

# **Background Paper in support of an Ipswich Municipal Government Zero Carbon Energy Resolution**

**Prepared by the Ipswich Climate Resilience Committee, December 2020**

## **Background**

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This paper is intended as background and rationale for a proposed Ipswich municipal government Zero Carbon energy resolution. This background paper defines the goals and strategies for the municipal government to follow in pursuit of the resolution.

An Ipswich committee (Commission on Energy Use and Climate Protection) first developed a Climate Action Plan in 2011, and an update was prepared in 2017 to provide more focus for the municipal government. Further, the Community Development Plan was updated in 2008 with a section directly addressing the role of municipal government in reducing its greenhouse gas (GHG) emissions, and developing energy conservation and renewable energy programs.

As a coastal community with a tidal river running through its central downtown, Ipswich is facing a high degree of climate vulnerability. Large numbers of homes, businesses, and municipal infrastructure are located in low-lying areas, making them vulnerable to predicted sea level rise, increased storm surge, erosion, and storm-related flooding. These and other climate-related vulnerabilities must be addressed to protect human life as well as the economic well-being of Ipswich.

At the same time, it will be necessary to reduce the town's GHG emissions, which collectively causes climate change. It is imperative for Ipswich to reduce its GHG emissions if we are to meet the goals of the 2008 Massachusetts Global Warming Solutions Act (GWSA). On April 22, 2020, the GWSA was updated by establishing a goal of meeting "net zero" emissions by 2050. Ipswich should also meet its own climate goals established in the 2011 and 2017 Climate Action Plans.

Recently, Ipswich has made encouraging progress towards reducing the municipal government's GHG emissions, such as achieving a Green Communities Program designation in February 2020. In addition, in 2019, Ipswich completed requirements for the State Municipal Vulnerability Preparedness (MVP) program and is now eligible for MVP Action Grant funding and other climate resiliency opportunities. However, ambitious work lies ahead for the entire community to reduce and eventually eliminate all GHG emissions, and to address the town's climate vulnerability.

## **How is Ipswich vulnerable to climate change?**

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Like many North Shore communities, much of Ipswich is low-lying and exposed to rising sea levels and flooding. Low-elevation areas flood on annual and semi-annual basis during storms and abnormally high tides, which is exacerbated by improperly-size stormwater infrastructure, such as road culverts, which function as hydrological barriers. Approximately 25% of Ipswich is vulnerable to coastal inundation under present-day conditions, according to a climate vulnerability assessment prepared for seven communities in the Great Marsh<sup>1</sup>. The Great Marsh Coastal Adaptation Plan (GMCAP) identified 46 structures in Ipswich that are subject to a 1% annual chance of flooding, with 11 being regarded as critical infrastructure (i.e., one well, two dams, and eight bridges)<sup>2</sup>. According to the recently released State of the Coast Report prepared by the Trustees of Reservations, a 10-year storm in Ipswich may flood more than 340 buildings, and chronic daily tidal flooding could impact 50 buildings by 2050<sup>3</sup>.

Crane Beach, Plum Island, Clark Beach, and Pavilion Beach are exposed and highly vulnerable to wind, wave action, and sea level rise. An analysis completed by the Massachusetts Coastal Erosion Commission found Crane Beach was experiencing the second highest erosion rate on the North Shore, with an average beach loss of 4.6 feet per year between 1970 and 2009<sup>4</sup>. Rising seas and increased storm activity, erosion and its associated impacts are likely to worsen. New England coastal communities, including Ipswich, are projected to experience sea levels higher than the global average. Under a 2-meter (6.6 feet) global sea level scenario, Portsmouth and Boston would experience increased mean sea levels of about 0.9 meter (3 feet) by 2050 and around 2.7 meters (9 feet) by 2100<sup>5</sup>. While some uncertainties in future projections for sea level rise exist, such as the sensitivity of Antarctic and Arctic ice sheets to future warming, it is possible that higher sea levels may occur<sup>6</sup>.

