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Transportation and Climate Change

12 Sustainable Transportation and Climate Change

The promotion of energy efficient and sustainable transportation systems is an issue that has increasingly become a priority both regionally and nationally. Higher fuel costs and concerns related to climate change have contributed to a strengthening focus on reducing the personal use of automobiles and also on using new and developing technologies that take advantage of more fuel efficient and cleaner burning vehicles.

Climate change is a result of global warming, which is largely caused by human activities, specifically the production of greenhouse gases (GHG). Greenhouse gas emissions are caused by everyday activities, such as the generation of electricity generation and the operation of motor vehicles. While electricity is the largest contributor (33%) of GHG emissions in the United States, the transportation sector comes in at a close second. The transportation sector is responsible for 27 percent of GHG emissions in the United States and it is projected that transportation will continue to account for more than one-third of Massachusetts' total GHG emissions in 2020. The consequences of climate change are expected to include increased numbers of very hot days, average rainfall, temperature, and more severe storms. These effects will also, in turn, impact the performance of our infrastructure. As a result, these variables must be examined when planning for the future of the transportation system in Franklin County, because the decisions that are made today, "particularly those related to the redesign and retrofitting of existing transportation infrastructure or the location and design of new infrastructure, will affect how well the system adapts to climate change far into the future."[1]

Sustainable transportation and the reduction of GHG's has been a priority for Franklin County and the Franklin County Transportation Planning Organization (FCTPO). This chapter will discuss ongoing and recommended initiatives that encourage sustainable transportation and, therefore, also the mitigation of GHGs in the region. In addition, this chapter will examine ways in which the transportation infrastructure system can be adapted to the changing conditions that climate change will bring to the region.

Guiding Policies, Programs and Plans

The Commonwealth of Massachusetts, FRCOG, and other regional organizations have demonstrated their commitment to reducing GHG emissions. Massachusetts has been one of the more proactive states in the country to address the impacts of GHG emissions on climate change. Within the past few years the following policies and plans have been enacted, which lay the foundation for GHG reductions.

Global Warming Solutions Act

In August 2008, Governor Deval Patrick signed into law the Global Warming Solutions Act, making Massachusetts one of the first states in the nation to move forward with a comprehensive program designed to grow the clean energy economy and address climate change. The Act requires an 80 percent economywide reduction of GHG emissions below 1990 levels by 2050 and also requires the Secretary of Energy and Environmental Affairs to set a GHG emission reduction requirement for 2020 that is 10 to 25 percent below 1990 levels. In the 2010 *Massachusetts Clean Energy and Climate Plan for 2020*, the Secretary set the 2020 GHG limit to 25 percent and has outlined the measures that are needed to meet this reduction. These measures include reductions across a wide range of GHG contributors, including: buildings, electricity supply, transportation, and non-energy related emissions.

[1] Transportation Research Board (TRB). Potential Impacts of Climate Change on U.S. Transportation. TRB Special Report 290. 2008.

In the transportation category, the Plan looks at the following specific actions to be taken over the next 10 years:

- Raise the fuel efficiency of vehicles;
- Increase the amount of renewable fuels used;
- Provide incentives for consumers to purchase more fuel-efficient vehicle models; and
- Create a "Pay as You Drive" (PAYD) Auto Insurance pilot program.

GreenDOT

On June 2, 2010, MassDOT announced that it had launched GreenDOT, a comprehensive environmental responsibility and sustainability initiative that will make MassDOT a national leader in "greening" the state transportation system. GreenDOT will be driven by three primary goals: reduce GHG emissions; promote the healthy transportation options of walking, bicycling, and public transit; and support for smart growth development. The initiative includes GHG reduction targets mandated under the Global Warming Solutions Act.

Documenting GHG-Emissions Reduction for GreenDOT Implementation

MassDOT, using its statewide travel demand model, has provided the Franklin Regional Transportation Planning Organization (TPO) with statewide estimates of CO_2 emissions resulting from the collective list of all recommended projects in all the Massachusetts RTPs combined. Emissions are estimated in the same way as the criteria pollutants (volatile organic compounds, nitrogen oxides, and carbon monoxide) whose emissions are required for the air quality conformity determination (for further description, see Chapter 16). However, the CO_2 emissions shown here are part of an effort separate from the conformity analysis and are not part of those federal standards and reporting requirements.

