ENVIRONMENT & CLIMATE CHANGE

Environment and climate change are important areas of consideration for transportation planning. The Montachusett Region needs to help protect and minimize negative impacts to its many areas of environmental value and its air, water, soil and wildlife. Along with environmental protection, the Montachusett Region hopes to reduce greenhouse gas emissions which contribute to global climate change. This section will discuss the current and future activities the Montachusett Region is undertaking to protect its environment and reduce greenhouse gas emissions.

> "The threats that climate change poses to transportation systems–including flooding, changes in average temperatures, and extreme weather events–are clear. But MPOs and DOTs have little if any information on precisely what impacts they can expect, where, and in what time frames. As a result, agencies are largely not acting to adapt the transportation system to climate change, or are waiting for further guidance on the topic."
>
> – FHWA *Integrating Climate Change into the Transportation Planning Process*

In response to building concerns on the effect of global climate change and the development of The Commission on the Future of Transportation in the Commonwealth, the MRPC has looked at ways climate change will impact the Montachusett Region. In particular, staff has focused on potential flooding by identifying flood prone areas and the effects that it will have on each community in relation to major transportation infrastructure. Transportation infrastructures such as roadways, bridges, rail lines etc. are essential for the economic wellbeing of our region. More than half the country's population now lives along the nation's coasts, and one third lives in the highly populated coastal areas of the Northeast. The area between Boston and Philadelphia is one of the most populous areas of the country. The Montachusett region, being a part of this larger corridor, not only has infrastructure which carries regional significance, but national as well.

Regional Significance

"Global climate change affects the coastal areas with rising air temperature, increasing rainfall, rising ocean temperatures and rising sea levels, which lead to increased coastal flooding. In addition to sea level rises, much of the Northeast shoreline is gradually sinking, increasing the effects of rising ocean waters." Even though there are no coastal areas in the Montachusett region it is important to note other effects climate change may have on inland areas. "The Northeast is projected to see a steady increase in precipitation, with total increase of around 10 percent, about four inches per year, by the end of the century. It is winter precipitation that is rising fastest, with more precipitation expected to fall as rain rather than snow. Rainfall is expected to become more intense and periods of heavy rainfall are expected to become more frequent."[i] Since flooding is a major concern to transportation infrastructure in the region, it is important to identify and recognize areas which are vulnerable to such events.

The flood zone maps at the end of this document show Federal Emergency Management Agency (FEMA) 100-year flood zones in the Montachusett region. A 100 year flood is "calculated to be the level of flood water expected to be equaled or exceeded every 100 years on average. The 100-year flood is more accurately referred to as the 1% annual exceedance probability flood, since it is a flood that has a 1% chance of being equaled or exceeded in any single year."[ii]

The map ***FEMA 100-Year Flood Zones, MA DOT Bridges, and DCR Dams*** in the appendix shows all "High" and "Significant" hazard dams in the region and bridges that structurally deficient. According to the Massachusetts Highway Project Development and Design Guidebook, a *structurally deficient* bridge is defined as "a bridge structure that has a defect requiring corrective action."[iii]

Dams are shown by their Hazard Codes, a system that categorizes dams according to the degree of adverse incremental consequences of a failure or mis-operation of a dam. The hazard potential classification does not reflect in any way on the current condition of the dam (e.g., safety, structural integrity, flood routing capacity), rather the potential hazards downstream that would

be realized by a failure. Three classification levels are *Low, Significant, and High.* According to the Massachusetts Office of Dam Safety a…

High Hazard Potential dam refers to dams located where failure will likely cause loss of life and serious damage to home(s), industrial or commercial facilities, important public utilities, main highway(s) or railroad(s).

Significant Hazard Potential dam refers to dams located where failure may cause loss of life and damage home(s), industrial or commercial facilities, secondary highway(s) or railroad(s) or cause interruption of use or service of relatively important facilities.

Low Hazard Potential dam refers to dams located where failure may cause minimal property damage to others. Loss of life is not expected.

