

8. Sustainability, Water, and Energy Use

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Introduction

The idea of sustainability can come across as just another buzz word, but the concept is quite old, simple, and very much aligned with the longstanding values of Hingham. Sustainability means *meeting our own needs today without compromising the ability of future generations to do the same*. In that sense, sustainability is not just environmentalism. In addition to caring for natural resources, lasting prosperity requires planning for the social well-being, cultural richness, economic health, and general welfare of Hingham residents many decades from now.

This chapter focuses on three interrelated aspects of sustainability that are of particular importance to Hingham: Water, Climate Change/Sea Level Rise, and Energy Use. As a coastal community, it is vital that Hingham protects its coastal resources as well as its estuaries, rivers, lakes, ponds, and aquifers. These resources play an enormous role in shaping the identity of Hingham and the way people experience the community every day. Protecting these resources represents an investment in natural habitat, drinking water quality, economic development (e.g. boating, fishing, and tourism), transportation (e.g., ferry service), and scenic beauty. However, these same resources can become threats as they flood, erode, or inundate Hingham's built environment. Natural hazards in the form of sea level rise, coastal erosion, and inland flooding are increasing in frequency and severity due to larger forces at work with climate change, the result of decades of increased carbon storage in the planet's atmosphere. To move toward a more sustainable future, Hingham will need to adapt locally to changes that have already occurred. Its Hazard Mitigation Plan (2014 with 2016 revision) and related Climate Change Vulnerability, Risk Assessment and Adaptation Study (2015) serve as the foundation for local government efforts to institutionalize the Town's responses to natural hazards.

While planning for adaptation and mitigation at the local level is critical to the sustainability of Hingham, the Town must also assume responsibility for activities that can potentially make conditions worse on a global scale for generations to come. The carbon footprint of any community is largely determined by its

energy use. The combined energy use in buildings and vehicles generally makes up the largest share of emissions in a municipality. Hingham is fortunate to have local support and resources for improving the energy efficiency of local buildings and vehicles and expanding opportunities for the use of renewable energy. Its status as a Green Community in Massachusetts is the result of a planning process that identified a series of actions that will make Hingham more proactive in its pursuit of a sustainable future.

Public discussions for this Master Plan process revealed clearly that sustainability, as a value, is shared by many individuals and local organizations who demonstrate this value in their policies, everyday activities, and behaviors. The Town of Hingham is dedicated to furthering these values of sustainability, leading by example and approaching all issues from a sustainability perspective. Throughout this assessment, this commitment is reflected in the “Spotlight on Sustainability” call-out boxes in each of the preceding sections.

Existing Conditions and Trends

CLIMATE CHANGE & SEA LEVEL RISE

Municipal Vulnerability Preparedness

In 2018 the Town received a Municipal Vulnerability Preparedness (MVP) Planning Grant from the Massachusetts Office of Energy and Environmental Affairs (EEA) to:

- Define top local natural and climate-related hazards of concern.
- Identify existing and future strengths and vulnerabilities.
- Develop prioritized actions for the community.
- Identify immediate opportunities to collaboratively advance planning actions to increase resilience.

The Town completed the MVP process in early 2019 and has since become an MVP-certified community. The top climate-related hazards identified through this process were:

- Coastal flooding
- Inland flooding
- Severe storms
- Heat/Drought

As an MVP-certified community, the Town is now eligible to apply to EEA through implementation grants to advance the actions identified out of the MVP process to address Hingham’s top climate-related hazards.

