010 Baseline** 0.06 acres per resident
- **2020 Target** 0.09 acres per resident

Percentage of redevelopment of vacant buildings and sites
Reflecting the region's priority to develop in existing downtown areas/hamlets, utilize existing infrastructure and reflect the economic health of downtown areas.
- **2010 Baseline** unknown
- **2020 Target** future indicator once data becomes available.

Number of building permits issued in downtown areas/ hamlet centers
Reflecting the region's priority to preserve open space and develop in existing downtown areas/hamlet centers and reflects the economic health of downtown areas.
- **2010 Baseline** unknown
- **2020 Target** future indicator once data becomes available.

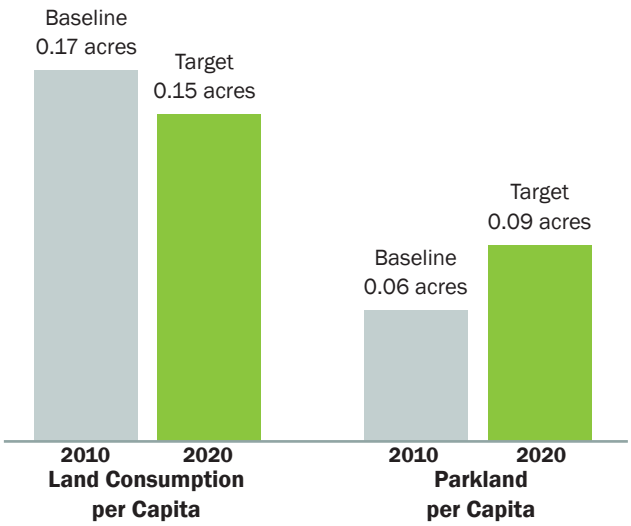


Figure 38 **Land Consumption and Parkland per Capita**

Waste Management

Total solid waste generated per capita
Reflecting the region's goal to reduce the volume of waste generated.
- **2010 Baseline** 0.8 tons municipal solid waste generated per capita per year
- **2020 Target** 0.6 tons per capita per year

Solid waste diverted (i.e. not landfilled or exported) per capita per year
- **2010 Baseline**
  - Recycling and composting equals 0.13 tons per capita per year
  - Waste to energy equals 0.5 tons per capita per year
- **2020 Target**
  - Recycling and composting equals 0.16 tons per capita per year
  - Waste to energy equals 0.4 tons per capita per year

Figure 39 **Waste Generated per Capita per Year**

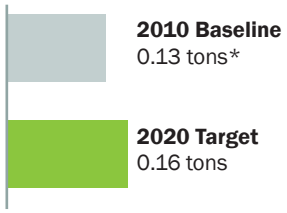


Figure 40 **Recycling and Composting per Capita per Year**

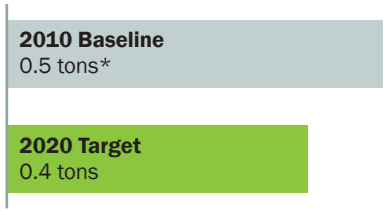


Figure 41 **Waste to Energy per Capita per Year**

**NYS DEC 2008; Long Island GHG Inventory (2012) (baseline 2010), produced by NYIT*

Sustainability Indicators and Targets

Water Management

Water demand per capita

Reflecting the region's goal to preserve its aquifer and drinking water supply for future generations while also reducing energy associated with water consumption.

- **2010 Baseline** 135 gallons per day per capita
- **2020 Target** 120 gallons per day per capita

Total number of impaired waterways

Reflecting the region's priority to protect the health of its coastal waters for tourism, recreation, fishing, environmental health, and community pride.

- **2010 Baseline** 67 impaired waterways
- **2020 Target** 64 (5% reduction in number of impaired waterways)

