

CLIMATE & SUSTAINABILITY FRAMEWORK

CITY OF NEW HAVEN
JANUARY 2018



Greenhouse gas emissions – from myriad sources including vehicles, electricity, and industry – all contribute to climate change, but the solutions grow from much deeper seeds in society. Addressing New Haven's climate and sustainability challenges provides an opportunity to also promote equity, commit to a responsible and low carbon economic development trajectory, ensure New Haven's resilience capacity to meet future challenges, and improve the quality of life for those who live, work, and recreate in New Haven. The solutions to mitigate climate change can be driven by government, but increasingly they require the participation of every New Haven resident. Incorporating all members of the New Haven community in planning and implementing these solutions – from increasing renewable energy production, to expanding use of mass transit and active transportation, to purchasing local nutritious foods – will be key to the success in meeting both climate and sustainability objectives.

Cities like New Haven have a vital role to play in addressing our planet's challenges. Given the urgency of climate change and its associated impacts, the City has set an interim goal of reducing greenhouse gas emissions by 55% of 1999 levels by 2030. Furthermore, by 2050, the City will strive to be carbon neutral. In setting these ambitious goals, the City is joining forces with hundreds of other cities that have also pledged to take a leadership position on addressing climate change.

The Framework proposes goals and actions that can advance both climate and sustainability objectives and limit temperature rise to two degrees Celsius. These solutions are embraced in six innovative strategies to tackle climate change and sustainability:

1. Electric Power
2. Buildings
3. Transportation
4. Materials Management
5. Land Use and Green Infrastructure
6. Food

This Climate and Sustainability Framework lays the initial seeds for sustainable and low-carbon development that can address both the City's current and future needs while responding to the threat of climate change.

SUSTAINABLE CITY, SUSTAINABLE FUTURE





CITY OF NEW HAVEN

TONI N. HARP, MAYOR

165 Church Street
New Haven, Connecticut 06510
T: 203.946.8200 F: 203.946.7683
www.CityofNewHaven.com



January 2018

Dear Residents of New Haven,

Climate change poses unique challenges – and opportunities – for New Haven residents. We are already beginning to feel the impacts of climate change in New Haven, which include coastal and inland flooding, heat waves, and air quality.¹ These impacts will disproportionately affect New Haven's most vulnerable residents, and that is why we have prioritized equity and justice in implementation of this framework.

Today, New Haven is taking a monumental step forward in addressing climate change and sustainability, and I am excited to announce the development of the New Haven Climate and Sustainability Framework. We are building on our long history of environmental leadership in Connecticut, from signing on to the Global Covenant of Mayors to committing the City to purchase 100 percent renewable energy for municipal buildings. By serving as a leader in the state, we are helping build a more environmental, social, and economically sustainable city that can serve as a model for others.

Our Climate and Sustainability Framework outlines goals and actions to make New Haven into a low-carbon and resilient economy. In addition to reducing greenhouse gas emissions, this framework identifies strategies that can:

- Create safe and convenient transportation routes accessible for biking, walking, and public transportation;
- Save residents, businesses, and the City money on utility bills by switching to renewable energy;
- Promote local farms and healthy nutrition options;
- Build resilience to future climate impacts;
- Reduce waste and toxic pollution;
- Enable development of green jobs as we build a local clean energy economy; and
- Improve public health and wellbeing.

By working collaboratively with the City, residents, and businesses, together we can create a sustainable and resilient New Haven.

Sincerely,


Toni N. Harp
Mayor, City of New Haven

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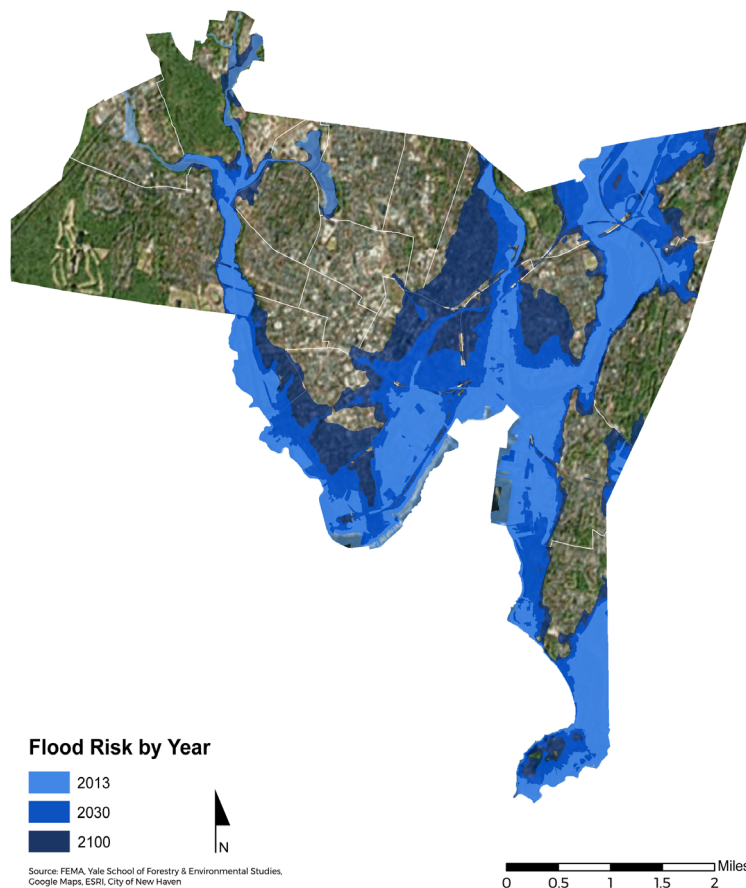
New Haven's Climate Challenge

Sixteen of the seventeen warmest years on record have occurred since 2000, and 2016 was the hottest year recorded for the third straight year.² Heat-trapping carbon dioxide and other greenhouse gases produced from burning fossil fuels causes global warming, and results in severe and irreversible impacts to people and ecosystems.³ Many of the impacts are worldwide, and have been worse than scientists predicted. Sea level rise and saltwater intrusion will force millions to flee islands and low-lying countries, from Kiribati to Bangladesh. Increased desertification across the African continent will spread the pangs of famine and exacerbate geopolitical instability. Intense weather events like Hurricane Sandy will have greater economic and human costs, crippling infrastructure and energy systems.⁴

Although climate change is a global problem, many impacts are already being experienced in New Haven. More frequent, high intensity rain events cause flash flooding at several crucial locations downtown. Sea level rise in conjunction with storm surge threaten businesses and infrastructure within Long Wharf and residents along the coast in Fair Haven and the East Shore. Heat waves exacerbate poor air quality contributing to long-term respiratory health impacts for vulnerable residents.⁵

Scientists have recognized a growing urgency to make sharp reductions in greenhouse gas emissions, along with adaptation, to help reduce the severity of climate change. The window of opportunity in the next three to fifteen years will determine

how we respond to climate change – and whether we are able to establish a low-carbon development trajectory.⁶ The participation of cities like New Haven as part of the climate solution is an important opportunity to reduce emissions and prepare for the future.

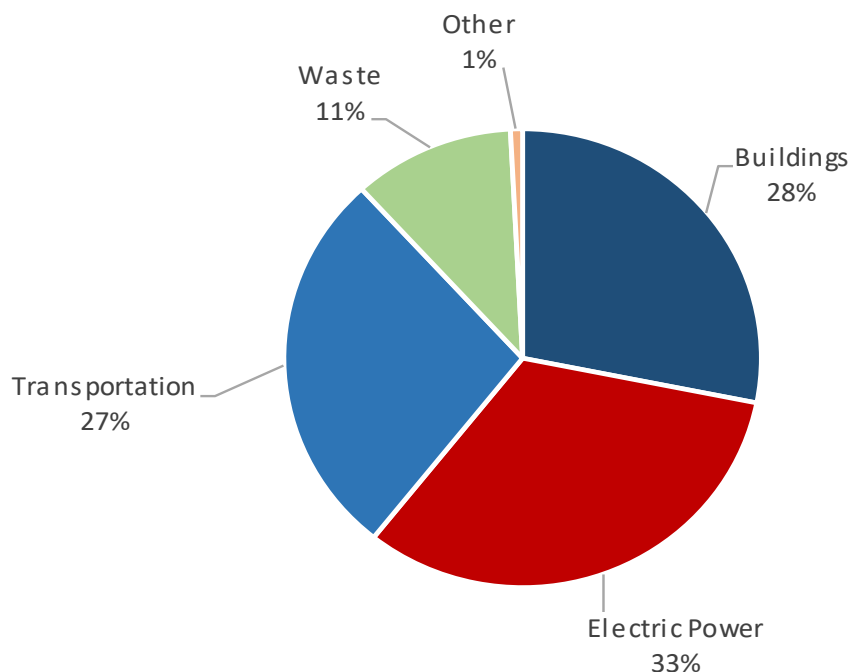


GREENHOUSE GAS INVENTORY

The strategies, goals, and actions outlined in the New Haven Climate and Sustainability Framework are supported by a greenhouse gas inventory. The 2017 inventory establishes a new baseline for our emissions, from which we can target certain sectors for emissions reductions and monitor progress to meeting goals. The results of the Greenhouse Gas Inventory are summarized herein, and included as Appendix B.

New Haven Greenhouse Gas Emissions (2015)

Total: 1.4 million metric tons CO₂e



In 2015, New Haven produced 1.4 million metric tons of CO₂e, which represents a decline of emissions by 6% from 2009. Additionally, New Haven's population grew since 2009 but per capita emissions declined by 5%, and are about 6 tons lower than the national average of 16 tons per person. These trends support New Haven's low-carbon development trajectory – coal-fired power plants have shut down, more rooftop solar is on the electric grid, and people are making sustainable choices. However, electric power still represents the greatest share of emissions (33%), closely followed by buildings (28%) and transportation (27%). Therefore many of the actions are aimed at cleaning up the electric grid, improving building energy efficiency, and reducing emissions associated with transportation.