Table 4-38: High Hazard Dams in the Montachusett Region

HIGH HAZARD DAMS IN THE MONTACHUSETT REGION				
Dam Name	**City/Town**	**Ownership**	**Regulating Authority**	**ID Code**
Lower Naukeag Lake Dam	Ashburnham	Municipality	Office of Dam Safety	MA00002
Upper Naukeag Lake Dam	Ashburnham	Municipality	Office of Dam Safety	MA00003
Winnekeag Lake Dam	Ashburnham	Private	Office of Dam Safety	MA00007
Lake Wampanoag Dam	Ashburnham	Private	Office of Dam Safety	MA00010
Ashby Reservoir Dam	Ashby	Municipality	Office of Dam Safety	MA00334
Whites Mill Pond Dam	Winchendon	Private	Office of Dam Safety	MA00630
Lake Monomonac Dam	Winchendon	Municipality	Office of Dam Safety	MA00631
Whitney Pond Dam	Winchendon	Municipality	Office of Dam Safety	MA00633
Crocker Pond Dam	Westminster	Private	Office of Dam Safety	MA00638
Westminster Reservoir Dam	Westminster	Private	Office of Dam Safety	MA00639
Wyman Pond Compensating Reservoir Dam	Westminster	Municipality	Office of Dam Safety	MA00641
Hickory Hills Lake Dam	Lunenburg	Private	Office of Dam Safety	MA00851
Fall Brook Reservoir Dam and Dike	Leominster	Municipality	Office of Dam Safety	MA00869
Notown Reservoir Dam	Leominster	Municipality	Office of Dam Safety	MA00870
Scott Reservoir Dam	Fitchburg	Municipality	Office of Dam Safety	MA00871
Lovell Reservoir Dam	Fitchburg	Municipality	Office of Dam Safety	MA00872
Wrights Reservoir Dam	Gardner	Municipality	Office of Dam Safety	MA00117
Cowee Pond Dam	Gardner	Municipality	Office of Dam Safety	MA00118
Perley Brook Reservoir Dam	Gardner	Municipality	Office of Dam Safety	MA00119
Lake Shirley Dam	Lunenburg	Municipality	Office of Dam Safety	MA00455
Lost Lake Dam	Groton	Municipality	Office of Dam Safety	MA00808
Greenes Pond Dam	Fitchburg	Municipality	Office of Dam Safety	MA00875
Overlook Reservoir Dam	Fitchburg	Municipality	Office of Dam Safety	MA00876
Snows Mill Pond Dam	Fitchburg	Private	Office of Dam Safety	MA00878
McTaggarts Pond Dam	Fitchburg	Municipality	Office of Dam Safety	MA00879
Rockwell Pond Dam	Leominster	Municipality	Office of Dam Safety	MA00882
Pierce Pond Dam	Leominster	Private	Office of Dam Safety	MA00883
Wachusett Reservoir Dam	Clinton	State	Office of Dam Safety	MA00886
Cresticon Upper Dam	Athol	Private	FERC Jurisdiction	MA00932
Crescent Street Dam	Athol	Private	Office of Dam Safety	MA00934
Birch Hill Dam	Royalston	Federal Agency	Army Corps of Engineers	MA00963
Tully Lake Dam	Royalston	Federal Agency	Army Corps of Engineers	MA00970
Bickford Pond Dike	Hubbardston	Municipality	Office of Dam Safety	MA01022
Wachusett Reservoir North Dike	Clinton	State	Office of Dam Safety	MA01294
Lovell Reservoir Dike	Fitchburg	Municipality	Office of Dam Safety	MA01334
Lake Samoset Dam	Leominster	Private	Office of Dam Safety	MA00866
Notown Reservoir Dike	Leominster	Municipality	Office of Dam Safety	MA01240
Overlook Reservoir Dike	Fitchburg	Municipality	Office of Dam Safety	MA01236
Falulah Reservoir Dam	Fitchburg	Municipality	Office of Dam Safety	MA02312
Red Dam	Winchendon	Municipality	Office of Dam Safety	MA02345
Damon Pond Dam	Ashby	State	Office of Dam Safety	MA02518

Environmental Impacts of Transportation

The environmental impact of transportation is significant because it is a major user of energy, and burns most of the world's petroleum. This creates air pollution, including nitrous oxides and particulates, and is a significant contributor to global warming through emission of carbon dioxide.[iv] One of the most well documented human contributors to climate change is emissions from automobiles. According to the Environmental Protection Agency (EPA) around 14% of all global greenhouse gas emissions are from the transportation sector and almost all (95%) of the world's transportation energy comes from petroleum-based fuels, largely gasoline and diesel. A significant contributor to overall transportation emissions is congestion on our roadways, causing cars to idle and produce more byproduct from burning fuel.