Climate Change Vulnerability, Risk Assessment, and Adaptation Study

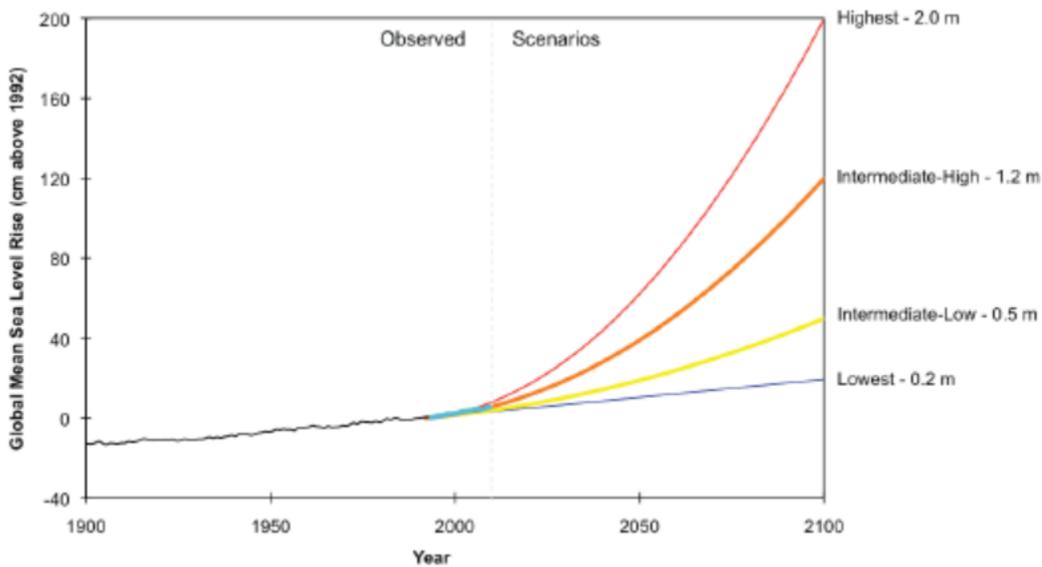
In 2014 the Town received a Coastal Community Resilience Grant from the Massachusetts Coastal Zone Management Agency (CZM) under CZM’s Pilot Grants Program to:

- Identify areas of the town that are vulnerable to the combined effects of sea level rise and storm surge from extreme storm events.
- Assess the vulnerability of municipally owned public infrastructure and natural resources.
- Identify adaptation strategies that will help mitigate the long-term effects of sea level rise and storm surge.
- Educate the public, town officials, and state legislators about those potential impacts.

Inundation Modeling. The sea level rise and storm surge modeling developed for this study (based on mathematical representations of the processes) was utilized to assess the vulnerability and risk of coastal flooding to Hingham’s infrastructure and natural resources. The model incorporates climate change influences on sea level rise, tides, waves, storm track, and storm intensity for present (2013), 2030- and 2070-time horizons.

The sea level rise scenarios used are the same as recommended by Massachusetts CZM and those used by the Massachusetts Department of Transportation and other state agencies (Global Sea Level Rise Scenarios for the United States National Climate Assessment, NOAA Technical Report OAR CPO-1, December 12, 2012), see Figure 8.1. The water surface modeling utilized is part of the existing Boston Harbor Flood Risk Model (BH-FRM), previously developed and includes the Town of Hingham.

Figure 8.1 – Global Mean Sea Level Rise Scenarios



Source: *Climate Change Vulnerability, Risk Assessment, and Adaptation Study*, Kleinfelder, June 29, 2015, p. 7.

Natural Resources Modeling. Based on a qualitative basis, impacts to natural resources including beaches, coves, and salt marshes were assessed. As part of another, larger project with CZM, the software Sea Level Rise Affecting Marshes Model (SLAMM) was linked to the Marsh Equilibrium Model (MEM) and incorporated into this study. In addition, 2011 USGS LiDAR for the Northeast, the 2011 National Wetlands Inventory data layer, sea level rise projections (consistent with those used in the BH-FRM modeling earlier) and additional data input (accretion rates, erosion rates, tidal range and attenuation, freshwater parameters, dikes and dams, and impervious surfaces) were also utilized.

Findings from the modeling show the various wetland classification areas for 2011, 2030, and 2070 where natural resources are evolving (reductions and growth) in response to sea level rise.

Infrastructure Vulnerability Assessment. A risk-based vulnerability assessment for municipally owned infrastructure (including limited state-owned roadways) subject to flooding was also performed in order to show how damaging a flood event can be and what the consequences are to the community, and included:

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- Determining the critical assets subject to flooding
- Determining critical elevations
- Obtaining probability of exceedance data
- Determining consequence of failure scores
- Calculating risk scores and rankings

Adaptation Strategies. As a result of the modeling developed, various adaptation strategies were identified. Generally, there are three approaches for adapting to the effects of sea level rise and storm surge from extreme weather events:

- Protection
- Accommodation
- Retreat

This study reported on a combination of protection and accommodation strategies since retreat strategies would likely not be feasible given the extent of expected inundation by 2070 (although retreat strategies may become more viable by 2100 if sea levels continue to increase as predicted). Recommended adaptation options are based on a base flood elevation equivalent to the 0.2% probability of exceedance in 2030 and 2070, the approximate 500-year recurrence interval.

WATER

Natural Water Resources

For more information on water resources such as coves, rivers, lakes, and ponds, please see the Natural & Cultural Resources section.