This inventory, when coupled with the State's recently released 'Comprehensive Energy Strategy,' highlights the interconnections between city-wide actions and state and federal policies. Meeting emission reductions targets pursuant to the 2008 Global Warming Solutions Act will depend on many factors, including some outside of the City's control, including the availability of state and federal funding, state and federal regulations (such as Federal vehicle emissions standards or State Renewable Portfolio Standard), technology development and adoption, the participation of local businesses and organizations, and citizen engagement.



OUR FRAMEWORK

The New Haven Climate and Sustainability Framework is a step forward in recognizing the linkages between climate change and other sustainability challenges, such as economic development and green jobs, nutrition and food security, reduced resource consumption and waste streams, and the overall health and wellbeing of our population. Developed nations, like the United States, have had an outsized role in creating the problem of climate change and so this Framework serves as a step towards climate justice objectives globally.

The Framework also reflects international agreements that integrate climate change and sustainability objectives in the urban context. Within the past two years, the United Nations adopted the Sustainable Development Agenda for 2030, the Paris Climate Agreement, and the New Urban Agenda. Each of these international frameworks sets targets, objectives, and helps guide policy development. These agreements rely on leadership from cities – like New Haven – to help achieve global environmental and social solutions.

THE FRAMEWORK PROCESS

The Framework was the result of a collaborative process between City staff and members of the public. In January 2016, community members asked the City to update the 2004 Climate Action Plan. In response, the City worked with local advocates and community members to document existing climate and sustainability efforts in New Haven and create progressive goals and actions around six key strategies. Public input was solicited through six stakeholder working groups, three public meetings, and commenting available on the New Haven Climate and Sustainability Framework website. Transparency and inclusivity throughout

the collaboration process has ensured that all New Haven residents have had the opportunity to participate fully. The Framework serves many different purposes. For members of the public, the Framework identifies steps the City is taking to address climate change and ways that residents can help meet our goals. For City Departments, the Framework can help prioritize projects that the City could implement based on environmental and social co-benefits. For New Haven businesses, organizations, and institutions, the Framework identifies programs and other opportunities to reduce pollution and save funds.

Because the City has limited resources to enact all the measures outlined in this Framework, and there is so much outside of the City's control, all residents, businesses, organizations, and institutions are needed to be part of the solution. Everyone can contribute to the solutions that tackle the region's most pressing challenges and that achieve a sustainable vision for New Haven.

CO-BENEFITS OF THE FRAMEWORK

There are numerous benefits from implementing this Framework, which exceed the climate and sustainability objectives of a particular measure. Actions to support renewable energy can create good green jobs and help develop an interconnected network that supports a clean energy economy. Tackling New Haven's waste production and switching to cleaner fuels can have numerous public health benefits, including improving air quality and reducing asthma hospitalizations. Creating independent electric grid networks can promote energy security and reduce infrastructure risk during extreme weather events. Financial savings accrue from reduced energy use supported by home energy retrofits.



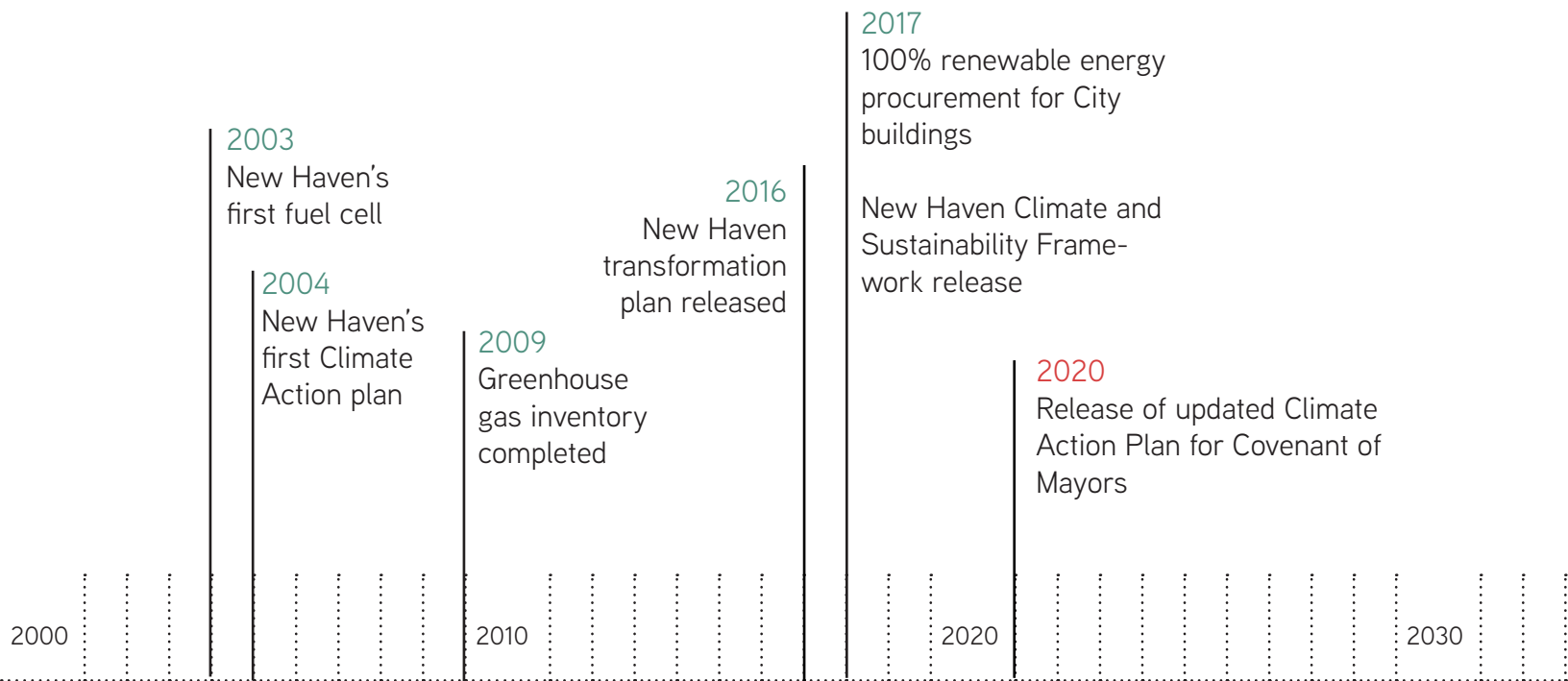
INTRODUCTION TO STRATEGIES

New Haven will use six bold strategies to address Climate and Sustainability challenges:

- Electric Power
- Buildings
- Transportation
- Materials Management
- Land Use and Green Infrastructure
- Food

Each Strategy lays out a unique vision, and a suite of goals to support that vision, and possible actions that can help achieve each goal. Actions are in different stages of completion: some actions are already underway or have secured funding, whereas others are longer term and may be unfunded; these actions are listed for future guidance. Finally, the strength of this Framework depends not only on the capacity of the City, but also the cooperation of residents, businesses, local organizations to achieve real outcomes.

At this time, the GHG emissions reductions are not quantified. The overall objective of implementation of these actions is to achieve a broader suite of emissions reductions as well as sustainability metrics.



NEW HAVEN'S SUSTAINABILITY TIMELINE

Electric Power

Burning coal, natural gas, and oil for electricity and heat is the largest source of New Haven's emissions— 33% of New Haven's GHG emissions are from electricity generation. Natural gas-fired power plants currently supply half of our electric grid, and renewable energy represents just a small percentage (see graph on opposite page).⁷ To meet deep emissions cuts in the electric power sector, the goals and actions in this strategy seek to increase the production and grid connectivity of local, renewable energy resources.

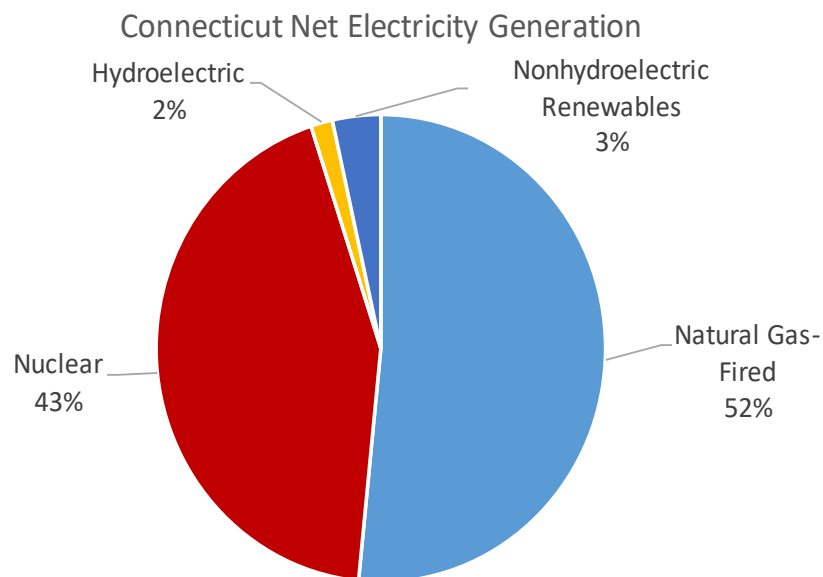
These actions can also help reduce energy costs, which are among the highest in the nation. The average Connecticut family pays approximately \$150 per month for home heating, electricity, and natural gas.⁸ The high costs are partially due to physical constraints on the amount of natural gas that can be accessed during times of demand, the utility structures in New England, and Connecticut's reliance on heating oil, which is more expensive than natural gas.⁹ A shift to renewable energy can help reduce these costs. Our high electric usage and costs presents an opportunity for New Haven residents, businesses, and public facilities to reduce energy demand, shift towards renewable energy sources, create green jobs, and save money.