> Transportation generates 30 percent of America's total global warming emissions, including more than one-third of all U.S. carbon dioxide emissions.
>
> More than 60 percent of U.S. transportation emissions come from cars and light trucks.
>
> Source: EPA

Regional Initiatives

Environment and climate change are important areas of consideration in transportation planning. It is important to account for the most vulnerable infrastructure when considering improvements and planning future developments. Efforts to prepare and mitigate the effects of climate change have been made and are currently underway in the region which MRPC has been both directly and indirectly involved in. The following are brief descriptions of such efforts.

Montachusett Regional Stormwater Development Program

During the 2016/2017 UPWP MRPC developed a Stormwater Data Collection App which was made available to member communities required to abide by the EPA's MS4 Permit. This app is capable of collecting GPS coordinates and pertinent information of stormwater assets in the field. MRPC continues to offer support to member communities who wish to utilize the app.

Central Massachusetts Evacuation Plan Mapping

MRPC, in coordination with the Central Massachusetts Planning Commission (CMRPC) and the Central Massachusetts Homeland Security Council, developed a data assessment/SWOT Analysis (strategic planning method to evaluate the Strengths, Weaknesses, Opportunities and Threats) of existing conditions, that was included in the development of a county-wide evacuation plan. This multiyear project was completed in 2016 and was partially funded through the Homeland Security Council and focused mainly on the development of evacuation zones, critical infrastructure, demographic data and the designation of evacuation routes.

Multi-Modal Corridors

To lessen the reliance on driving and burning fossil fuels, which contributed to global climate change, the region is initiating programs that make it easier and safer to have more transportation mode choices. Within the Montachusett region, this includes the development and promotion of bicycle and pedestrian trails and lanes and the establishment of Safe Routes to School and Complete Streets programs in member communities.

Over the last few years, the MRPC has utilized GIS mapping to document where various pedestrian, bicycle and mixed-use trails are in the region. All 22 MRPC communities and Devens have been surveyed and mapped. An inventory is available for the public that shows trails which are available for use. Using trail inventories in these ways can encourage the use of bike and pedestrian modes of travel and might be a first step in planning for future trail construction.
The MRPC also works to assist communities with walkability and complete streets. In 2012, Walkability studies were conducted in the towns of Groton and Westminster and in 2019 Lunenburg was studied. These planning documents were requested to study the downtown areas of each town and how walkable or accessible they are for residents and visitors. These reports showed detailed information for traffic counts, sidewalk inventory and condition, points of interest locations, etc. The MRPC was also hired by the town of Shirley to assist with their Complete Streets Prioritization Plan which was approved in 2018.

Trail Inventory

This project was driven by the Montachusett Regional Trail Coalition (MRTC). The MRTC is focused on trail connectivity by establishing new trails as well as maintaining the existing trail network. This group was formed in March 2012 and is made up of state and local officials and other interested parties who are passionate about trails in the region. These individuals made a request to MRPC for assistance with developing a regional trail map that can be used to boost trail interest, awareness and tourism for the region. The Montachusett Region Trail Guide was published in 2014 and was distributed to various locations across the region including all public libraries, town halls and visitors' centers. A trail inventory update was conducted in 2017 and an updated Regional Trail Guide was created in 2018.

Renewable Energy

The Montachusett Region has worked to increase the use of renewable energy sources. Some Montachusett Region communities have Wind-Energy Bylaws and Wind-Energy Turbines. The Montachusett Regional Planning Commission (MRPC) also has a Regional Energy Plan.

Montachusett Regional Energy Plan

The MRPC completed the development of a Regional Energy Plan. In the fall of 2011 MRPC was awarded $66,000 from the federal Department of Commerce's Economic Development Administration (EDA) to put together the plan. The goal of the plan is to make recommendations to the Montachusett Region's 22 communities to promote the reduction of electricity used, energy used for transportation, an non-electric energy used for heating; replacement of fossil fuels with renewable resources and the reduction of global climate change emissions. The scope of work for this project included a renewable energy regional inventory (mentioned above), design and construction of energy educational exhibits, and series of community workshops. An assessment and analysis of the Montachusett Region Current Energy Needs/Demands (by end-user) was also undertaken. Based upon this information, Worcester Polytechnic Institute students worked to build a system dynamics simulation model of future energy demands and

needs within the Montachusett Region. The model can be used to simulate a variety of path-altering scenarios. The study and its recommendations can be found on the MRPC.org website in the Comprehensive Planning section under "Energy Planning".