Water Supply

In April 2019, Hingham voters agreed to buy the Town's water system from Aquarion Water Company and take ownership of water supply for the first time since 1879. The purchase includes treatment plants off Main Street, twelve wells, Accord Park Reservoir, 192 miles of pipes, more than 3,000 valves, two tanks, and two booster pumping stations.

Moving forward, the town will hire a water superintendent, operations and maintenance vendor, and capitol vendor as well as organize a citizen's advisory board, made up of three Hingham residents, one Hull resident, and one Cohasset resident. This is a major step toward creating a sustainable municipal water supply for years to come.

For more information on water supply, please see the Community Facilities & Services section.

Hingham Harbor

Hingham Harbor is arguably one of the most character defining natural features of Hingham. Its coves and islands are a major aspect of Hingham's natural beauty and the harbor itself is a major economic draw for boating, fishing, commuting, and more. Hingham Harbor is located in Hingham Bay, north of Hingham Center and east of Weymouth Back River. The harbor is currently used principally for recreational purposes and is enjoyed by boaters, bathers, beach walkers, and visitors to the waterfront. The study area extends approximately three-quarters of a mile from east to west along the southerly shoreline of Hingham Harbor and includes a mixture of Town-owned properties and privately held properties with active commercial establishments. State highway Route 3A and heavily traveled Summer

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Streets define the southern boundary of the study area. Commercial businesses remain along the harbor and provide a mix of offices, marine services, and automotive repair/gasoline sales.

The Town-owned lands include the bathing beach and picnic grove, bandstand, “Iron Horse” Park, Town Pier, Whitney Wharf Park, P.O.W./M.I.A. memorial, Barnes Wharf/Lincoln Maritime Center, and Steamboat Wharf. The Commonwealth of Massachusetts controls the land at the rotary and Route 3A. The Trustees of the Bathing Beach control the westernmost portion of the harbor study area and Grove.¹

Master Plan for Hingham Harbor. In July 2007, the Town, led by the Hingham Harbor Development Committee, completed a Master Plan for Hingham Harbor. Goals of the plan include:

- Creation of contiguous, safe, attractive, and universally accessible pedestrian access along the harbor.
- Increased mixture of public recreational opportunities.
- Visionary planning for future harbor area land uses and improvements.
- Identifying selected projects for near-term (5-15 years) implementation.

The Harbor Development Committee is seeking funding to update this plan now that it is over ten years old. Focus areas that should be considered for any plan update are sections on programs and facilities, as well as ways to better connect the Harbor area with downtown Hingham.

Hingham Harbor Development Committee. Originally formed in 1957 as the Dredging Committee, the Harbor Development Committee (HDC) was established in 1971 by Town Meeting Warrant Article as an advisory committee to the Selectmen with a mandate to “coordinate the planning and development of the tidal water areas within the Town borders.” The Town’s Trustees of Bathing Beach is considered a “sister agency.”

Major Responsibilities of the Harbor Master. The Harbor Master has jurisdiction over all the coastal waters, rivers, and ponds of Hingham including activity on the five islands in the harbor. Most of the activity is in the coastal waters during the summer months, when boats are in the water 24 hours per day, seven days per week. The off-season workload is significant but has a greater focus on management and maintenance of the boat fleet or other equipment and administrative duties (e.g., permits, budgets, etc.). The Harbor Master and staff have full police powers across the entirety of the Town and can therefore respond to and assist with any police action in the community. While boating in the Harbor is primarily recreational, a small lobster fleet still exists.

Facilities. Harbor Master facilities include:

- Public waste pump-out facility shoreside
- Off-shore pump-out with a boat
- One town public tie-up in the inner harbor
- Three private marinas
- One maritime center (town-owned and rented to the maritime center)
- One yacht club
- One storage shed used for employee service
- Town-owned vessels and vehicles, including:
 - Three vessels

¹ Description of Hingham Harbor copied directly from *Master Plan for Hingham Harbor, 2007*.

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- Two trucks
- Two trailers
- Smaller gator

Discussions with the Harbor Master for this Master Plan suggests that a smaller boat with a shallow draft would be a valuable addition to the fleet. The occasional need for shallow water access along with low clearance at the bridge at George Washington Blvd would be addressed with a smaller craft. The Harbor Master and crew also do not have access to a high-quality indoor storage/repair facility. Currently, the Harbor Master rents a small bay from the school department for storage, but this is not equipped for repairs. Without a large repair garage or shed, maintenance needs to take place outside, which can be very problematic in off-season inclement weather. Engines and more complicated repairs often have to be done at marine shops out of town. This is not ideal because a boat that is sent away is not available if there is an emergency and it is generally not cost effective due to transport expenses.