Local energy generation can increase the resiliency of our electric grid and create high-quality, sustainable jobs. Climate change has exposed grid vulnerabilities; extreme weather events like Superstorm Sandy or sea level rise can shut down entire power plants and substations, heat waves can stall power transmission, and physical distance to grid infrastructure can prevent workers from safely repairing equipment. By creating microgrids or local energy districts, more of the infrastructure can be concentrated in a redundant system that is more well equipped to withstand future impacts. Localizing our electric system also helps drive green job growth in New Haven, and can support our transition to a clean energy economy.

The City had an early switch to clean energy, beginning in 2003 with a fuel cell installed at the Greater New Haven Water Pollution Control Authority. Today, one megawatt of renewable energy from eight solar arrays helps power four New Haven public schools, City Hall, and the Hall of Records. To achieve the City's goal of using 100% renewable energy for all of its operations, the City will build twelve more solar arrays for a total of 2.5 MW of solar power capacity and purchase Renewable Energy Credits (RECs). This complete shift to renewable energy will reduce New Haven's carbon footprint and save over \$100,000 per year.¹⁰

Another important aspect of an electric power shift is encouraging residents and commercial entities to adopt renewable energy; New Haven homes have installed a cumulative 735 kilowatts (kW) of rooftop solar panels through 2016.¹¹ A variety of State programs, such as Solarize CT, subsidize renewable energy installation and help consumers reduce their energy usage. However, many of these programs are underutilized. Increasing awareness among homeowners, renters, and businesses about existing State and local programs that support the transition to clean energy is a priority addressed in our actions below.

Companies in New Haven can also invest in renewable energy. As large users of electric power, companies can help clean up the electric grid. New Haven businesses are leading the way: Phoenix Press invested in a wind turbine to power its facility in Fair Haven, saving \$35,000 in annual utility costs.¹² IKEA installed one of largest solar arrays in the State in 2012, and in March 2017 added a fuel cell system.¹³ Now, solar panels provide half of IKEA's energy, and the company plans to receive 100% of its energy from renewable sources by 2020. From local operations to multinational companies, every New Haven business has the potential to source renewable energy.



Goal 1: Advance outreach and education objectives

- Increase publicity and outreach to the community about renewable energy installations on municipal buildings
- Provide simple, straightforward ways for residents, businesses, and community organizations to participate in renewable energy projects and programs (e.g. solarize campaigns, purchasing entity)

Goal 2: Make energy system more resilient

- Evaluate use of microgrids and Energy Improvement Districts for resiliency planning

Goal 3: Increase resources

- Hire an energy expert for the City

Goal 4: Increase renewable energy production

- Strengthen a City Purchasing Policy to source electricity for municipal operations from renewable sources
- Deploy more solar energy production on residential properties
- Develop incentive program for commercial and municipal buildings to utilize and install renewable energy
- Enact policies to allow collective investment into local, off-site, communal generation facilities (community solar)
- Advocate to the State to allow any third-party, including utilities, to build distributed energy resources that are renewable and prioritize low income communities
- Advocate for new residential and non-residential construction to install conduit for future photovoltaics and electric vehicle charging stations and to install plumbing for future solar water heating.
- Advocate to the State to explore a state-wide carbon fee and dividend to encourage using fossil fuels more efficiently or replacing them with low emissions energy sources
- Advocate to the State to authorize Community Choice Aggregation (CCA) to create a purchasing entity (by municipality or others) that sources primarily renewable energy
- Explore creating a municipal utility district (MUD) or public utility district (PUD) for electricity

State Electricity Solutions

The Connecticut Green Bank, Clean Energy Finance and Investment Authority, Connecticut Energy Efficiency Fund, and local utilities administer innovative solutions to improve energy efficiency and encourage the switch to rooftop solar photovoltaics (PV) - including Energize CT, Solarize CT, and Commercial Property Assessed Clean Energy (C-PACE) programs.

Through Energize CT's home energy consultations, residents can receive professional support for energy efficiency upgrades and financial assistance to cover those improvements. Solarize CT provides residents with discounts off of the cost of a solar photovoltaic system. C-PACE is an option for commercial, industrial, and multi-family property owners that secures financing to a lien on the property.

As a result of these successful energy programs, New Haven now has 735 kilowatts (kW) of installed solar PV on residential properties. C-PACE has been used to leverage more than \$100 million in clean energy financing, and is one of the most successful programs of its kind in the country.





Buildings

New Haven's building stock varies from historic homes and churches built over 300 years ago to state-of-the-art hospitals and modern skyscrapers hosting businesses that drive the City's economy. Over the lifecycle of these buildings, energy, materials, and water are consumed. Buildings account for 28% of New Haven's greenhouse gas emissions. As New Haven's population continues to increase, reductions in energy and water use will ensure that we can grow sustainably. The goals and actions within this strategy focus on the use of green construction methods, improved energy efficiency, and reductions in water consumption.

Integrating sustainability principles into the design of buildings involves accounting for the full impact of the building on its occupants and surroundings. Choosing renewable materials, installing energy and water efficient fixtures and implementing renewable energy systems at the outset of new construction and major retrofit projects reduces the overall impact over time. Moreover, small changes in the way buildings are constructed and maintained can have lasting economic and environmental effects. The internalization of environmental impacts through the permitting process can incentivize low-emission construction methods and the reuse of building materials after deconstruction.

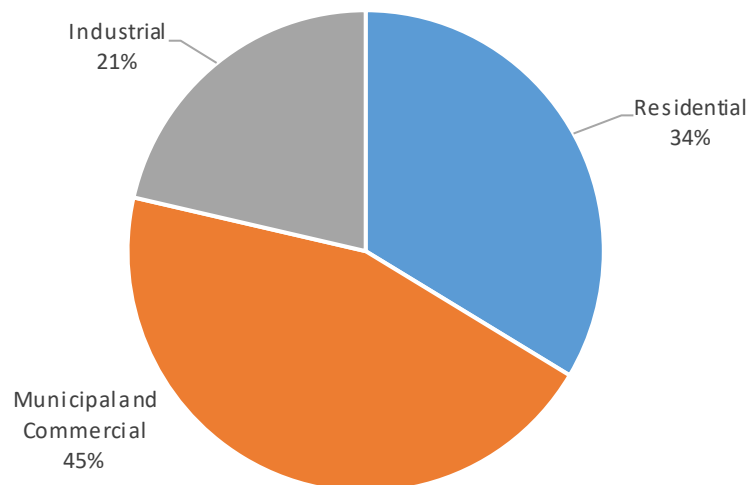
Yet many New Haven's buildings are already erected and lacking the latest energy efficiency and water conservation technologies. Homes and buildings with poor insulation and drafty windows can be improved to meet current standards, and yield financial savings that often exceed the costs associated with the efficiency upgrades. The Home Energy Solutions program run by Energize CT provides low-income residents with a free consultation to seal leaks and drafts; evaluate efficiency of appliances, heating and cooling systems; and provide energy-efficient lighting and water conservation devices. To encourage efficiency upgrades for the 70% of New Haven residents who rent their homes, the Framework proposes using energy scorecards to disclose baseline rental property energy use. These scorecards can help potential tenants select low-energy use rental properties and encourage property owners to invest in efficiency upgrades. Additionally, expanding the reach of the Commercial Property Assessed Clean Energy (C-PACE) program offered by the Connecticut Green Bank can finance efficiency upgrades in multi-family homes.

Energy and water efficiency upgrades result in minimal inconveniences, reduce greenhouse gas emissions and water consumption, and save money for New Haven residents, businesses, and the municipality.

Goal 1: Reduce the energy and water consumption through infrastructure retrofits in New Haven's buildings

- Draft and implement a new ordinance or a series of new ordinances to incorporate green building practices into new construction and major retrofit projects
- Adopt a policy that requires installation of EPA-certified WaterSense products when replacing water fixtures in municipal buildings
- Implement energy efficiency improvements and upgrades within municipal facilities
- Expand reach of CT Green Bank's energy efficiency financing options into underserved populations
- Advocate to the State to restructure Energize CT's home audit and energy efficiency program to remove barriers to resources in rental housing units, particularly in underserved populations

2015 Building Emissions (excluding electricity)
Total: 395,000 metric tons CO₂e



Goal 2: Reduce building energy and water consumption through behavior change

- Create an Energy Benchmarking and Reporting Program for municipal and commercial buildings
- Adopt an energy scorecard for property owners of rental properties to be provided to new renters by reputable third-party organizations
- Work with UI to install smart meters in new buildings or major redevelopments to record electric energy consumption in intervals of an hour or less and communicate information back to the utility for monitoring and billing.
- Work with Regional Water Authority to support monthly water billing to all residential and commercial users at equal cost to quarterly billing.