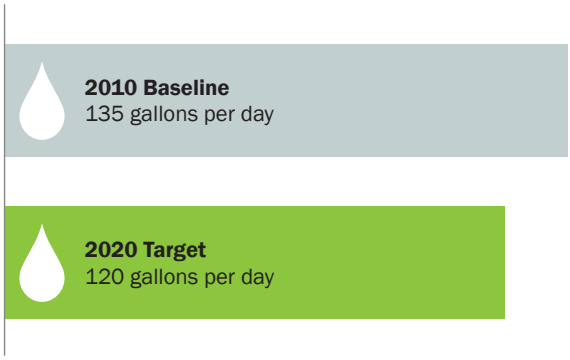


Figure 42 Water Demand per Capita

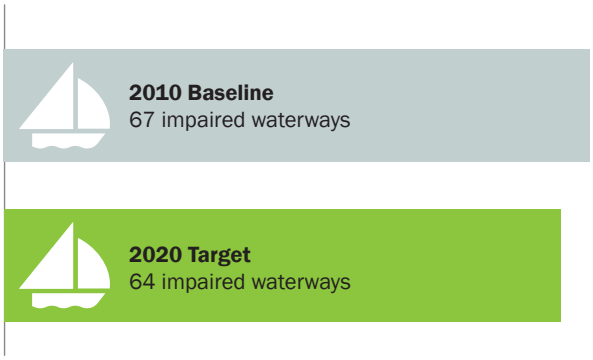


Figure 43 Number of Impaired Waterways

Governance

Number of CSC communities

The number of certified Climate Smart Communinties (CSC) municipalities demonstrates progress in promoting energy efficient communities that seek to reduce cost of living amidst rising energy costs and mitigation toward long-term impacts of climate change.

- **2010 Baseline** 0
- **2020 Target** 1 County, 8 Towns, 4 Villages, 1 City

CGLI Goals and Strategies

	Align w/ LIREDC Goals	Adapt to Climate Change
Economic Development and Workforce Housing		
Goal 1 Improve housing and transportation affordability by providing incentives for workforce housing and commercial buildings that are location efficient, affordable and green; thereby creating jobs for local contractors and local labor.		
Strategy 1.1 Provide gap financing and technical assistance incentives for new and redeveloped buildings that are location efficient, affordable and green.	x	x
Goal 2 Support a green innovation economy and local jobs by retaining, growing and attracting green business clusters.		
Strategy 2.1 Provide financial assistance for the incubation and commercialization of energy and green technologies. Facilitate growth and retain technologies developed by Long Island's research laboratories and universities, creating and retaining local jobs and businesses.	x	
Strategy 2.2 Retain and grow the green construction sector through technical assistance and financing of a fuel neutral cooperative advertising program. Provide home performance contractors with resources to market and expand this emerging sector through the use of a successful tool that has worked well in other parts of the state.	x	
Strategy 2.3 Retain and grow the aquaculture and agriculture sectors by providing gap financing and technical assistance for projects that will help them green their operations and distribution channels. Increase the amount of locally grown products sold on Long Island to reduce GHG impacts and create/retain local jobs.	**x**	
Goal 3 Support a green innovation economy and local jobs through green business designations and marketing.		
Strategy 3.1 Provide technical and financial assistance to businesses to green their operations, secure a third party green business designation, and provide marketing support.	x	
Goal 4 Promote high-value jobs through green workforce development.		
Strategy 4.1 Support green training of the new and incumbent workforce to grow opportunities for local jobs.	x	
Strategy 4.2 Maintain and grow the network between educational institutions, workforce investment boards, students, employers and labor organizations.	x	
Goal 5 Advance Superstorm Sandy recovery and rebuilding to manage future economic risks.		
Strategy 5.1 Provide incentives for rebuilding greener and more resilient developments in areas impacted by the storm surge or encourage relocation locally outside the floodplain and develop and implement strategies for enhancing resilience and more rapid restoration of the electric grid.	x	x
Energy		
Goal 1 Improve energy efficiency of existing residential building stock.		
Strategy 1.1 Require Energy Performance Certificates at point of sale or rental.		x
Strategy 1.2 Continue to develop, evolve, and expand outreach and education campaigns to promote energy efficiency and renewable programs and basic energy efficient behaviors (such as use of a comparative billing software).	x	x
Goal 2 Improve energy efficiency of existing commercial building stock.		
Strategy 2.1 Require annual energy benchmarking for all non-residential buildings over 25,000 sq ft (approximately 3,500 existing buildings).		x
Strategy 2.2 Require energy audits every 5 years for all non-residential buildings over 25,000 sq ft (approximately 3,500 buildings).		x