Recent and Pending Improvements. The Town has made many recent investments in the Harbor area, and has future investment in the pipeline including:

- Basin dredging (completed every 10 years)
- A pedestrian bridge was built linking the Harbor to Whitney Wharf
- Bathhouse and snack shed improvements
- Harbor wharfs and walls have been studied and recommendations made for elevating them to account for sea level rise
- Armor stone replacement at Bathing Beach
- Protective dune installation at Bathing Beach parking lot
- Harbor Walk being installed in three phases
- Replacement boat ramp has been designed and will be built soon
- New mooring technology that may allow for boat to be moored in more dense configurations

Further, the ongoing Route 3A transportation corridor improvements, led by the Route 3A Task Force, are a driving force behind much of the change along the Harbor now.

ENERGY USE

Energy impacts nearly all aspects of our daily lives. We depend on energy to travel; to heat and cool our buildings; and to power everything from streetlights, to smartphones, and medical equipment. Today, as the environmental and financial costs of energy rise, the need to produce and consume energy responsibly is clear. The thoughtful development of energy policies will provide a multitude of benefits to us all. Finding ways to rely less on fossil fuels and more on renewable energy sources can help improve air quality and related public health issues over time. The same is true when we use energy more efficiently. Clean energy is also a growing sector in the Nation's economy and presents an opportunity for local jobs.

Energy is an essential component of nearly everything the Town of Hingham does. The Town uses energy for buildings, street lighting, municipal vehicles, and equipment. Energy requires a tremendous amount of infrastructure for both supply and distribution. Traditional sources of energy and existing rates of consumption are not sustainable for the environment or for the economy. Burning fossil fuels has harmful impacts on the environment and the decreasing supply is increasing costs. Communities across the country are responding by modifying operations, with an emphasis on energy conservation

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and efficiency, renewable energy sources, and fuel-efficient vehicles, lowering the cost of municipal services while also reducing environmental impacts.

It is important to keep the local, regional, and global perspective in mind when thinking about energy issues in Hingham. Energy planning is relevant to the Town's operations but also to residents and businesses living and operating within Hingham. The master plan will consider strategies to reduce consumption as well as the sources of energy, generation, and distribution within the Town, security and reliability, and the impact on the local and regional economy.

Much like sustainability, it is important to view energy as a subset of every aspect of the master plan since energy strategies will help to ensure sustainable development practices are used, housing is energy efficient, businesses can reduce energy costs and operate efficiently, and efficient transportation options are available.

The Town has implemented several measures to reduce energy costs, diversify energy generation, and reduce greenhouse gas emissions related to municipal operations. This assessment provides an overview of municipal energy projects and programs currently being employed by the Town.

Green Communities Designation

In December 2018, Hingham was designated a Green Community by the Green Communities Division of the Massachusetts Department of Energy Resources (DOER). Once a community has been designated as a Green Community the Division provides technical assistance and financial support to improve energy efficiency and increase the use of renewable energy in public buildings, vehicles, facilities, and schools. For example, Hingham has already received over \$140,000 in grant funding to implement energy efficiency measures at the Broad Cove Sewer Pumping Station, South Elementary School, and Hingham High School.

Hingham had to meet the five criteria for Green Communities in order to be designated:

Criterion 1: *As-of-right siting in designated locations for renewable/alternative energy generation, research and development, or manufacturing facilities.*

The Town allows such uses by right in both the Industrial and Industrial Park zoning districts. A recent buildout analysis conducted by the Town suggests there is more than the minimum required development potential than what is required by the Green Communities program.

Criterion 2: *Expedited application and permit process for as-of-right energy facilities.*

Most such facilities are subject only to non-discretionary site plan review, which means they must be approved within 75 days so long as they meet all technical requirements. Further, in 2014 the Town designated South Shore Park – an area within the Industrial Park zoning district in South Hingham – as a Priority Development Site (PDS) per MGL 43D. This is a mechanism for ensuring a faster permitting process in exchange for financial and technical assistance from the State.

Criterion 3: *Energy use baseline and plan to reduce energy use by twenty percent (20%) within five (5) years.*

The Town worked with the Metropolitan Area Planning Council (MAPC) to prepare an Energy Reduction Plan in November 2018. The plan and its baseline assessment are summarized below.

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Criterion 4: Purchasing only fuel-efficient vehicles.