Goal 3: Improve outreach and education

- Boost the City's Energy Efficiency Rehabilitation Program (EERAP) to increase participation
- Promote Energize CT's home audits and energy efficiency improvements, particularly in low-resource neighborhoods
- Conduct educational campaigns for building owners and occupants about incentive programs and actions that can be taken to improve water and energy efficiency
- Inform building permit applicants of information regarding possible tax credits or financing assistance for energy efficiency improvements

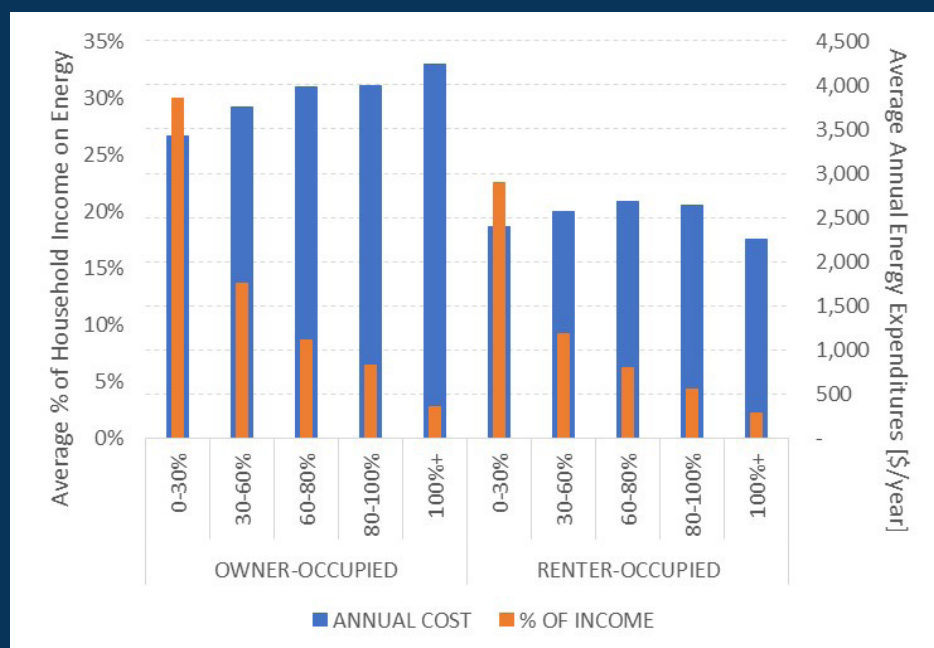
Goal 4: Increase Resources

- Create a revolving fund within the City budget for municipal energy efficiency projects

Addressing Energy Burden

The U.S. Department of Energy's Cities Leading through Energy Analysis and Planning (Cities-LEAP) and State and Local Energy Data (SLED) programs partnered with New Haven to demonstrate how their data can inform more strategic energy decisions.

The analysis shows that 71% of occupied housing units in New Haven are renter-occupied and that 73% of these renter-occupied units are low-income households. These low-income households- both rental and owner occupied- spend upwards of 25-30% of their average annual income on energy. Prioritizing actions that address this burden for low income households is an important part of the Framework. Energy efficiency upgrades, disclosing anticipated utility bills to potential renters/buyers, and improving code compliance are suggested to help achieve this objective. For more on this study, go to <https://energy.gov/eere/analysis/downloads/city-energy-data-decisions>





The Palladium Building, Orange Street
photo credit: Elsa Rose Farnam

Transportation

With clusters of highways, railroads and public transit systems, New Haven has long been a regional transportation hub. Since its inception, New Haven's port has been a prime economic generator connecting the City to regional and international markets. The growth of manufacturing during the 19th century and the establishment of railroad connections to the port led to further growth of the city's economy and population.

Before the Interstate Highway System was built, New Haven's transportation system was characterized by local streets and dense development built for pedestrians and streetcars, with docks and railroad lines that served as regional and international connections. The Interstate Highway System changed the City's local environment, street plan, and connections to regional systems. I-95 cut the city off from its waterfront, and I-91 and the Oak Street Connector divided eastern and western neighborhoods from the city center. While New Haven receives some benefits from the Interstate Highway System, it also suffers from significant impacts, including more isolated neighborhoods, a less effective public transit system, and increased air pollution.

Despite the multi-model options for transit available in New Haven, many people still rely heavily on personal vehicles for commuting and day-to-day travel needs. Transportation-related emissions accounted for 28% of New Haven's emissions in 2015. In the same year, 57.5% of New Haven's commuters drove alone to work, 9.5% car-pooled, 13.3% used public transportation, 12.6% walked, 2.9% biked, 3.2% worked at home, and 0.8% used other means including taxis and motorcycles.¹⁴ Between 2001 and 2011, traffic congestion in southwestern Connecticut increased 19%.¹⁵ Stop and go traffic not only emits more GHG emissions per vehicle than steadily moving traffic, but congestion also incurs costs from delays - in 2011, congestion along the I-95 in the Bridgeport, Stamford, and New Haven Metro Area resulted in 41 million hours wasted in delays and \$860 million in costs related to the delays.¹⁶

Almost 30% of New Haven households are car-free but this distribution is uneven across neighborhoods. In some low-income neighborhoods, the rate increases to over 60%, compared to 19% in affluent neighborhoods. According to a 2015 Harvard study, commuting time is the most significant barrier to escaping poverty.¹⁷ Only 27% of jobs are accessible by public transit within 90 minutes in Greater New Haven.¹⁸ Reducing barriers to reliable transportation options will especially benefit New Haven's low-income communities, which rely heavily on unreliable public transportation to reach jobs and school.

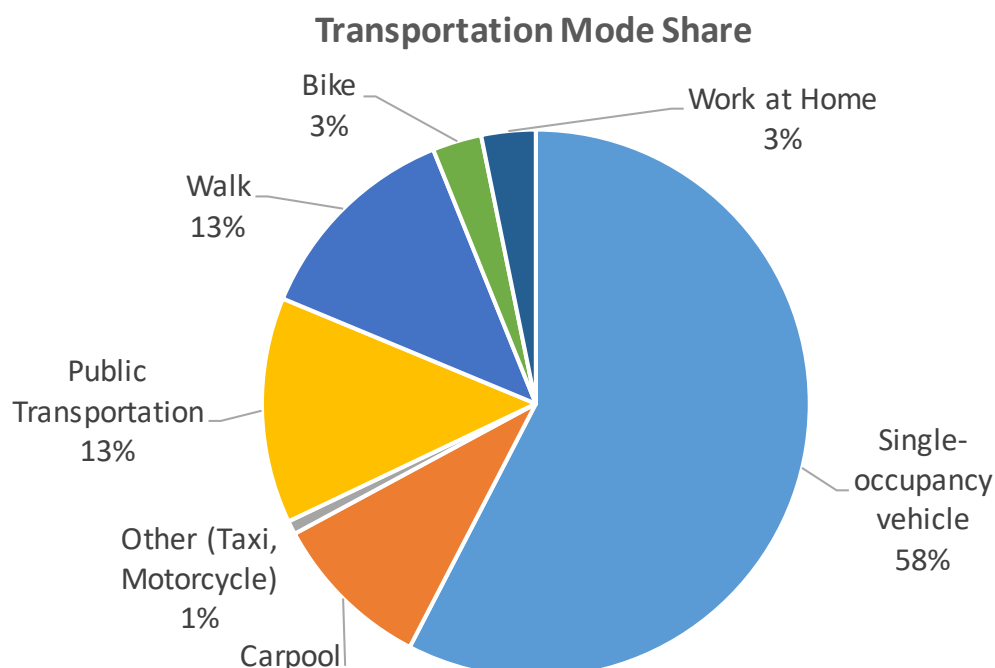
The City of New Haven recognizes the need to invest in reliable, safe, affordable, and sustainable transportation to reduce strain on infrastructure, cut GHG emissions, and improve local quality of life. The goals and actions under the Transportation strategy take the form of improving road performance by reducing congestion, upgrading our mass transit systems, and expanding and improving biking and walking infrastructure. A city that is walkable, bike-able, and public transit friendly decreases air and sound pollution, creates safe streets, expands the mobility of the City’s most vulnerable residents, improves the health of the citizens, and increases the foot traffic at local businesses. By shifting to a low-carbon transportation system – one that focuses on public transportation, biking and walking, and less polluting vehicles – New Haven can create a sustainable transportation future.

Goal 1: Expand safe, connected active transportation network across all neighborhoods

- Improve and expand sidewalk and crosswalk infrastructure, including incorporating green infrastructure elements, where appropriate
- Construct safe, connected cycling infrastructure across all neighborhoods
- Create a Bicycle/Pedestrian Master Plan for the City
- Implement city-wide active transportation way-finding program
- Create a quarter mile safe corridors for children around all schools under Safe Routes to School program

Goal 2: Increase use of mass transit

- Implement city-wide bike share
- Obtain or designate funding source to implement Move New Haven, the CT Transit bus rerouting feasibility study that will enhance accessibility to jobs, educational facilities, and to destinations outside the downtown core.
- Improve bus stop facilities
- Work with CT Transit to improve real-time route information visualization



Goal 3: Support Transit Oriented Development

- Account of the true cost of parking
- Continue to work with car sharing companies to expand accessibility and locations

Goal 4: Improve vehicle efficiency

- Draft and implement an ordinance requiring new and leased municipal vehicles to meet minimum efficiency standards of 30 mpg
- Update the existing Hybrid Parking Permit Ordinance to include EVs only and/or high vehicle efficiency standards
- Draft and implement an ordinance requiring EV stations in every new parking facility
- Explore phasing out diesel school buses and municipal heavy duty trucks and shifting towards electric and/or cleaner fuels

Goal 5: Improve outreach and education

- Increase awareness of multimodal options
- Work with employers to enable and incentivize employees to decrease the number of vehicle miles driven
- Create a program to facilitate car sharing between municipal departments
- Continue the work to provide efficiencies by consolidating private shuttle systems
- Explore implementation of an equitable Vision Zero Policy
- Implement regular, large scale Open Streets events that cross multiple neighborhoods
- Implement safe biking and pedestrian education in schools and increase the number of students participating in Safe Routes to School program

New Haven Bikeshare

In 2018, New Haven will be one step closer to ensuring that all residents are able to bike around the City. The bike sharing program will install 300 bikes around New Haven at 30 stations, and is designed to meet the needs of New Haven residents. Listening meetings solicited public comment and an open data portal enabled residents to suggest bike station locations; this open and transparent process has been successful at targeting communities that have lacked clean transportation in the past.