The Global Warming Solutions Act (GWSA) legislation requires reductions by 2020 and further reductions by 2050, relative to the 1990 baseline. The project mix from this RTP (and all other RTPs) was modeled for both 2020 and 2035 using an Action (Build) vs. Baseline (No-Build) analysis to determine the CO_2 emissions attributed to the all TPO's mix of projects and smart-growth land use assumptions. The estimates of the modeled CO_2 emissions are provided below:

Table 12-1: Massachusetts Statewide CO2 Emissions Estimates (all emissions in tons per summer day)

Year	CO2 Action Emissions	CO2 Base Emissions	Difference (Action – Base)
2010	101,514.4	101,514.4	n/a
2020	105,747.5	105,856.4	-108.9
2035	115,034.1	115,028.0	6.1

As shown above, collectively, all the projects in the RTPs in the 2020 Action scenario provide a statewide reduction of nearly 109 tons of CO_2 per day compared to the base case. However, the 2035 Action scenario estimates an increase of about 6 tons of CO_2 emissions compared to the base case. It should be noted that this current analysis measures only projects that are included in the travel demand model. Many other types of projects that cannot be accounted for in the model (such as bicycle and pedestrian facilities, shuttle services, intersection improvements, etc.) will be further analyzed for CO_2 reductions in the next Transportation Improvement Program development cycle. This information will be updated and reported at that time.

Working closely with MassDOT, the Franklin Regional TPO will continue to report on its actions to comply with the GWSA and to help meet the GHG reductions targets. As part of this activity, the TPO will provide further public information on the topic and will advocate for steps needed to accomplish the TPO's and state's goals for greenhouse gas reductions.

HUD-DOT-EPA Interagency Partnership for Sustainable Communities

In 2010, the U.S. Department of Housing and Urban Development (HUD) announced a notice of funding availability for the Sustainable Communities Planning Grant Program. A top priority of President Obama is to build economically competitive, healthy, opportunity-rich communities. In the 2010 Budget, Congress provided a total of $150 million to HUD for Sustainable Communities Initiative to improve regional planning efforts that integrate housing and transportation decisions, and increase the capacity to improve land use and zoning. In the Fall of 2010, a consortium, with FRCOG as lead partner, received a $425,000 grant under this program for Franklin County. One of the tasks to be performed is the creation of a Regional Plan for Sustainable Development. This is a three-year grant and the work will be completed in 2014.

FHWA Livability Initiative

In cooperation with the HUD-DOT-EPA Partnership for Sustainable Communities, the Federal Highway Administration (FHWA) also launched a Livability Initiative to work to continue improving the relationship between infrastructure and community needs, specifically to improve a community's 'livability,' to enhance the environmental sensitivity of roads and bridges and to help states explore multi-modal transportation options. According to the FHWA livability is defined as the following:[2]

> Livability is about tying the quality and location of transportation facilities to broader opportunities such as access to good jobs, affordable housing, quality schools, and safe streets. This includes addressing safety and capacity issues on all roads through better planning and design, maximizing and expanding new technologies such as ITS and the use of quiet pavements, using Travel Demand Management approaches to system planning and operations, etc.

> Part of FRCOG's scope of work for the HUD Sustainable Communities Planning Grant is a task to conduct a "Complete Streets and Downtown Livability Plan" for the Town of Deerfield. This plan will incorporate FHWA's livability principles.

Green Communities

In 2008, Massachusetts created the Green Communities Program which uses funding from auctions of carbon emissions permits under the Regional Greenhouse Gas Initiative to reward communities that achieve Green Communities designation by meeting five clean energy benchmarks:

- Adopting local zoning bylaw or ordinance that allows "as-of-right siting" for renewable and/or alternative energy R & D facilities, manufacturing facilities or generation units;
- Adopting an expedited permitting process related to the as-of-right facilities;
- Establishing a municipal energy use baseline and a program to reduce use by 20 percent within five years;
- Purchasing only fuel-efficient vehicles for municipal use, whenever such vehicles are commercially available and practicable; and
- Requiring all new residential construction over 3,000 square feet and all new commercial and industrial real estate construction to reduce lifecycle energy costs (i.e., adoption of an energy-saving building "stretch code").

In 2010, the FRCOG assisted 18 towns in Franklin County in creating Action Plans that outline the ways in which the towns can meet these energy benchmarks and become designated. At this point in time, three towns in the county are now officially designated as Green Communities and are eligible to receive funding grants.

Pioneer Valley Clean Energy Plan

At a more regional level, the *Pioneer Valley Clean Energy Plan* was developed in 2008 by the FRCOG and PVPC to examine energy use in the Pioneer Valley and identify clean energy goals for the

[2] Federal Highway Administration (FHWA). Livability Initiative. www.fhwa.dot.gov/livability. Last updated 6/10/10.

Pioneer Valley. The resultant four goals for the region consist of the following:

1) Reduce our region's energy consumption to 2000 levels by the end of 2009 and reduce that by 15 percent between 2010-2020;
2) Site sufficient new capacity to generate 214 million kilowatt hours of clean energy annually in the Pioneer Valley by the end of 2009 and another 440 million kilowatt hours per year by 2020;
3) Reduce our region's GHG emissions by 80 percent below year 2000 levels by 2050;
4) Create local jobs in the clean energy sector.