In October 2018, the Town formally approved a Fuel-Efficient Vehicle policy. This policy states, in brief, that all Town departments and divisions shall purchase only fuel-efficient vehicles for municipal use whenever such vehicles are commercially available and practicable. This does not apply to “exempt” vehicles such as fire trucks, police cruisers, and other vehicles that do not currently have more fuel-efficient options. The Town will keep an inventory of vehicles in order to track progress on this criterion over time. Currently, the Town owns and maintains 112 vehicles – however, only twelve of them are “non-exempt” and subject to this policy. Of these twelve, the average age is 7.8 years and the average fuel efficiency is about 22 MPG.

Criterion 5: Adopt the Board of Building Regulations and Standards Stretch Code for new construction.

The Town adopted the “stretch code” which emphasizes energy performance, as opposed to prescriptive requirements, and is designed to result in cost-effective construction that is more energy efficient than that built to the “base” energy code.

Town of Hingham Energy Reduction Plan

Hingham has a concrete plan to reduce its energy consumption by 20% between 2018 and 2023. All data below comes from the Hingham Energy Reduction Plan, approved by the Town in November 2018. The results of this effort will make a huge difference in the carbon footprint of Hingham’s municipal buildings, street and traffic lights, utilities, vehicles, and other infrastructure. The report showed that in 2018, the Town’s baseline energy usage was 102,787 MMBTUs (Million British Thermal Units – a standards measurement of the energy content of fuel). This means the target reduction is 20,557 MMBTUs, which amounts to the equivalent of over 3,700 barrels of oil!

Figure 8.2: Hingham Energy Reduction Plan, 2018

Currently, the vast majority of energy consumption (95%) comes from buildings (73%) and vehicles (22%). Consequently, building energy efficiency is where the Town stands to gain the most. As seen in Table 8.1 below, the top ten energy users in Hingham are all buildings and include all six public schools.

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Five energy users alone make up about half of the Town’s energy use, and therefore present the best opportunities for reduction in energy consumption.

User	Annual Energy Use (MMBTU)	Annual Energy Use (% of Baseline)
Hingham High School	20,614	20.06%
Hingham Middle School	10,762	10.47%
Hingham Town Hall	7,673	7.46%
South Elementary School	6,208	6.04%
Foster Elementary School	5,302	5.16%
South Shore Country Club	4,650	4.52%
Plymouth River Elementary School	3,816	3.71%
Hingham Public Library	3,717	3.62%
East Elementary School	2,709	2.64%
Central Fire Station	1,883	1.83%
Source: Town of Hingham Energy Reduction Plan, 2018.		

The energy reduction plan calls out sixty-seven specific energy conservation measures to take over the next four to five years in twenty-three different facilities. It also provides general guidance for pursuing even more and deeper conservation efforts beyond the first five years. The Green Communities program is an excellent way for Hingham to continue pushing itself toward more sustainable energy policy and outcomes well into the future.

Public Resources

Massachusetts offers a number of programs designed to support energy efficiency and renewable energy upgrades to buildings. From single-family homes, to commercial and industrial structures, to municipally owned buildings, programs are available to aid in financing and provide support. Energy efficiency upgrades can come at a wide variety of costs. Some efforts, like replacing light bulbs with new higher efficiency model, come at a nominal cost. However, when a property owner faces higher cost improvements such as upgrades to heating and cooling systems, or the installation of renewable energy systems, the cost of those improvements can at times become prohibitive. The programs discussed below each provide opportunities to assist property owners in securing the knowledge and funding necessary to lower their energy costs and reduce environmental impact.

Local Resources: The Hingham Municipal Lighting Plant (HMLP) provides electricity to customers in Hingham. HMLP is a member of New England Power Pool (NEPOOL) and ISO-NE (Independent System Operator - New England), so it can provide power more reliably since it is connected to the power grid and not buying power from a single supplier. HMLP is a public power system, one of over 2,000 in the country. By being public, residents have control instead of investors. HMLP offers incentives to customers looking to make their homes or buildings more energy efficient, including ENERGY STAR appliance rebates, energy efficient light bulbs, and an Energy Advisor service that provides over-the-phone consultations as well as in-home energy audits.

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In terms of renewable energy, HMLP offers a rebate in the form of a credit on the bills of customers who install and own a photovoltaic system at their homes in Hingham. The amount of the rebate varies according to the capacity of the photovoltaic system.

State Resources: At the state level, Massachusetts has at least thirty different energy efficiency and renewable energy financial incentives potentially available to the Town of Hingham and/or local property owners and businesses. These incentives include loans, rebates, and grants, as well as tax credits, incentives, exemptions, and deductions.