Ipswich is fortunate to hold diverse and productive natural resources that provide important economic drivers for the tourism and seafood industries, but they are also vulnerable to the effects of climate change. Crane Beach draws over 250,000 users annually-both locals and visitors. Open fields, conservation land, and farms attract tourists and provide local residents with valuable recreational and agricultural destinations. Ipswich is the largest soft-shell clam producer in Massachusetts, and provides an estimate direct value of \$2 million and a total

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<sup>1</sup> Schottland, Taj, Melissa G. Merriam, Christopher Hilke, Kristen Grubbs, and Wayne Castonguay. 2017. *Great Marsh Coastal Adaptation Plan*. National Wildlife Federation Northeast Regional Office, Montpelier, VT.

<sup>2</sup> Ibid.

<sup>3</sup> State of the Coast: Future climate-driven risks- and their solutions- on Massachusetts' North Shore. 2020. Trustees of the Reservations. <https://www.onthecoast.thetrustees.org/download-a-copy>

<sup>4</sup> Massachusetts Executive Office of Energy and Environmental Affairs (MA EEA). *Shoreline Characterization and Change Analyses. North Shore Region. Regional Coastal Erosion Commission Workshop*. Gloucester, MA: 2014. <http://www.mass.gov/eea/docs/czm/erosioncommission/shoreline-profile-north-shore.pdf>

<sup>5</sup> <https://tidesandcurrents.noaa.gov/publications/techrpt083.csv>

<sup>6</sup> Sweet WV, Kopp RE, Weaver CP, Obeysekera J, Horton RM, Thieler ER, Zervas C. 2017. Global and regional sea level rise scenarios for the United States. National Oceanic and Atmospheric Administration, National Ocean Service. NOAA Technical Report NOS CO-OPS 083. p. 1-56

economic value of \$8 million to the area<sup>7</sup>. Approximately 21% of the landmass in Ipswich contains salt marsh wetlands which are part of the Great Marsh, the largest contiguous salt marsh in New England<sup>8</sup>. Salt marsh wetlands provide valuable storm surge and flood protection for the community, as well as serving as productive nursery and feeding habitat for commercial and recreational fisheries and waterfowl. These and many other important natural resources are at risk from more frequent drought and flooding, rising sea levels and storm surge, and warming ocean waters and ocean acidification. Nearly 322 acres of high marsh and 445 acres of estuarine beach/tidal flats could be lost to open water by 2050<sup>9</sup>. Increasing red tide events have caused shellfish closures for parts of most years, often linked to large storm events that carry fecal-coliform and other pollutants from urban areas into creeks and marshes<sup>10</sup>.

Over the past decades, the northeastern U.S. region saw a 55% increase in the amount of precipitation falling as very heavy events<sup>11</sup>. In 2006, the Town experienced its worst flooding in its history during the Mother's Day flood, and increased impacts from both coastal and inland flooding are becoming more and more common throughout the seasons and the years<sup>12</sup>. Extreme precipitation events are projected to be 22% more likely under a "business as usual" emissions scenario over the 21<sup>st</sup> century<sup>13</sup>. Conversely, the Ipswich River watershed suffered its worst drought in the history of the region in 2016<sup>14</sup>. Climate projections forecast changes in precipitation patterns and an overall increase in both temperature and stretches of dry days, suggesting that these patterns of drought and flooding will only be more problematic for the community in the future.

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<sup>7</sup> Town of Ipswich. 2013. Open Space and Recreation Plan. Ipswich, MA.

<sup>8</sup> Schottland et al. 2017.

<sup>9</sup> State of the Coast: Future climate-driven risks- and their solutions- on Massachusetts' North Shore. 2020.

<sup>10</sup> Schottland et al. 2017.

<sup>11</sup> Easterling DR, Kunkel KE, Arnold JR, Knutson T, LeGrande AN, Leung LR, Vose RS, Waliser DE, F. WM. 2017. Precipitation change in the United States. Climate Science Special Report: Fourth National Climate Assessment. [Wuebbles DJ, Fahey DW, Hibbard KA, Dokken DJ, Stewart BC, Maycock TK (eds)]. U.S. Global Change Research Program. p. 207-30.