New Haven's bike share initiative is another example of how this bicycle-friendly city is taking steps to reduce traffic and air pollution, and promote more active lifestyles. It also demonstrates the innovative and creative financing approach at City Hall; the bike share program is a public-private partnership that will depend on membership and ad sponsorships, rather than on city funds. By looking outside the box for project funding, New Haven is setting a precedent that it could address other actions outlined in this plan.



photo credit: Markeshia Ricks, NH Independent



New Haven Transportation System: highways, the Harbor, and railways
photo credit: Malachai York

Materials Management

Materials management refers to the lifecycle of goods, from production to purchase to end of use. Many problems haunt sustainable materials management: overconsumption of goods, inefficient use of resources during production, and insufficient recycling or reuse of materials once their primary use is exhausted. New Haven produces over 500,000 tons of waste annually, the disposal of which produces over 150,000 tons of CO₂ equivalent in GHG emissions annually and threatens environmental and public health.^{19, 20}

With only one landfill in the state, Connecticut's incineration rate is the highest in the country. Approximately 86% of Connecticut solid waste is disposed in-state, almost all of which is processed at incineration facilities that produce electricity as a byproduct (national average is less than 10%).²¹

New Haven's waste problem is exacerbated by inadequate recycling rates. In 2014, New Haven recycled 29% of its waste, an increase of 16% over 3 years.²² Connecticut's average rate was 35% during the same year with a target to increase to 60% diversion by 2024.¹⁹ Most New Haven households have recycling bins, but unfortunately, the recycling stream is often contaminated. Even though the State has single-stream recycling, removing contaminated recyclables costs the State over \$20 per ton.¹⁹

To address these problems in New Haven, the City is embracing a 'zero waste' approach to materials management. Zero waste is a systems approach to materials management that seeks to reduce the waste and inefficiencies generated throughout the lifecycle of a product. Instead of viewing by-products of production and consumption as waste, these materials are viewed as valuable resources to be conserved. Zero waste approach aims to eliminate waste rather than manage it, recognizes the importance of producer responsibility, and provides opportunities for the reuse and recycling of discarded products.

The goals and actions under this strategy focus on reducing material consumption, increasing reuse, recycling, and composting opportunities, increasing outreach and awareness of proper disposal practices, and improving and enforcing compliance. Implementing sustainable waste management practices produces numerous benefits. Increasing the recycling rate both reduces pollution and frees up funds for other budget priorities. As recycling is less expensive than disposal, Connecticut would

save an estimated \$2.5 million annually if it reached its target recycling rate of 60%. Eliminating waste would decrease the amount of materials incinerated and therefore reduce associated air pollution impacts. Creative reuse of materials could provide new economic opportunities for used or discarded materials. Sustainable materials management will ultimately result in a cleaner, more resourceful New Haven.

Goal 1: Reduce production of waste

- Phase in a tax or ban on certain single use items (e.g. plastic bags, plastic utensils, straws, single-serve plastic water bottles)
- Create a policy whereby all city-permitted events must follow Zero Waste guidelines
- Encourage organizations to pursue Zero Waste Facility Certification - a third-party certification program that meets Zero Waste International Alliance standards.
- Implement a Pay-As-You-Throw program where households pay a variable rate for trash removal depending on the amount of waste produced
- Create and implement a sustainable purchasing guide for City operations

Goal 2: Increase opportunities to reuse products

- Recover waste after catastrophic disasters (such as felled trees and building debris) that could be reused or recycled
- Evaluate options for promoting deconstruction, as opposed to demolition, and the reuse of materials from buildings

Goal 3: Increase recycling opportunities

- Improve recyclables' capture rate in public buildings, parks, schools and other public locations

Goal 4: Increase composting opportunities

- Expand community-level composting
- Create a city-wide composting program
- Explore creating a regional partnership around waste disposal, particularly focused on composting

Wait, before you throw that away....

Did you know that producers are required to take back paint, electronics, and mattresses to be reused and/or recycled in CT? Mattresses, electronics, and tires can be dropped off at the New Haven Waste Transfer Station for FREE! For a list of items that can be disposed of at the New Haven Transfer station, go to http://www.cityofnewhaven.com/gov/depts/pw/trash/transfer_station.htm

And to find out where to dispose of your oil-based and latex paint, go to <https://www.paintcare.org/drop-off-locations/>

Goal 5: Dispose of waste more efficiently

- Designate commercial and multi-family residential waste zones where companies bid for contracts to handle all of the commercial trash within defined areas
- Install 'smart' trash compactors with recycling bins in public spaces. Smart trash compactors communicate real-time capacity to cloud-based software, which can limit pickups to when compactors are full.
- Expand number of hazardous waste and electronic collection events hosted by the City

Goal 6: Improve and enforce compliance

- Enforce the "Styrofoam Ordinance" Sec. 30³/₄-17, "No vendor, commercial or retail user located and doing business within the city shall sell, give or provide eating utensils or food containers to any consumers within the city if such utensils or containers are composed of polystyrene" (Styrofoam).
- Enforce recycling for municipal, residential, and commercial properties

Goal 7: Increase outreach and awareness of material management

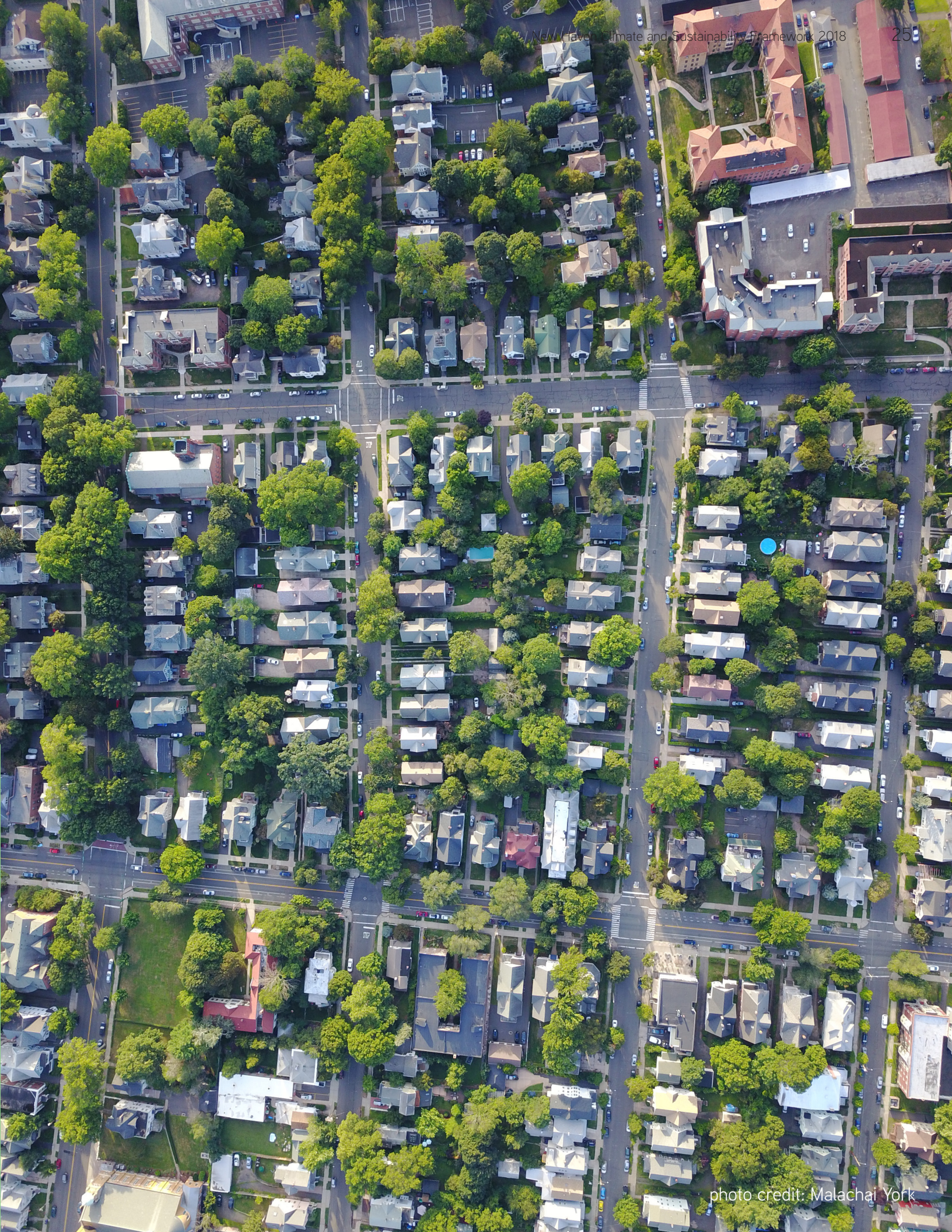
- Create public awareness campaigns regarding littering, illegal dumping, bringing your own bag, waste reduction, proper recycling, textile recycling, hazardous waste recycling, e-waste, composting
- Expand participation in Extended Producer Responsibility (EPR) program where the producer is given significant responsibility for the treatment and/or disposal of post-consumer products
- Promote See-Click-Fix, a web-based platform, as the tool to use to report and track material management related issues

Peels & Wheels: Local Compost Hero

Peels & Wheels Composting, a partner of New Haven Farms, is a local waste pickup and composting service run by a man -- Domingo Medina -- and his bike. For a fee, Medina picks up household compost bins around New Haven weekly, empties them into the containers on his bike trailer, and pedals the food waste to the New Haven Farms site at the end of James Street. There, the waste is composted, and a few weeks later, used as rich fertilizer for the farm's crops. Since he began the program in September 2014, he has diverted 75,000 lbs. of food scraps and now supplies about 80% of New Haven Farms' compost needs.



photo credit: Allan Appel, NH Independent



Land Use & Green Infrastructure

New Haven enjoys the title of the “first planned city” in the United States as the City was laid out according to a grid, known as the “Nine Square Plan”.²³ With the inclusion of a 16-acre park at the center, the Plan sought to balance the need for development and growth with an inherent desire for green space. Further, New Haven adopted the moniker the ‘Elm City’ in recognition for the many elm trees planted around the City as part of the nation’s first public tree planting program. Although many of the City’s famous elm trees succumbed to disease, the City has maintained its robust tradition of green spaces, tree planting, and public parks. The Land Use and Green Infrastructure goals aim to help the City maintain its important legacy and ensure access for all to the City’s green spaces. These actions outline ways to encourage public and private institutions to promote active stewardship, invest in green infrastructure, and improve the quality of life in our City.