CGLI Goals and Strategies

	Align w/ LIREDC Goals	Adapt to Climate Change
Strategy 2.3 Encourage use of energy alignment clause in leases.		x
Strategy 2.4 Encourage energy conservation education for building owners, property managers and real estate community.	x	x
Goal 3 Improve energy efficiency of new building stock.		
Strategy 3.1 Promote adoption of more stringent local Energy Efficiency Construction Code by municipalities. (Home Energy Rating System for residential, International Green Construction Code for commercial).	x	x
Strategy 3.2 Provide incentives (such as property tax waivers) for new homes that meet the Passive House standard.		x
Strategy 3.3 Provide enhanced sustainable and energy conservation training of design professionals.	x	x
Goal 4 Double local renewable energy generation by 2020.		
Strategy 4.1 Develop and encourage municipal adoption of "Solar ready" code requirements for new construction so that retrofitting photovoltaic or solar hot water is structurally easy and cost-effective.	x	x
Strategy 4.2 Call for municipalities to require a feasibility study of renewables and/or combined heat and power for new commercial development over 25,000 sq ft with the installation of a minimum 30% of electric demand (or equivalent) through renewables.	x	x
Strategy 4.3 Standardize permit process for renewable energy commercial projects.	x	x
Strategy 4.4 Encourage geothermal heat pump projects through education and incentives. Develop an incentive program for replacing fuel oil boilers with natural gas or ground source heat pumps (where no gas supply available) that leverages or enhances existing LIPA rebates.	x	x
Strategy 4.5 Develop a series of regular conferences on adoption of renewable energy on Long Island.		x
Goal 5 Lead by example and improve energy efficiency of municipal buildings, fleets and other operations (20% by 2020).		
Strategy 5.1 Promote and implement energy efficiency improvements in municipal facilities, including street lighting, traffic lights, parking lot and park lighting and wastewater facilities.	x	x
Strategy 5.2 Promote and implement energy efficiency improvements across LI school buildings through cost-effective, shared services for audits and retrofits.		x
Goal 6 Increase market penetration of electric, plug-in hybrid, and other low-carbon alternative fuel vehicles (30% by 2020).		
Strategy 6.1 Expand and develop electric vehicle charging and mapping infrastructure and enhance grid services to allow widespread charging capacity for electric vehicles.	x	x
Strategy 6.2 Create and promote incentives for electric vehicles and alternative fuel vehicles both for private sector and for municipal fleets.	x	x
Goal 7 Encourage innovation and adoption of 21st century technologies that increase the capabilities of the electric grid.		
Strategy 7.1 Encourage research and pilot programs to advance smart grid technologies, controls and improved renewable energy forecasting that can enhance the security and integrity of smart grid infrastructure.	x	x
Strategy 7.2 Support efforts to increase the efficiency, reliability, and resilience of the grid (transmission and distribution), including its capacity for self-monitoring and self-repair, and adapt to the challenges presented by the addition of electric vehicles as a new energy demand on the grid.	x	x

CGLI Goals and Strategies

	Align w/ LIREDC Goals	Adapt to Climate Change
Transportation		
Goal 1 Improve transportation options for all Long Islanders: reduce Long Island's vehicle miles traveled, fuel consumption and GHG emissions.		
Strategy 1.1 Expand and improve public transportation across the Island (rail and bus).	x	
Strategy 1.2 Increase the number of Long Island employers providing incentives/services to employees for VMT reduction.	x	
Strategy 1.3 Improve safety of streets for pedestrians and cyclists through implementation of Complete Streets, signal optimization, and a comprehensive bike plan.	x	x
Strategy 1.4 Increase the number of alternative fuel vehicles on Long Island by targeting municipal and private fleets and buses.		x
Strategy 1.5 Reduce long-haul truck traffic through improvements to rail freight system.	x	x
Land Use and Livable Communities		
Goal 1 Increase the number of communities with reduced auto dependence and increased livability on Long Island.		
Strategy 1.1 Increase mixed-use developments in Long Island downtowns and near LIRR stations by 100%.	x	x
Goal 2 Increase the amount of natural resources and protected open space on Long Island.		
Strategy 2.1 Permanently protect 10% of the Island's most critical unprotected open space and farmland.	x	x
Strategy 2.2 Preserve 10% of unprotected open space along the coasts to serve as a storm-resilient buffer.	x	x
Strategy 2.3 Restore the tree canopy on Long Island to pre-Superstorm Sandy conditions.		x
Goal 3 Increase the resiliency of coastal development.		
Strategy 3.1 Utilize best practices for the redevelopment of neighborhoods in coastal areas to become more resilient.	x	x
Waste Management		
Goal 1 Reduce the amount of municipal solid waste generated.		
Strategy 2.2 Require energy audits every 5 years for all non-residential buildings over 25,000 sq ft (approximately 3,500 buildings).		
Strategy 1.2 Develop regionally-shared education programs and waste audits to promote waste reduction opportunities in residences, government offices, schools and large institutions.		
Strategy 1.3 Expand pilot testing "Pay As You Throw / Save Money and Reduce Trash" programs to evaluate impact of cost incentives and provide lessons learned.		
Goal 2 Develop localized facilities to the reduce volume of organics transported to landfills and increase energy capture.		
Strategy 2.1 Expand New York State pilot program to test viability of food waste to biogas on Long Island.	x	x
Strategy 2.2 Create new and/or expand existing yard waste compost facilities to serve most municipality and commercial needs.		