<sup>12</sup> Town of Ipswich. 2019. Municipal Vulnerability Preparedness Plan. Community Resilience Building Workshop Summary of Findings. March 2019. Prepared for the Town of Ipswich by the Ipswich River Watershed Association.

<sup>13</sup> Easterling et al. 2017.

<sup>14</sup> Town of Ipswich. 2019.

## **How can Ipswich limit its vulnerability to climate change?**

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The 2017 GMCAP report includes a climate vulnerability assessment for Ipswich and specific adaptation strategies and recommendations for the town and for the region as a whole. Some of the GMCAP report recommendations include:

- 1) Best Practices. Establishing and maintaining a permanent Municipal Resiliency Task Force or committee; collaborating across municipal departments; incorporating climate change adaptation planning and climate projections into all relevant local and regional plans as well as capital investment projects;
- 2) Natural and Nature-based Strategies. Using living shorelines to stabilize shoreline edges in lieu of hardened structures, where appropriate; restoring degraded salt marshes; facilitating marsh migration; open space conservation for flood storage and uptake of carbon from the atmosphere;
- 3) Gray Infrastructure and Retrofits. Removing unnecessary dams; upgrading road-stream crossings, retrofitting buildings to be more flood resilient;
- 4) Land-use Planning and Policy. Updating municipal policies; prioritizing low-impact development practices; revising local wetlands protection bylaws and regulations; moving development away from the coast and from wetlands; instituting comprehensive water resources management, including strategies for stormwater, waste water, and public drinking water; creating “freeboard incentive” for residential and commercial buildings; using transferable development credits to reduce risky coastal development;
- 5) Outreach and Engagement. Developing municipal strategies for enhanced outreach and education; strengthening existing regional outreach and education programs.

If implemented across the board, climate resiliency and adaptation measures can ensure the municipal government is operating in a coordinated and comprehensive manner. These measures include policies, local regulations, ordinances, and rules, and should be incorporated in all municipal departments and operations and Town advisory boards and committees. A Town Resolution is needed to codify climate resiliency and GHG reduction goals across broad municipal government boards and departments.

## **Why should Ipswich reduce its greenhouse gas emissions?**

Greenhouse gas emissions, primarily carbon dioxide released from burning fossil fuels, must be reduced and eventually eliminated to prevent the worst consequences of climate change. In 2018 the Intergovernmental Panel on Climate Change (IPCC) issued Special Report 15, which concluded humankind has a mere 12 years left, during which time sufficient and dramatic carbon-emission mitigation strategies must be inaugurated to avoid the global average temperature from rising above the 1.5°C limit which the 2015 Paris Climate Change Agreement aimed for, while pledging to keep it well below 2°C above pre-industrial levels<sup>15 16</sup>. The IPCC report stated that in order to prevent exceeding the 1.5°C limit, global net anthropogenic CO<sub>2</sub> emissions must decline by about 45% from 2010 levels by 2030 and reach net zero around 2050. While this will require extraordinary and immediate action, it is (as yet) an attainable goal.

While the goal of reducing and eventually phasing out all fossil fuel energy use will require robust international and national efforts, cities and towns on every continent and country must be a part of the process if these goals are to be met. It will require substantial cooperation and collaboration between municipal, state, federal, and international government, as well as private and non-governmental organizations. Ipswich, in particular, has a strong incentive for meeting these goals given the Town's high vulnerability to the effects of climate change. As stewards of our children's future, we have special responsibilities to minimize the worst consequences of climate change for them and their children. In this regard, Ipswich is confronting both economic and logistical challenges, as well as the moral imperatives of meeting these climate goals.