State level agencies with information regarding these resources and more include:

- Massachusetts Department of Energy Resources (DOER): <https://www.mass.gov/orgs/massachusetts-department-of-energy-resources>
- Massachusetts Clean Energy Center (MassCec): <https://www.masscec.com/about-masscec>

Massachusetts offers some of the best energy rebates and incentives in the country. DOER has compiled a clearinghouse of these rebates and incentives called the Commonwealth Energy Tool for Savings (energyCENTS). This tool provides a single-entry point to all the energy saving opportunities available to Massachusetts residents, businesses, and institutions, including rebates, loans and financing for electric vehicles, appliances, home energy assessments, solar electricity, and much more. Just answer some basic questions about your home or your business, and a list of everything you may be eligible for will be filtered for you.

<http://public.dep.state.ma.us/Doer/mesa/#/home>

Electric Charging Stations

The number of plug-in electric cars on American roads grows every year, and with them comes the need for more places to charge them.

In order to plan for electric vehicles, it is important to understand the difference between the three types of charging currently common in the United States.

Level 1 (120-volt): The “charging cord” that comes with every electric car has a conventional three-prong plug that goes into any properly grounded wall socket, with a connector for the car’s charging port on the other end and a box of electronic circuitry between them. This is the slowest type of charging, although for plug-in hybrids with smaller battery packs, it may be enough to recharge in a few hours to overnight.

Level 2 (240-volt): Most dedicated home and public charging stations operate at 240 Volts, with their cables again connecting to the standard charging port on a car. For charging stations installed at home, this requires the same type of wiring as an electric stove or clothes dryer. This will be at least twice as fast as Level 1 charging, often quicker, due to the higher amperage of the circuit. At a minimum, such charging stations should be installed on a dedicated 40-amp circuit, but to future-proof the wiring, 50 or 60 amps is better. Generally, owners of battery-electric cars will require a Level 2 home charging station to provide overnight recharges.

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DC Fast Charging: DC fast charging uses direct current (DC) rather than household alternating current (AC) and is very high-powered. This means that DC charging is really only practical at dedicated public sites, often along highways, given the higher cost for a utility to install dedicated high-power lines. Unlike the first two charging types, where every plug-in car in the U.S. uses the same “J-1772” socket (except Tesla, and even it provides an adaptor), there are three different kinds of DC quick charging.

- CHAdeMO: This is currently the most popular standard, used by many Japanese and Korean car makers.
- CCS (Combined Charging Standard): All U.S. makers except Tesla and all German makers use this standard.
- Tesla Supercharger: Tesla has gone its own way and created a dedicated network of free, high-powered fast-charging stations that can only be used by Tesla owners.

For owners of electric and plug-in hybrid vehicles in Hingham, the following are the charging options available today.

Home: Across the country, most recharging is done at home and overnight. This is when electricity is usually cheapest. Many battery-electric car owners will install a charging station in their garage or carport. For plug-in hybrids, many owners just stick with the 120-volt charging cords described above.

Work: Charging at work is quietly growing in popularity. It’s a good way for corporations to cut their carbon footprint, it’s not that expensive to install, and it’s a nice employee perk--whether or not the company or landlord charges a fee for it.

Public Sites: Finally, there are thousands of public charging stations throughout the U.S. and Canada, and the number grows each week. Virtually all public sites offer Level 2 charging, with a few providing DC fast-charging as well - increasingly with both CHAdeMO and CCS cables. Some public charging is free, while other sites impose a fee, using several different networks that generally require membership up front.

According to the website PlugShare (www.plugshare.com) there are currently no charging stations within the Town that are open to the public. The nearest charging station is located at Weymouth Town Hall, with seven others located around the periphery of Hingham in Weymouth, Braintree, Rockland, Norwell, and Scituate.

Other Energy Resources and Efforts

MBTA Solar Land Lease: In 2018, MBTA installed a solar panel array above the parking lots at the West Hingham and Nantasket Junction Commuter Rail Stations. The project is meant to provide environmental benefits such as reducing carbon emissions and also help the town reduce carbon dioxide while providing covered parking space for residents.

Cleaner Greener Hingham: This Town committee provides resources to residents on green practices. Their mission is to promote the practice of long-range planning for recycling and composting through education and facilitation.

Energy Action Committee: This Town committee is charged with helping to reduce energy use and promote energy efficiency and renewable energy use throughout Hingham. It is also the committee charged with planning for climate change.

Issues and Opportunities

CLIMATE CHANGE & SEA LEVEL RISE

Municipal Vulnerability Preparedness

There were several issues identified by the Municipal Vulnerability Preparedness project as specific areas of concern. These are summarized below.