CGLI Goals and Strategies

	Align w/ LIREDC Goals	Adapt to Climate Change
Goal 3 Increase the amount of locally recycled non-organics.		
Strategy 3.1 Initiate market feasibility assessment for regional facility/ies to expand capacity to recycle plastics waste.	x	
Goal 4 Promote energy efficiency throughout waste management processes and systems.		
Strategy 4.1 Expand efficient management of municipal and private municipal solid waste fleets to include biodiesel and compressed natural gas vehicles.	x	x
Strategy 4.2 Initiate cross-municipality and operator discussion on upgrades to incinerator facilities that would optimize energy capture from waste.	x	x
Water Management		
Goal 1 Work together to preserve the region's sole source aquifer and maintain it in a sustainable way.		
Strategy 1.1 Develop a regional entity to coordinate management of the aquifer system.	x	x
Strategy 1.2 Continue water monitoring by the U.S. Geological Survey in Suffolk County and obtain funding to re-establish monitoring in Nassau County.	x	
Strategy 1.2 Continue water monitoring by the U.S. Geological Survey in Suffolk County and obtain funding to re-establish monitoring in Nassau County.		
Strategy 1.4 Curb pesticide usage.	x	x
Goal 2 Reduce water consumption.		
Strategy 2.1 Reduce potable water consumption due to excessive irrigation.	x	x
Strategy 2.2 Show water use trends on water bills.		
Strategy 2.3 Conduct a rate study to provide more uniform water rates across the region that are commensurate with the environmental cost of the resource.		
Goal 3 Increase wastewater pollution control.		
Strategy 3.1 Conduct a feasibility study to convert septic systems in priority areas to cluster treatment facilities with better treatment capabilities.	x	x
Strategy 3.2 Incentivize the replacement or retrofit of failing septic systems.	x	x
Goal 4 Control flooding and surface water pollution from stormwater runoff.		
Strategy 4.1 Increase the development of green infrastructure in the public and private realms.	x	x
Governance and Implementation		
Goal 1 Promote regional coordination of sustainability planning and implementation.		
Strategy 1.1 Support the continuation and expansion of the Long Island Green Homes Consortium in sustainability education, outreach and planning.	x	x
Strategy 1.2 Facilitate plan implementation by coordinating public engagement, outreach and workshops on behalf of NYSERDA and the LILIREDC for prospective CFA funding applicants. Participation would include a wide group of stakeholders including local governments, businesses and organizations.	x	
Strategy 1.3 Increase the number of Climate Smart Communities and certified Climate Smart Communities.	x	x

CGLI Goals and Strategies

The following is a list of strategies that address anticipated climate change impacts that may be experienced on Long Island. They were not developed through the working groups and public engagement process. However, they are included in the plan as a reference for the communities to consider as they develop adaptation plans to reduce risks and guide investment decisions.

Adaptation to Climate Change

Strategies to Address Higher Temperature

Strategy 1.1 Conduct vulnerability assessments and establish communication plans.

Strategy 1.2 Establish more efficient, diverse and segmented energy and fuel sources.

Strategy 1.3 Manage energy demand.

Strategy 1.4 Promote cool roofs.

Strategy 1.5 Expand urban forest and green infrastructure.

Strategies to Address Flooding, Storm Surge and Sea Level Rise

Protection Strategies

Strategy 2.1 Expand the comprehensive planning process to include a sea level rise assessment and plan.

Strategy 2.2 Promote community engagement in National Flood Insurance Program's Community Rating System program.

Strategy 2.3 Create hazard mitigation plans.

Strategy 2.4 Update comprehensive plans, building/design codes and zoning restrictions.

Strategy 2.5 Incentivize cluster development in low-risk areas.

Strategy 2.6 Create rolling easements.

Strategy 2.7 Prioritize infrastructure investments in low-risk areas.

Strategy 2.8 Elevate existing equipment and raise elevation standards for new projects.

Strategy 2.9 Relocate.