## **Zero Carbon Energy Goal**

The primary strategies for reducing carbon emissions can be grouped in four general approaches:

1. **Conservation and Efficiency:** Reducing all energy use through conservation efforts (e.g., lowering thermostat in winter and turning off lights in unoccupied rooms) and energy efficiency (e.g., installing programmable thermostats, LED lighting, Energy Star appliances, and increased building insulation)
2. **Replacing Fossil Fuels with Non-Carbon Energy as a Source of Electricity:** Increased use of clean, non-carbon energy through the installation of locally-sited solar and wind generation, and purchasing grid-sourced electricity from non-carbon generation only
3. **Electrification of all On-site Building Energy Use:** Preventing expansion of fossil fuel usage by requiring all new buildings to be "Net-Zero" (all energy use is offset by on-site renewable energy) and by electrification of all energy use in new and existing buildings and transportation

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<sup>15</sup> IPCC. 2018. Summary for policymakers. In: Global warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty [V. Masson-Delmotte, P. Zhai, H. O. Pörtner, D. Roberts, J. Skea, P. R. Shukla, et al. (eds.)]. World Meteorological Organization, Geneva, Switzerland, 32 pp.

<sup>16</sup> Rhodes CJ. 2019. Only 12 years left to readjust for the 1.5-degree climate change option – Says International Panel on Climate Change report: Current commentary. Science Progress 1–15.

4. **Energy Storage:** Installation of utility- and smaller-scale (e.g., business and residential) energy storage systems to reduce peak demand and extend the use of renewable-sourced electricity beyond the times of generation

All four of these paths must be followed in order to achieve a Zero Carbon Energy future. In addition to eliminating fossil fuel use, the Town must reduce its energy use through conservation and efficiency. Not doing so will require a long-term and enormously expensive challenge to develop and purchase enough carbon-free energy sources to power our current use levels. In the interim, we have to electrify all of our energy uses so that they can be powered by carbon-free energy. Finally, incorporating energy storage not only extends the time of use in locally-generated, renewable energy, but allows it to be dispatched during periods of peak energy demand that typically results in the use of the most carbon-intensive energy sources that releases largest amount of GHGs and other emissions that contribute to poor air quality.

A transition to zero carbon energy presents an opportunity to address inequality and environmental injustice caused by a carbon-based energy system and centralized production of electricity. As we transform how we power our communities, Ipswich can make an intentional effort to improve social equity.

The benefits of a clean energy transition are broad in scope and significant. Developing clean energy sources can translate to local and statewide job creation, more reliable energy supplies and more stable energy prices, improved public health, and a better environment. In addition to the proliferation of zero carbon energy commitments by municipalities, more than 180 mayors nationally, both democrats and republicans, have pledged to promote sustainability and reduce GHG emissions, low-carbon transportation, energy efficiency in new and existing buildings, and green electricity and conservation efforts. The United States Conference of Mayors, the nation's largest nonpartisan organization of cities, approved a historic resolution this year, establishing a policy framework to support zero carbon energy goals in cities nationwide<sup>17</sup>.

### **Elements of a Zero Carbon Energy Goal for Ipswich by 2040:**

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1. **Electrification of energy uses:** Transition of all energy uses in all sectors (transportation, heating/cooling, etc.) to electric power provided by clean, non-carbon energy;
2. **Ensure justice, equity, affordability, and access:** A commitment needs to include measures that prioritize equity and affordability, and access to clean energy for all members of the community, including low income communities;
3. **Develop clean, local renewable resources only and phase out carbon sources:** Renewable energy includes carbon and pollution-free energy sustainably collected from renewable sources including wind, solar, and geothermal. Some forms of biomass may be included after being evaluated for sustainability and environmental justice implications. Natural gas, coal, oil, or any other forms of carbon-based energy production are not included as clean, renewable sources of energy. Fossil fuel infrastructure for new construction of public buildings should be avoided. New fossil fuel sources of energy should not be added to

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<sup>17</sup> Mayors Leading the Way on Climate. How Cities Large and Small are Taking Action. January 2020. <https://www.c2es.org/document/mayors-leading-the-way-on-climate-2020/>

existing buildings, such as expanding new gas lines into neighborhoods or businesses where they currently do not exist;