Renewable Energy Systems

Throughout the Montachusett Region, there are various renewable energy systems including wind turbines, solar photovoltaic, geothermal, landfill gas, hydro, and biomass. In recent years, there has been an increase in these types of systems throughout the region. The increase in renewable energy systems is helping relieve the demand on burning fossil fuels which lowers CO_2 emissions and greenhouse gases.

Siting of Renewable Energy Facilities

The Montachusett Regional Planning Commission (MRPC) and the Northern Middlesex Council of Governments (NMCOG) were awarded $188,512 in grant funds in fall 2012 from the federal Department of Commerce's Economic Development Administration (EDA) to develop a plan for the Siting of Renewable Energy Facilities for the Montachusett Region and the Northern Middlesex Region.

The goal of this project was to create a Regional Renewable Energy Facility Siting Plan encompassing the MRPC and NMCOG communities containing recommendations for siting and promoting renewable energy facilities. Adequately siting and promoting renewable energy facilities in appropriate locations will decrease reliance on fossil fuels and petroleum products. Currently, there are insufficient siting standards for renewables; therefore developers of renewable energy often do not know what criteria they need to meet in order to develop wind, solar, geothermal, hydropower and other facilities. This project was completed in 2014.

Wind-Energy Bylaws/Ordinances

Wind-Energy Bylaws/Ordinances detail specific height and setbacks requirements for wind-energy systems and provide identified areas in which people are allowed to put up wind-energy

turbines either by right or through a special permit. This provides an easier, quicker and less costly method than obtaining a zoning variance. In communities that do not have wind-energy bylaws/ordinances, a person might need to get a zoning variance to build their wind-energy turbine.

Climate Change Preparedness

In 2017-2018, MRPC was awarded a grant from the MA Office of Technical Assistance and Technology (OTA) and the US Environmental Protection Agency (EPA) to sponsor workshops designed to educate municipal officials, community leaders, Local Emergency Planning Committees (LEPCs) and businesses about the toxic chemicals stored, used and transported through their communities.

MRPC collaborated with OTA, EPA, the New England Consortium, and ESIS Health, Safety and Environmental to develop chemical safety trainings and pollution prevention assessment tools that can be used and adopted in future climate change preparedness planning. The goal was to ensure our region's communities are more capable of addressing climate change-related disasters by providing information and thoughtful preparation needed for targeted planning.

MRPC and OTA hosted trainings for local authorities and vulnerable facilities to help raise awareness on the issue and as part of their emergency preparedness plans. The trainings built models for incorporating toxics use reduction into community and regional emergency preparedness and climate resiliency planning and supply toxics users with the tools they need to prevent industrial accidents.

Pre-Disaster Mitigation Plans

In 2008, MRPC wrote Natural Hazard Pre-Disaster Mitigation Plans for all 22 communities in the Montachusett Region and in the winter of 2014, MRPC completed the updates to these same plans with funding provided by the Federal Emergency Management Agency through the Massachusetts Emergency Management Agency and the Massachusetts Department of

Conservation and Recreation. These plans identified natural hazards and assessed their risk of occurring. These hazards included climate change as well as flooding, wind, winter storm and fire related hazards. Flooding, droughts and severe winter storms can be caused by climate change's increase in temperature and storm frequency. These plans also included mitigation strategies for these types of hazards ranging from increased drainage management to increased communication between community boards and departments.

Montachusett Regional Transit Authority (MART) Initiatives

Along with environmental protection, the Montachusett Region hopes to reduce greenhouse gases emissions which contribute to global climate change. As a Regional Transit Agency, MART provides public transportation to area residents and visitors. Environmentally friendly initiatives include the outfitting of maintenance facilities in Gardner and Fitchburg with solar power and the inclusion of Hybrid powered buses and cars to their fleet of vehicles. MART continuously looks to upgrade the efficiency of their fleet and currently operates 23 city buses, of which 3 are Hybrids.