Strategy 2.10 Enhance or construct dunes and nourish beaches.

Strategy 2.11 Build/raise levee, floodwall or berm.

Functional Inundation Strategies

Strategy 3.1 Increase maintenance at flooding hotspots.

Strategy 3.2 Retrofit/make waterproof.

Strategy 3.3 Use corrosion-resistant materials.

Inundation Strategies

Strategy 4.1 Construct low-water crossings.

Strategy 4.2 Integrate extreme flood events into emergency management plans.

Strategy 4.3 Improve drainage.

Strategy 4.4 Integrate water sensitive urban design techniques into the urban form.

Strategy 4.5 Build causeways.

List of Figures

Figure 1 Cleaner Greener Long Island Project Organization 7

Figure 2 Long Island GHG Emissions Percentages by Sector 9

Figure 3 Long Island GHG Emissions Potential for 2020 10

Figure 4 Planning Process Diagram 22

Figure 5 Cleaner Greener Long Island Project Organization 23

Figure 6 Long Island GHG Emissions Percentages by Sector 27

Figure 7 Current (2010) and Projected (2020) LI GHG Emissions 28

Figure 8 Estimated GHG Emission Reduction Potential from Transit-oriented Development Strategy 29

Figure 9 Long Island GHG Emissions Potential for 2020 31

Figure 10 Housing and Transportation Affordability Index 39

Figure 11 GHG Emissions per Dollar of Gross Regional Product 55

Figure 12 2010 Regional Electricity Grid Fuel Mix . . . 55

Figure 13 Reduction in Annual Energy Use 55

Figure 14 Regional Energy Consumption per Capita . . 55

Figure 18 Alternative Transportation Commuting throughout the Tri-State Region 77

Figure 15 Vehicle Miles Traveled per Capita 77

Figure 16 Number of Registered Alternative Fuel Vehicles 77

Figure 17 Walk Score of Downtown Areas. 77

Figure 19 Land Consumption and Parkland per Capita 86

Figure 20 Waste Generated per Capita per Year 96

Figure 21 Recycling and Composting per Capita per Year 96

Figure 22 Waste to Energy per Capita per Year 96

Figure 23 Water Demand per Capita 106

Figure 24 Number of Impaired Waterways 106

Figure 25 Existing Building Replacement Cost 131

Figure 26 Scenario 1: 2050 Impacts from Category 3 Storm + Areas of High Social Vulnerability 131

Figure 27 Scenario 2: 2080 High Sea Level Rise from Category 3 Storm with Estimated % of Building Loss 131

Figure 28 Long Island GHG Emissions Potential for 2020 134

Figure 29 Housing and Transportation Affordability Index 135

Figure 30 GHG Emissions per Dollar of Gross Regional Product 136

Figure 31 2010 Regional Electricity Grid Fuel Mix . . 136

Figure 32 Reduction in Annual Energy Use 136

Figure 33 Regional Energy Consumption per Capita . 136

Figure 37 Alternative Transportation Commuting throughout the Tri-State Region 137