Geographic (vulnerable to flooding under current conditions):

- Hingham Shipyard
- Bare Cove Park
- Hingham Harbor coast/waterfront
- Route 3A rotary and corridor

Infrastructural:

- Aging sewer/drainage infrastructure (sewer pump stations) vulnerable to inland and coastal flooding, and future capacity based on precipitation projections.
- Public transportation (commuter rail and ferry) vulnerable to flooding of the train tunnel/severe storms and potential for disruption in ferry/train service. A better understanding of flood-prone areas in commuter rail line vicinity (near Route 3A) due to alteration of topography associated with rail's construction.
- Seawalls/Piers/Oceanic Buffers vulnerable due to existing conditions and need for maintenance.
- Emergency shelters (number and capacity of, public's knowledge of shelter locations) vulnerable to all hazards.
- Utility resiliency (need for green energy to reduce emissions and need to improve utility users' education regarding improvements to consumption) vulnerable to all hazards.

Societal:

- Evacuation routes (communicate location to general public) vulnerable to all hazards.
- At-risk populations (aging population and assisted living facilities) vulnerable to flooding, heat and drought.
- Reliance on technology (interruption of essential services) vulnerable to severe storms.
- Evacuation of pets (during emergencies) vulnerable to all hazards.
- Historic monuments, structures and cemeteries (located along the waterfront) vulnerable to coastal flooding.

Environmental:

- Ground and surface water supply (maintaining existing quality/quantity).
- Chemical management (hazardous materials) vulnerable to all hazards.
- Open space/Health of forests vulnerable to flooding, severe storms and drought.
- Transfer station as a potential source of pollution.

The Municipal Vulnerability Preparedness project identified many opportunities to improve resilience, including the following high priority recommendations:

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- Increase the height of the existing seawalls and adjacent upland, continue ongoing maintenance of existing walls, and work with private property owners to improve private seawalls.
- Implement resiliency improvements to sewer pump stations, including installation of watertight mitigation gates, improvements to pump station buildings, and sealing of manhole covers.
- Protect the quality and quantity of potable groundwater and surface water supply, including:
 - Identifying additional sources of water supply
 - Reducing water usage within the Town
 - Establishing emergency water distribution sites
 - Educating homeowners on testing of private wells
 - Education private well owners and developing a bylaw related to irrigation

The biggest barrier to implementation of these recommendations is a sustainable source of funding.

Climate Change Vulnerability, Risk Assessment, and Adaptation Study

Issues and Opportunities for Infrastructure. According to the study, the highest risk infrastructure assets are seawalls and other coastal stabilization structures (projected to flood annually by the 2070 timeline). Recommendations from the study fall under three categories:

- Present: Improvements that need to be addressed today (2013) due to existing conditions
- 2030: Improvements that will be necessary by 2030
- 2070: Improvements that will be necessary by 2070.

Those recommendations identified as ‘Present’ represent both the most pressing issues and opportunities for addressing climate change locally.

Coastal Stabilization Structures:

- Inner Harbor/Iron Horse Park: Design, permit, and construct improvements to existing waterfront structures and landscape.
- Lincoln Street/Bridge Street/Route 3A Bridge: Continue monitoring structures for condition and scouring.

Facilities/Buildings:

- William L. Foster Elementary School: Develop an emergency student relocation plan under the scenario that the school is flooded and unable to be occupied for an extended period.

Roadways:

- Route 3A/Otis Street/Summer Street:
 - Prepare evacuation planning and education for floodplain residents, businesses, and institutions.
 - Purchase electronic warning signs for road closures/evacuation if none already available.
 - Identify alternate heliport location for use during flooding events.
 - Carry out planning, engineering design, environmental assessment on options to raise Route 3A.
- George Washington Boulevard:
 - Coordinate closely with Hull on road closures/evacuations through Hingham.
 - Establish a debris management and roadway/bridge inspection protocol to re-establish access to Hull via Hingham.
- Rockland Street to Hull Street:

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- Coordinate closely with Hull on road closures/evacuations through Hingham.
- Purchase electronic warning signs for road closures/evacuation not already available.
- Establish a debris management and roadway/bridge inspection protocol to re-establish access to Hull via Hingham.
- Maximize the protective ecosystem functions that the adjacent salt marsh provides.

Issues and Opportunities for Natural Resources

Broad Cove:

- Increase the size of the culvert under Route 3A to improve tidal flow from Hingham Harbor.
- Include tidal controls.
- Raise the elevation of Route 3A.

Hingham Harbor Shoreline:

- Conduct a coastal processes and adaptation study to evaluate potential gray and green adaptation strategies.