Today, over 130,000 residents occupy New Haven’s 21.2 square mile area. Access to natural resources is essential to public health, and provides a grounding sense of place. From East Rock to West Rock, about 17 percent of the City is parkland. Increasing the quantity of park area while improving access for all New Haven residents is an important aspect of the Framework. Maximizing the productivity of currently underutilized land, such as brownfields and vacant properties, can be part of the solution. These properties contribute to urban blight, can prompt public safety concerns, and depress the value of surrounding properties.

In addition to parkland, tree canopy across the City varies from about 6 to 60 percent depending on neighborhood.²⁴ Setting tree planting goals that address the inequality of these resources across neighborhoods will improve environmental and public health objectives. To maintain the quality of parkland and the urban forest resources, active and ongoing maintenance is required from City government and residents alike. Increasing the number of community exercise programs, hiking trails, and youth employment opportunities within New Haven can help foster a sense of stewardship for these green spaces.

Along with the City’s land-based resources, three rivers and their tributaries flow through New Haven: the Quinnipiac, Mill, and West Rivers, all of which empty into the New Haven Harbor. These waterbodies suffer impairments due to the impacts of our built environment on their quality. Stormwater runoff carries pollutants such as fertilizer, pesticides, and litter from the streets into these rivers. The City’s sewer and storm sewer system routinely exceeds its capacity; as a result, sewer overflows are commonplace and will become more frequent as climate-related sea level rise and more intense storms flood our existing sewer system. Therefore, to

ease the strain on the wastewater and stormwater sewer systems, the Framework encourages the continued installation of green infrastructure in the public right-of-way, on public property, and private property. Green infrastructure views stormwater as a resource rather than a waste product, capturing and filtering stormwater using engineered gardens and infiltration practices. By diverting stormwater from the sewer system and into the soils, the capacity of the existing infrastructure is improved while reducing pollutant loading into New Haven's waterways. Further, educational campaigns are needed to stress the connections between land-based activities and resulting water quality. Overall, the Land and Infrastructure strategy recognizes the opportunity to interweave nature and society to promote a sustainable New Haven.

Goal 1: Increase stormwater infiltration on private and public property

- Update stormwater section of the Zoning Ordinance to increase the retention volume capture and incentivize vegetation-based infiltration systems, where possible
- Incentivize green infrastructure retrofits on existing private property
- Support and expand green infrastructure on public lands and buildings

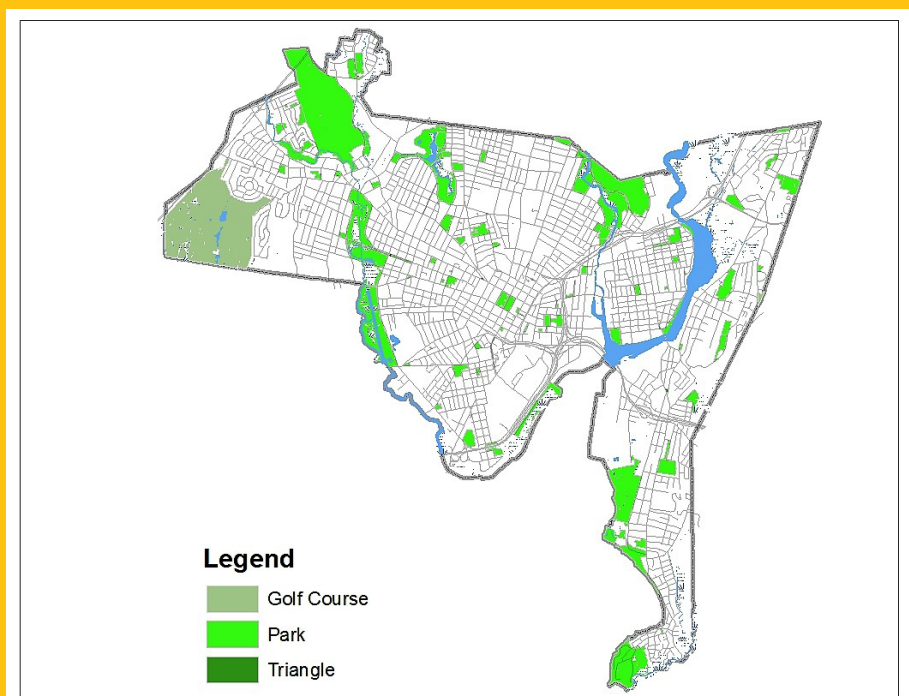
Goal 2: Decrease outdoor water use

- Encourage weather-based irrigation controllers, smart meters or other water-saving landscaping technologies
- Encourage use of native, salt and drought tolerant grasses, plants, and trees

Goal 3: Improve quality of soil and water bodies within and surrounding the City

- Enact a voluntary ban on pesticides, herbicides, and fertilizers
- Implement sewage infrastructure improvements from Greater New Haven Water Pollution Control Authority Long Term Control Plan
- Remediate and repurpose contaminated sites

17% of New Haven's 21.2 square mile area is designated as parkland



Goal 4: Increase quantity and quality of green space prioritizing projects in neighborhoods with disproportionately low access

- Develop an open space conservation plan and codify in New Haven Zoning Ordinance
- Determine the best temporary use for vacant/underutilized spaces accounting for future potential for development and habitat and social needs

Goal 5: Increase urban tree canopy

- Manage existing tree canopy.
- Create a tree ordinance to establish for standards for tree removal and replanting.
- Build upon previous tree planting goal (Tree Haven 10k) and set new goal

Goal 6: Engage public in urban environmental education/stewardship

- Update the New Haven Green Map, distribute hard copies, and create an online version that can be continually updated
- Increase opportunities for hiking, bird-watching, exercise, etc. in public spaces
- Emphasize value of urban forestry and tree programs to the city's quality of life through intensive community education and implementation programs
- Promote stewardship of open space
- Protect, restore, and promote New Haven harbor as a resource



Stormwater Bioswales

Stormwater bioswales, like the one pictured above, mitigate the impacts of stormwater by reducing the volume of runoff entering the sewer system and filtering pollutants through soil media and vegetation. Bioswales offer a cost-effective solution to managing stormwater compared to other hard infrastructure solutions, saving taxpayer money over the long term. The additional vegetation serves as a public amenity

as the plants cool the air through evapotranspiration, capture particulate matter from the air, and provide habitat for birds and pollinators.

The City of New Haven has installed 34 bioswales and there are plans to construct about 300 more over the next two years. Other types of green infrastructure can be installed on private property such as rain gardens, rain barrels, and underground infiltration systems.



East Rock Park and the Quinnipiac River estuary
photo credit: Malachai York

Food

Food provides linkages between the environment, public health, culture, social life, and the economy. New Haven's diverse food landscape- from nationally renowned restaurants and pizza to food trucks to an active food terminal in Long Wharf- combined with its diverse population serve as one of the City's defining characteristics in the region. Building upon this diversity and incorporating sustainability into its function while ensuring that all New Haven's residents have access to fresh, nutritious foods is the vision for the Food strategy in this Framework.

Equity in New Haven's food system is an issue of critical importance to the City. New Haven's Food Policy Council has been convening and working on building a just and sustainable food system since 2007. The current Food Action Plan is actively being updated. This Framework builds upon the goals of the Action Plan through the lens of sustainability and climate change mitigation and resiliency.

Far too many residents suffer from food insecurity. Almost 40,000 residents receive SNAP benefits and 59% of public school students receive free and/or reduced lunch.²⁵ Meanwhile, the industrial food system produces substantial waste—approximately 40% of all food in the United States is never eaten.²⁶ Building new and strengthening existing partnerships between food producers and those in need reduces waste while feeding more people.

Food insecurity and obesity are closely intertwined; low-income households often purchase less expensive foods, many of which are higher in calories and less nutritious. Improving physical and economic access to fresh, healthy food for all residents, regardless of income, requires a multi-pronged solution. The goals and actions in this Framework focus efforts on expanding access to fresh fruits and vegetables in underserved communities, providing children and families with nutrition education, and supporting community gardens.

The types of food consumed and the methods used to produce food impact the environment and local and regional economy.²⁷ Food purchased from local CT-based farms sustain regional jobs and support the local economy. By promoting the economic viability of Connecticut farms, farming jobs are maintained and agricultural land is protected from development. The Framework encourages local businesses to incorporate more local food into their operations.

The goals and actions suggested under this strategy build upon measures outlined in the Food Action Plan to ensure the sustainability of New Haven's food systems for

the benefit of the environment, economy, and community. Although federal and state regulations are needed to fully address food-based impacts, this strategy identifies actions the City can take to support the consumption of local foods, incentivize sustainable agriculture, reduce the environmental impact of our food system, and improve public health for all City residents.

Goal 1: Decrease food waste

- Encourage hospitality and food service sector to evaluate their food purchasing and preparation operations to prevent the production of food waste
- Streamline the food reclamation and redistribution systems
- Adopt a food waste reduction program for New Haven City Schools

Goal 2: Improve access to healthy foods for the City's underserved residents

- Increase the purchasing power of low-income residents
- Strengthen and expand partnerships between community gardens, urban farms, and residents in the City

Farmers' Markets

New Haven hosts six thriving farmers' markets, two of which are open year-round. These markets provide fresh, local, healthy produce directly from farmers to consumers. These markets increasingly serve low income communities by accepting SNAP and WIC benefits. From 2008 to 2016, the number of farmers' markets in CT accepting SNAP benefits increased from 12 to 84 markets. To further incentivize consumers to use these benefits on farmers' market produce, City Seed raises money to double the value of SNAP benefits when used for produce at farmers' markets. In CT, about \$60,000 of SNAP benefits were redeemed at farmers markets. Similarly, \$14 million of revenue went to farmers across the country from use of WIC benefits at farmers' markets. Allowing use of these public benefits at farmers' markets both provides much needed access to fresh produce for low income communities while supporting the local economy and keeping agricultural land productive across the state.



photo credit: Aliyya Swaby, NH Independent

Goal 3: Promote the consumption of local food (i.e. CT-grown) to strengthen the local and regional economy, support farmers, and increase the number of food-related occupations.