Figure 34 Vehicle Miles Traveled per Capita 137

Figure 35 Number of Registered Alternative Fuel Vehicles 137

Figure 36 Walk Score of Downtown Areas. 137

Figure 38 Land Consumption and Parkland per Capita 138

Figure 39 Waste Generated per Capita per Year 138

Figure 40 Recycling and Composting per Capita per Year 138

Figure 41 Waste to Energy per Capita per Year 138

Figure 42 Water Demand per Capita 139

Figure 43 Number of Impaired Waterways 139

List of Tables

Table 1 Economic Development and Workforce Housing Goals and Strategies 11

Table 2 Energy Goals and Strategies. 12

Table 3 Transportation Goal and Strategies. 14

Table 4 Land Use & Livable Communities Goal and Strategies. 14

Table 5 Waste Management Goals and Strategies . . 15

Table 6 Water Management Goals and Strategies . . 16

Table 7 Governance and Implementation Goal and Strategies. 17

Table 8 Summary of Climate Variables 18

Table 9 Strategies Quantifiable for GHG Emissions Reduction 31

Table 10 Long Island Employment by Non-Farm Sector (2012) 39

Table 11 Economic Development and Workforce Housing Goals and Strategies. 41

Table 12 Energy Goals and Strategies. 56

Table 13 Transportation Goal and Strategies. 78

Table 14 Land Use & Livable Communities Goal and Strategies. 87

Table 15 Waste Management Goals and Strategies . . 97

Table 16 Water Management Goals and Strategies . . 107

Table 17 LIREDC Working Groups Linkage to CGLI Plan Subject Areas. 117

Table 18 Governance and Implementation Goal and Strategies. 118

Table 19 Summary of Climate Variables 122

Table 20 CGLI Strategies with Adaptation Benefits. . 126

Table 21 Long Island Employment by Non-Farm Sector (2012) 135

Acronyms

Acronym	Definition
AAA	American Automobile Association
AERTC	Advanced Energy Research and Technology Center
AETI	Advanced Energy Training Institute
AFV	Alternative Fuel Vehicle
AIA	American Institute of Architects
ASCE	American Society of Civil Engineers
BAU	Business As Usual
BOCES	Boards of Cooperative Educational Services
BOMA	Building Owners and Managers Association
BRT	Bus Rapid Transit
CAFE	Corporate Average Fuel Economy
CEDS	Comprehensive Economic Development Strategy
CEFIA	Connecticut's Clean Energy Finance and Investment Authority
CGLI	Cleaner Greener Long Island
CHP	Combined Heat and Power
CNG	Compressed Natural Gas
CRS	Community Rating System
CSC	Climate Smart Communities
DOE	United States Department of Energy
DOS	New York State Department of State
DPW	Department of Public Works
EECGB	Energy Efficiency and Conservation Block Grant
ELI	Efficiency Long Island
EPA	U.S. Environmental Protection Agency
EPC	Energy Performance Certificates
EUI	Energy Use Intensity
FEMA	Federal Emergency Management Agency
FIRM	Flood insurance rate map
FIT	Feed In Tariff
GHG	Greenhouse Gas
GIS	Geographic Information Systems
GLICCC	Greater Long Island Clean Cities Coalition
GRP	Gross Regional Product
GSHP	Ground Source Heat pPump
HART	Huntington Area Rapid Transit
HERS	Home Energy Rating System
ICLEI	International Council for Local Environmental Initiatives
IECC	International Energy Conservation Code
IgCC	International Green Construction Code
ISO-NE	ISO New England Inc.
LEED	Leadership in Energy and Environmental Design

Acronym	Definition
LEM	Location Efficient Mortgage
LI	Long Island
LICAP	Long Island Commission for Aquifer Protection
LI-GEO	Long Island Geothermal Energy Organization
LIGHC	Long Island Green Homes Consortium
LIPA	Long Island Power Authority
LIPPPS	Long Island Pesticide Pollution Prevention Strategy
LIREDC	Regional Economic Development Council
LIRPC	Long Island Regional Planning Commission
LIRR	Long Island Rail Road
MCL	Maximum Containment Levels
MPG	Miles Per Gallon
MRF	Materials Recovery Facility
MSW	Municipal Solid Waste
MT CO_2	Metric Tons of Carbon Dioxide Equivalents
MTA	Metropolitan Transit Authority
MW	Mega Watt
MWh	Mega-watt Hour
NFIP	National Flood Insurance Program
NG	Natural Gas
NGO	Non-governmental Organization
NIMBY	Not-in-my-backyard
NJTPA	North Jersey Transportation Planning Authority
NOAA	National Oceanic and Atmospheric Administration
NYC	New York City
NYISO	New York Independent System Operator
NYIT	New York Institute of Technology
NYMTC	New York Metropolitan Transportation Council
NYPH	New York Power House
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
NYSDOS	New York State Department of State
NYSDOT	New York State Department of Transportation
NYSERDA	New York State Energy and Research Development Authority
PAC	Greater Port Washington Peninsula Aquifer Committee
PACE	Property Assessed Clean Energy Loans
PAYT/ SMART	Pay As You Throw / Save Money and Reduce Trash
PV	Photovoltaic
RFMBPW	Residents For A More Beautiful Port Washington

Acronyms

Acronym	Definition
RPS	Renewable Portfolio Standard
SAIFI	System Average Interruption Frequency Index
SOV	Single Occupancy Vehicle
SSER	South Shore Estuary Council
STEM	Science, Technology, Engineering and Math
SUNY	State University of New York
SWAT	Sustainable Water Applied Technologies
SWM	Solid Waste Management
TDM	Transportation Demand Management
TNC	The Nature Conservancy
TOD	Transit-oriented Development
ToNH	Town of North Hempstead
USGBC	U.S. Green Building Council
USGS	U.S. Geological Survey
VMT	Vehicle Miles Travelled
WG	Working Group

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