Beal Cove:

- A good location for potential green resilience design (thin layer deposition projects, marsh expansion projects and/or living shorelines).

Issues and Opportunities for Policy/Regulatory Revisions

- Amendments to Wetlands Regulations
- Zoning Bylaw Changes
- Changes to the Planning Board Rules and Regulations for Subdivisions
- Land/Resource Acquisition
- Policies for Public Projects
- Install a Tide Gauge in Hingham Harbor
- Develop a Coastal Flood Operations Plan

As with the MVP report recommendations, the biggest barrier to implementation of these recommendations is a sustainable source of funding.

WATER

Hingham Harbor

There are several issues related to the Harbor that the Master Plan can help address, most notably:

- There will likely be increasing demand for boats in the Harbor and space is limited. With a current capacity of 1,500 – 1,600 boats, is it possible to sustainably meet this increasing demand?
- Sea level rise and storm surge. The Town is actively redoing the wharves and building infrastructure higher.

The Master Plan update also presents a good opportunity to revisit sustainable, long-term plans for the Harbor. These opportunities may include:

- Highlighting the importance of existing amenities: the inner harbor area, snack shack, public beach, etc.
- Exploring modern and advanced approaches to more efficient mooring that can decrease the swing radius allowing for tighter parking and more efficient use of space.
- Addressing larger issues related to dredging, including the importance of doing so every ten years.

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- Highlighting the importance of redoing the wharves and other infrastructure to be resilient in the face of projected sea level rise.
- Discussing the balance between long-term rental moorings and transient (shorter-term) moorings.
- Providing adequate boat service for ALL public areas.

ENERGY USE

The Town of Hingham can lead by example, adopting energy efficiency and renewable energy policies, and providing opportunities for residents and businesses to do the same. The Hingham Energy Action Committee and Hingham Net Zero (a new community group formed to support the Town's efforts to cut emissions) have been tasked by the Board of Selectmen to explore ways for Hingham to reach "Carbon Neutrality." The Energy Action Committee intends to prepare a package of goals for carbon neutrality to propose at Town Meeting in April 2020, as well as a list of longer-term actions that should continue to be researched. The Master Plan should support this process.

Issues related to energy use include:

- In the shorter term, energy efficiency upgrades in municipal buildings often require significant upfront investments. The Town will need to continue to find creative ways to pay for these investments.
- Nearly ninety percent of the Town's municipal fleet of vehicles are considered "exempt" from the Fuel-Efficient Vehicle policy, and the Town will need to look for alternative ways to decrease energy use from vehicles.
- Beyond the energy use directly controlled by the Town, there is a need to continue to educate and incent local residents, businessowners, and landowners to improve their own energy efficiency and use of renewable energy.
- There are currently no reported public electric vehicle charging stations in Hingham, and few in the immediate vicinity.

Opportunities related to energy use include:

- Although they can have larger upfront costs than the status quo, energy efficiency upgrades in municipal buildings can have a long term positive fiscal impact, saving the Town and taxpayers money over time. Regular efforts to assess the condition of municipal buildings will expose more opportunities for energy use reductions as well as provide the Town with a clear, long-term asset management strategy for the effective budgeting and maintenance of buildings.
- Finding more energy efficient options to replace municipal vehicles exempt from the Fuel-Efficient Vehicle policy is the single largest opportunity for reducing vehicle-related energy use. However, there are several other opportunities, such as instituting an "anti-idling" policy, monitoring tire air pressure, using fuel efficient tires, and using one-hundred percent synthetic oil. According to the Hingham Energy Reduction Plan, these alternative efforts could reduce the Town's baseline energy use by 3,536 MMBTUs or roughly 3.4 percent.
- As noted, the Town has an opportunity to lead by example and encourage individual public employees as well as local residents, businessowners, and landowners to improve their own energy efficiency and use of renewable energy. Efforts identified in the Hingham Energy Reduction Plan include:
 - Building Operator Certification: Training municipal building personnel on managing systems for peak efficiency.

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- Behavior-Based Energy Reduction Strategies: A great deal of savings can be had if people collectively are conditioned to use only the energy needed. Educating school children about energy conservation measures (as simple as turning off the lights when you leave a room) can reduce energy consumption and costs significantly. The Hingham Energy Reduction Plan estimates that such an effort in Hingham Public Schools could result in a five percent energy reduction.
- Given the limited number of public electric vehicle charging stations around Hingham, the Town has an opportunity to help spur greater use of electric vehicles. The Town may consider installing charging stations at public properties or working with other local businesses and institutions to install them.

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