- Formalize and expand regional partnerships regarding local food sourcing and distribution
- Incentivize food retailers to carry local products
- Encourage city-wide events purchase food from locally grown sources

Goal 4: Engage the public

- Support and expand school gardening programs
- Provide nutrition and food system curriculum/programs for youth
- Sustain and expand gardening and cooking education programs/opportunities

Urban Farming

New Haven Farms (NHF), a nonprofit founded in 2012 by the Fair Haven Community Health Center, converts vacant lots into small gardens in New Haven's most underserved/ neighborhoods. NHF currently manages ten gardens, and produced about 7,000 pounds of produce in 2016, which are distributed to their program participants and Community Supported Agriculture (CSA) members.

Low-income adults with high chronic disease risk factors are referred to NHF's flagship Farm-Based Wellness Program for bilingual on-farm education. Weekly gardening lessons, nutrition seminars, and gardening lessons comprise the program's multi-pronged approach to boost food knowledge among participants and their families, who also attend the workshops. Children and young adults learn alongside their parents, and the whole family takes home CSA-style shares of fresh produce, alongside culturally appropriate recipes. At NHF, participants go from "patients to producers."

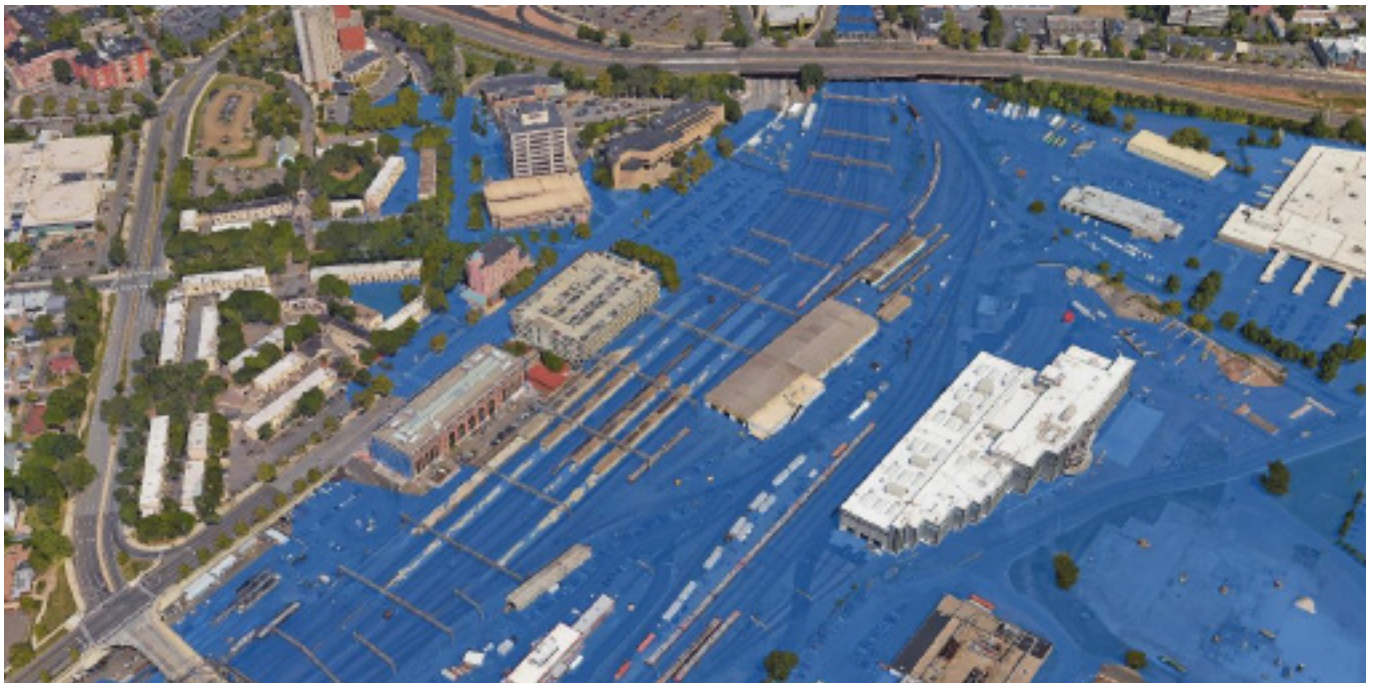




CLIMATE ADAPTATION AND RESILIENCE

The impacts of climate change are already being experienced in New Haven. An analysis of vulnerabilities within the City and potential future hazards identified coastal and inland flooding, sea level rise, heat waves, and air quality as the most pressing future risks. Therefore, integrating climate adaptation and resilience measures with this Framework's mitigation and sustainability measures is crucial for addressing the full impacts of climate change.

Importantly, climate risks are more severe in areas of high social vulnerability within the City. Social vulnerability reflects varying susceptibility of population groups in response to hazards or other disasters. There are different vulnerability factors assessed for each phase of disaster, including resistance, response, and recovery. Integrating the 'Cities in Hot Water' vulnerability assessment can help target funding and project implementation to ensure that New Haven's most vulnerable residents are adequately assisted.



Simulation of 100-year return period storm inundation in 2016 (from Long Wharf Flood Study)

New Haven has already begun to plan for and implement resiliency related projects. The City's Hazard Mitigation Plan (HMP) assesses vulnerability within the City and identifies key mitigation projects.²⁸ The HMP makes the City eligible for federal funding through FEMA and for points under the National Flood Insurance Program's Community Rating System (CRS). New Haven received a score of Class Seven under the CRS program which gives homeowners 15 percent reduction in their flood insurance premiums. Only seven communities out of 65 participating in New England have received this high rating. Some examples of projects that have recently been implemented include:

- Flooding and Deterioration of Embankment near Ferry Street Bridge (Brewery Square)
- Removal of Pond Lily Dam
- Comprehensive Flood Studies of Long Wharf and Mill River Districts
- Long Wharf Flood Protection Study
- River Street Shoreline Stabilization Analysis

IMPLEMENTATION & REPORTING

In light of President Trump's decision to pull the United States out of the Paris Climate Agreement, there has been an upwelling of support for climate initiatives at the local, state, and regional levels. The City of New Haven is one such city that has an important role to play in the climate fight. Although there are many policies that are outside of the City's jurisdiction (e.g., at the state or federal level), there many important policy levers, program development, or advocacy roles that the City can play. Expanding the capacity of other cities and regions to also address climate change, meanwhile serving as a champion for policy change, is an important role for the City to play.

Next Steps

The Climate and Sustainability Framework is a guidance document from which the City, businesses, organizations, and the community at large can use to draw inspiration on climate change and sustainability. This Framework is complemented by the recent launch of Sustainable CT, a voluntary certification program to recognize thriving and resilient CT municipalities. The Sustainable CT platform will be used to document and report on the City's sustainability initiatives.

The City is also committing to increased capacity building, which can help facilitate an integrated sustainability structure within the City government, continue regular meetings with stakeholders, support and convene a Sustainability Team on a regular basis, and provide outreach and education to ensure success.

The Framework also helps codify a number of initiatives in progress to comply with the City's membership in the Global Covenant of Mayors. Greenhouse gas inventories will be conducted every four years, as required by the Covenant, which can inform progress on this Framework. After the next inventory in 2020, the City will craft an action plan and supplement the plan's goals and actions accordingly.

Implementation and Monitoring

There are several key steps toward implementation and monitoring in order to meet the objectives of the Climate and Sustainability Framework. The following need to be identified to make best use of the Framework:

1. **Vulnerable Communities.** A clear metric that can be used to prioritize actions in New Haven's most vulnerable communities should be developed. This metric, combining pollutant exposure, income, race/ethnicity, homeownership, and climate vulnerability can help identify priority areas.
2. **Project Phasing.** Identifying actions by each time phase (early, mid, and late) can help identify which are priority actions. Phasing depends on a number of different factors, including funding sources, infrastructure upgrades, and political opportunities.
3. **Funding.** Identification of grant opportunities, state or federal funds, private investments, and leveraging network effects (e.g., combined resources of large New Haven institutions like Yale University and Southern Connecticut State University) to achieve desired project outcomes.
4. **Education and Outreach.** Most of the goals rely on a baseline level of education and outreach to meet the desired outcomes, and will be necessary to advance the City's overall vision. Creating a separate strategy to achieve these education and outreach goals, and therefore galvanizing the public, will help advance the overall objective of this Framework.
5. **Modifications.** Some level of flexibility should be accepted as necessary in meeting the objectives of the Framework. It will be important for actions to be modified over time, as changing situations and funding make certain projects more or less appealing.