4. Net-Zero buildings: A commitment to work toward requiring all new buildings, to the extent allowable under existing codes, to be constructed as net-zero buildings. Work towards establishing a building code that requires new buildings be net zero;
5. Zero carbon energy generation: The Ipswich Electric Light Department (ELD) should set a goal of providing zero carbon electricity by 2040. This includes a goal of local distributed renewable generation, as well as Zero Carbon goal for the Ipswich ELD grid-sourced electricity portfolio;
6. Promote and increase energy storage: The ELD should investigate and pursue the installation of utility-scale energy storage (e.g., battery banks) as part of an effort to reduce peak demand and eliminate carbon-based electricity sources during those periods. In addition, the ELD should promote and incentivize energy storage devices (e.g., Tesla Power Wall) for residents and businesses, and investigate the feasibility of dispatching stored energy to the grid during peak demand periods;
7. Undertake campaign to convert heating systems to electricity-only in existing buildings: Develop an aggressive campaign for the municipal government, local residents and businesses to install and undertake comprehensive efforts to replace fossil fuel energy sources (i.e., oil, natural gas, and propane) for space and water heating needs and cooking with electricity, combined with energy conservation and efficiency measures;
8. Transparent and inclusive planning and implementation process: Ensure that community members and local businesses have an opportunity to engage and participate in planning and implementing the Zero Carbon Energy goal.

### **Strong commitments also include organizational change in Ipswich town government:**

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1. Consolidate recommendations: Ipswich needs to collect its recommendations for climate action from the 2011 and 2017 Climate Action Plan, the GMCAP, and other related plans and goals into a comprehensive list of recommended actions. The recommendations should be prioritized by effectiveness in addressing the problem, and timing, so it can serve as a blueprint for achieving a Zero Carbon goal for the entire community. A climate action recommendation blueprint should be a living document that is updated and revised as technology and strategies evolve. These plans should be integrated into every Town department and used in annual planning and project review;
2. Commitment to regional collaboration: Make a commitment to working with surrounding communities to achieve aligned climate and clean energy and equity goals;
3. Commitment to advocate: A commitment to advocate for policies or regulations at the state, regional and/or federal level that aid the Town in the energy transition;
4. Municipal-wide organizational commitment: Town departments should have coordinated review and implementation of climate and energy-related goals, projects, and budgets. This effort needs to include all relevant departments. Examples include road (e.g., ensuring safe pedestrian and bicycle access, climate resiliency), buildings (e.g., prioritizing construction of only net-zero buildings), and Town vehicles (e.g., purchasing electric vehicles when available and feasible).
5. Municipal planning, review and monitoring of building projects: Key Town department and committees should be involved with and coordinate in the planning and budgeting stages of

all Town building projects as part of a Zero Carbon energy goal. The current Strategic Planning Committee, composed of representatives of a broad array of boards and committees, can be a starting point for establishing a permanent committee to review projects to ensure fully-electric heating systems (i.e., air and ground-source heat pumps) are included in the design and construction of building projects. This permanent committee could also be tasked with monitoring the resulting operations of net-zero buildings, renovation of existing buildings, and more.

6. Functional and effective oversight method: The committee tasked with monitoring planning, design, and operations will need to adopt a process and method for evaluating project design for construction and operation costs, and track and evaluate operations to assure projects function as designed relative to energy use.

**Working towards Zero Carbon Energy:** A number of environmental non-profits in the state, including the Sierra Club Chapter in Massachusetts, Environment MASS, and 350 MA for a Better Future, joined together in the MassPowerForward coalition and have embraced the goal of 100% renewable energy.

Thirteen communities in Massachusetts have adopted a commitment to work toward 100% renewable energy – either for the municipality or for the community as a whole. These municipalities include cities like Salem, Lowell, and Cambridge, to towns such as Leverett, Greenfield, and Marblehead. The Sierra Club “Ready for 100” Campaign recognizes community commitments as places where a city’s or town’s leadership has established a goal to transition the entire community to 100% clean, renewable energy. The links below contain more detailed information on this subject.

<https://www.sierraclub.org/ready-for-100/commitments>

<https://www.mapowerforward.com/>