Green Communities

The Green Communities Designation and Grant Program helps municipalities become designated as a "Green Community" and provides funding to qualified municipalities for energy efficiency and renewable energy initiatives. The Program is open to all communities served by investor-owned utilities and those served by municipal light plants that adopt the renewable energy charge.

To achieve "Green Community" designation, a municipality must meet five clean energy benchmarks:

- Provide as-of-right siting;
- Provide expedited permitting;
- Establish an Energy Reduction Plan (ERP);
- Purchase only fuel-efficient vehicles; and
- Minimize life-cycle costs.

The MA Department of Energy Resources (DOER) calculates community funding allocations using a formula that provides each community with a $125,000 base grant plus additional amounts based on per capita income and population. The "Green Community" designation also makes municipalities eligible for special initiatives such as electric vehicle charging stations and additional competitive grant rounds subsequent to the initial Green Communities grant.

There are currently sixteen communities in the Montachusett region that are designated Green Communities: **Ashburnham, Ashby, Athol, Ayer, Fitchburg, Gardner, Harvard, Lancaster, Leominster, Lunenburg, Petersham, Royalston, Shirley, Townsend, Westminster, and Winchendon.**. Collectively, these communities have received over $4.5 million in funding through the program which has been used in municipal and school buildings for weatherization, HVAC upgrades, variable frequency drive installations, energy management systems, heating fuel conversions, LED lighting retrofits, energy audits, and building envelope upgrades, to name a few. MRPC is working with **Groton, Hubbardston and Templeton** in 2019 to become designated Green Communities and assists many of our communities with tasks associated with maintaining Green Community status on an annual basis.

MRPC strongly supports the Green Communities Program and we believe becoming a Green Community produces significant energy improvements and cost savings for municipalities. Such action also demonstrates the community's commitment to green energy and environmental protection.

Statewide Initiatives

In May 2016, the Supreme Judicial Court of Massachusetts ruled that the Massachusetts Global Warming Solutions Act (GWSA) requires MassDEP to promulgate new regulations that "impose a limit on [greenhouse gas] emissions that may be released, limit the aggregate emissions released from each group of regulated sources or categories of sources, set emission limits for each year, and set limits that decline on an annual basis" to meet the requirements of Section 3(d) of Chapter 21N of the General Laws.

Executive Order 569 was signed by Governor Baker in September 2016, which directed the Executive Office of Energy and Environmental Affairs (EOEEA) to coordinate and make consistent new and existing efforts to mitigate and reduce greenhouse gas emissions and to build resilience and adapt to the impacts of climate change.

The Executive Order also directed MassDEP to promulgate regulations satisfying the mandate of Section 3(d) by August 2017 to ensure that the Commonwealth meets the 2020 statewide emissions limit mandated by the GWSA.

Trends

Climate change impacts such as global warming is expected to increase the frequency of precipitation and severity of weather events. It is important to anticipate the impact of such factors on transportation infrastructure.

Recommendations

- Encourage the development of more projects which qualify for Congestion Mitigation and Air Quality (CMAQ) funds.
- Maintain the prevalence of environmental factors when reviewing and prioritizing transportation projects.
- Continue to monitor and assess vulnerable infrastructures.

The importance of the environment in the Montachusett region goes beyond just the moral responsibility to protect our planet. Natural resources and attractions which exist in the region could also have economic benefits as well. Both the protection of our environment and the efficient connectivity of people to these assets should play a prominent role in transportation decision making now and in the future. Environmental Performance Measures set in this plan will help ensure progress continues to be made.

[i] "Confronting Climate Change in the U.S. Northeast: Science, Impacts and Solutions," a report of the Northeast Climate Impacts Assessment © 2007 Union of Concerned Scientists.

[ii] Holmes, R.R., Jr., and Dinicola, K. (2010) *100-Year flood–it's all about chance* U.S. Geological Survey General Information Product 106

[iii] Massachusetts Highway Project Development and Design Handbook. (January 2006):

Massachusetts Highway Department; Executive Office of Transportation

[iv] Center for International Climate and Environmental Research (2007). "Climate forcing from the transport sectors"