36 REFERENCES

1. Yale School of Forestry & Environmental Studies. 2016. Cities in Hot Water: A Report to the City of New Haven. May 2016.
2. NASA. 2016. 2016 Climate Trends Continue to Break Records. July 19, 2016.
3. Intergovernmental Panel on Climate Change. 2014. Fifth Assessment Report. Summary for Policymakers.
4. *Ibid.*
5. Yale School of Forestry & Environmental Studies. 2016. Cities in Hot Water: A Report to the City of New Haven. May 2016.
6. C. Figueres, H.J. Schellnhuber, G. Whiteman, J. Rockström, A. Hobley, S. Rahmstorf. 2017. Three years to safeguard our climate. *Nature*. June 28 2017.
7. U.S. Energy Information Administration. 2017. Connecticut State Energy Profile. June 15, 2017.
8. U.S. Energy Information Administration. 2015. 2015 Average Monthly Bill- Residential.
9. U.S. Environmental Protection Agency. 2014. Emission Factors for Greenhouse Gas Inventories. April 4, 2014.
10. Hernandez, E. 2017. New Haven commits to using only renewable energy for city operations. *New Haven Register*. July 5, 2017.
11. Connecticut Municipal Solar Scorecards. 2017. New Haven.
12. Greenbaum, J. 2010. Phoenix Press: Little Wind Goes Long Way. Printing Impressions. August 1, 2010.
13. Bloom Energy. 2017. Connecticut Governor and IKEA 'Flip-the-Switch' On Fuel Cell System to Generate More On-site Power at New Haven Store. March 20, 2017.
14. United States Census Bureau: Means of Transportation to Work: 2011-2015 American Community Survey 5-Year Estimates
15. Connecticut Department of Transportation and the Federal Highway Administration. FAQs: Traffic Congestion On I-95. www.ct-congestion-relief.com/faqs.html#top
16. CT Dept. of Transportation
17. Raj Chetty and Nathaniel Hendren. April 2015. The Impacts of Neighborhoods on Intergenerational Mobility, www.equality-of-opportunity.org/images/nbhds_exec_summary.pdf
18. Mark Abraham. December 2015. How Transportation Problems Keep People Out of the Workforce in Greater New Haven.
19. Bisaro, A. (2016, November 26). Connecticut municipal solid waste plan calls for 60 percent reduction in next 8 years. *New Haven Register*. Retrieved November 28, 2016, from <http://www.nhregister.com/general-news/20161126/connecticut-municipal-solid-waste-plan-calls-for-60-percent-reduction-in-next-8-years>
20. New Haven 2015 Greenhouse Gas Inventory
21. DEEP 2016 Comprehensive Materials Management Strategy http://www.ct.gov/deep/lib/deep/waste_management_and_disposal/Solid_Waste_Management_Plan/CMMS-Final_Adopted_Comprehensive_Materials_Management_Strategy.pdf
22. Connecticut DEEP: Estimates of Connecticut Municipal Solid Waste (MSW) Generated, Disposed, and Recycled FY2014. www.ct.gov/deep/Lib/deep/reduce_reuse_recycle/Data/Average_state_msw_statistics_FY2014.pdf
23. Connecticut DEEP: Estimates of Connecticut Municipal Solid Waste (MSW) Generated, Disposed, and Recycled FY2014. www.ct.gov/deep/Lib/deep/reduce_reuse_recycle/Data/Average_state_msw_statistics_FY2014.pdf
24. Urban Resources Initiative http://uri.yale.edu/sites/default/files/files/Map_Existing.UTC.pdf
25. Connecticut History <https://connecticuthistory.org/township3ge/new-haven/>
26. Natural Resources Defense Council. 2012. Wasted: How America Is Losing Up to 40 Percent of Its Food from Farm to Fork to Landfill. NRDC Issue Paper 12-06-B. <https://www.nrdc.org/sites/default/files/wasted-food-IP.pdf>
27. Weber, C. and H.S. Matthews. 2008. Food-Miles and the Relative Climate Impacts of Food Choices in the United States. *Environmental Science & Technology* 42(10):3508-3513. doi:10.1021/es702969f.
28. City of New Haven. 2016. Natural Hazard Mitigation Plan Update. April 2017.

CREDITS & ACKNOWLEDGMENTS

WORKING GROUPS

CITY STAFF

Giovanni Zinn, City Engineer; Karen Gilvarg, City Plan Director; Doug Hausladen, Director of Transportation, Traffic, and Parking; Joy Johannes, Food System Policy Director; Dawn Henning, Project Manager- Engineering; Ted Stevens, Staff Planner- City Plan; Krysia Solheim, Sustainability Consultant;

PARTICIPANTS

Henry Auer, New Haven Energy Task Force (NHETF); Sherill Baldwin, EcoWorks; Kendall Barbary, CT Fund for the Environment (CFE); Lynne Bonnett, New Haven Bioregional Group; Billy Bromage, NH Food Policy Council; Laura Cahn, Environmental Advisory Council (EAC); Kimball Cartwright, NH Ecology Project; Ceyda Durmaz Dogan, New Haven Leon Sister Cities Project (NHLSCP); Henry Dynia, Neighborhood Housing Services of New Haven (NHS); Elias Estabrook, NHS; Max Farbman, NH Land Trust; Kathy Fay, NHS; Sarah Ganong, CFE; Aaron Goode, Community Management Team (CMT) leader; Rachelle Graham, NH Land Trust; Annie Harper, NHETF; James Jenkins, New Haven Farms; Iris Kaminski, concerned citizen; Shannon Laun, CFE; Melissa Kops, Connecticut Green Building Council; Kevin McCarthy, CMT leader; Joe Megale, Greater New Haven Water Pollution Control Authority (GNHWPCA); Brianne Mullen, Yale Office of Sustainability; Colleen Murphy-Dunning, Urban Resources Initiative; Huan M. Ngo, BrainMicro, LLC; Frank Panzarella, NHETF; Paula Panzarella, NHETF; Jeremy Schulick, NH Climate Movement (NHCM); Chris Schweitzer, NHLSCP; Jennifer Stock, NHCM; Lindsay Toland Crum, Yale Office of Sustainability; Tabitha Sookdeo, NHLSCP; Michael Uhl, Hitachi and System Smart; Nikki Westfall, NHS

INTERNS

Elsa Rose Farnam, Choate High School; Emily Fish, CFE; Yupei Guo, Yale University; Mary Ignatiadis, CFE; Anna Lipin, Yale University; Dana Monz, CFE; Emma Ryan, Yale University; Pamela Torola, Yale University; Emily Wier, Yale School of Forestry and Environmental Studies; Jingru Zhou, Yale University;

GREENHOUSE GAS INVENTORY

Pamela Torola, Dawn Henning, Emily Wier

REPORT WRITING

Emily Wier, Krysia Solheim, Anna Lipin, Elsa Rose Farnam, Dawn Henning


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PHOTO CREDITS

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APPENDIX A: GLOSSARY

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APPENDIX B: GHG INVENTORY

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APPENDIX A: GLOSSARY

Bioswales: Bioswales are marshy landscape features along roads or parking lots designed to concentrate or remove silt and pollution from surface runoff water. The water's flow path is designed to maximize the amount of time spent in the swale, which increases the trapping of pollutants and silt.

Brownfield: A former industrial or commercial site contaminated by pollutants that preclude further economic use of the site. Environmental remediation is most often needed to remove toxic pollutants.

Carbon dioxide: This greenhouse gas is produced from the combustion of fossil fuels, and is one of the most significant contributors to climate change.

Climate adaptation: The process of reducing the vulnerability of social and biological systems to the impacts of climate change.

Climate mitigation: The process of reducing greenhouse gas emissions, which cause climate change.

Co-benefit: Additional benefits that occur which exceed the emissions reductions that can result from a climate mitigation action.

Commercial Property Assessed Clean Energy: C-PACE is a program run by the Connecticut Green Bank that helps commercial, industrial, and multi-family property owners finance smart energy upgrades to their buildings through a lien that stays with the property and is paid as part of the property tax bill.

Compost: Compost is organic material that has been decomposed and recycled as a fertilizer and soil amendment. Compost is used in farming, gardening, landscaping, or sent to an anaerobic digester.

CT Green Bank: The Connecticut Green Bank is an entity that accelerates the deployment of clean energy in the State using limited public dollars to attract private capital investment in clean energy projects. The funds are used to incentive clean energy projects among residential, municipal, small business, and larger commercial users.

Energy efficiency: Strategies to reduce the amount of energy required to produce the same level of energy services.

Federal vehicle emissions standards: Regulations issued by the U.S. Environmental Protection Agency and Department of Transportation to improve the fuel efficiency of vehicles.

Food Insecurity: Food insecurity broadly refers to a lack of consistent access to sufficient amounts of nutritious and affordable food.

Fuel cell: A fuel cell converts hydrogen or another fuel into electricity, and can provide power for a number of different capacity needs.

Global Covenant of Mayors: New Haven is a member of the Global Covenant of Mayors, a global network of elected officials pledging to reduce emissions and track progress to meeting climate change targets.

Global Warming Solutions Act 2008: Connecticut's Public Act 08-98 established greenhouse gas emission reduction targets of 10% below 1990 levels by 2020, and 80% below 2001 levels by 2050.

Greenhouse gas emissions: Gases which trap heat within Earth's atmosphere, including carbon dioxide, methane, water vapor, nitrous oxide, and fluorinated gases. Produced in excess, these gases cause climate change.

Greenhouse gas inventory: An accounting of the sources and emissions produced within a given jurisdiction.

New Urban Agenda: The 2016 United Nations agreement that outlines ways to achieve sustainable urbanization, and was adopted at the Habitat III Conference.

Paris Climate Agreement: The 2015 United Nations agreement in which all signatories committed to reducing greenhouse gas emissions, in line with their nationally determined contributions.

Renewable Energy Credits (REC): These credits represent the environmental attributes of power generation and are sold separately from the commodity electricity. RECs are traded, bought, and sold on the electric grid, and often used to comply with regulations.

Renewable Portfolio Standard: A regulation that requires electricity supply companies to obtain specific portions of their electricity production from renewable energy sources.

Single-use items: Items such as plastic bags and straws which are typically used once, and then disposed.

Solar array: A network of solar photovoltaic panels.

Solarize CT: Solarize CT is another CT Green Bank-supported program that is administered by Smart Power to make switching to solar power easy and affordable. It provides residents with discounts off of the cost of a solar photovoltaic system (in addition to state and federal incentives).

Sustainable Development Agenda for 2030: A set of 17 "Global Goals" with 169 targets to meet sustainability objectives, which were adopted by United Nations member states and build upon progress from the United Nations Millennium Development Goals.