The goals identified in that report represent energy use goals for many sectors, including transportation. However, Goals 1 and 3 are directly applicable to the transportation sector in the region. In order to achieve the outlined energy reductions identified in Goal 1, three sectors were targeted, which include: (1) Industry, (2) Buildings, and (3) Transportation. An approximate 30 percent energy use reduction goal was identified for the Pioneer Valley transportation sector. The plan identifies a series of guiding principles for the region to help in achieving the four goals mentioned above. The guiding principles that can be directly related to the transportation sector include the following:

- Reduce energy consumption through conservation and efficiency;
- Promote a comprehensive public transportation system including expansion of bus lines, public rail transportation, shuttles, car sharing, and safe bike routes and sidewalks and pedestrian paths with an emphasis on energy efficiency and use of renewable fuels; and
- Increase urban infill in order to make communities more pedestrian friendly and energy efficient.

Alternative Transportation Plan

In 2009, the FRCOG created the *Alternative Transportation Plan* that examined ways to encourage alternative forms of transportation to Franklin County other than the singly-occupied vehicle. The Plan made a number of recommendations which are summarized here:

- Continue implementation of the 2009 *Franklin County Bikeway Plan Update*,
- Continue implementation of the 2008 *Franklin County Park and Ride Study*;
- Establish a Zipcar within Franklin County;
- Support the current efforts underway to bring passenger rail back to the county and be ready to capitalize on it when it is restored;
- Promote ridesharing efforts;
- Improve bus transit to attract residents wishing to park and ride, and increase the level of service for lower-income people and elderly.

Many of the recommendations in the *Alternative Transportation Plan* are part of ongoing efforts by the FRCOG, FRTA, and other organizations in the region and are described in more detail in the next section.

Current Planning Activities

The FRCOG recognizes the rural nature of the Franklin County region and acknowledges that traveling by automobile is often the most convenient or only option. However, with increases in the cost of fuel and more attention being focused on environmental issues, such as climate change, it is important to discuss options for reducing dependence on the single-occupied vehicle and increasing alternative transportation options whenever possible. The Franklin County region and the FRCOG have been working on bringing sustainable transportation to the area and mitigating GHGs in many ways. This section highlights the many planning activities and programs that have recently been completed or are ongoing in this topic area.

Park and Ride Lots

Park and ride lots provide an opportunity to those who do not live on or within walking distance of public transit routes to travel to an intermediary location and take public transportation or carpool with other commuters. There is currently a park and ride lot on Route 2 in Charlemont which was established by MassDOT in 2002. MassDOT is currently in the process of establishing a park and ride lot in the Town of Whately, which will be easily accessible to Routes 5/10, Route 116, and Interstate 91. The lot can be serviced by both the FRTA and

the PVTA bus systems. It is currently under design and $1.2 million has been earmarked in CMAQ funds for its construction in the 2011 Transportation Improvement Program.

Charlemont MassDOT Park and Ride

In 2008, FRCOG published the *Franklin County Park and Ride Study* which examined the demand for park and ride lots and determined optimal locations for potential sites in the county. The study found that there is a high demand for park and rides and that there are many places throughout the county that are already functioning as informal park and ride lots. Based on this information, the study recommended 14 specific sites that could become park and ride lots. In 2010, two of these sites became official park and ride lots – the Greenfield Visitors Center, located on Rt. 2A, and the Sunderland Historical Society, located on Rt. 47 in Sunderland Center. To date, MassDOT has posted way-finding signs along I-91 directing commuters to the Visitor's Center. However, the entrance to the lot and the actual site still needs to be signed, which MassDOT will do when the weather breaks in the Spring of 2011. The Sunderland park and ride lot has also been officially designated as a park and ride and has been added to MassDOT's map of park and ride lots. Way-finding signs have not yet been posted, but MassDOT has agreed to do so in the Spring of 2011 along Route 116 from I-91 directing commuters to this lot.

Ridesharing

There are several programs and internet-based resources that promote carpooling or "ridesharing" in Franklin County and the wider region. The major program to encourage ridesharing across Massachusetts is Mass*Rides*. Mass*Rides* provides travel assistance to commuters, employers, students, and other travelers by providing information about transportation alternatives, including: transit, biking, and walking. It also helps employers to establish vanpool or carpool options for employee commutes. Another important rideshare program for Franklin County is run through UMass Amherst, which is a major employer for county residents. There are also several other locally-based internet rideshare resources that attempt to connect ride-seekers with drivers offering rides within the region. They include: Zipride.com, RideBuzz.org, and Craigslist.org.

Shared Vehicle Program

Car sharing is defined as the joint access and ownership of a car. For individuals who do not need a car every day, it is a way to have a car when you really need one while relying on alternatives for most trips. Zipcar is a national vehicle sharing program that is available in Massachusetts. This service allows users to pay a fixed rate for the use of a vehicle that they are able to reserve when they need it. Members can reserve cars for time periods ranging from just hours to many days. These reservations include the cost of fuel, insurance, and reserved parking. Presently, the closest Zipcar location can be found on the campus of Amherst College in the Town of Amherst. The Franklin County *Alternative Transportation Plan* examined the possibility of bringing Zipcar to the county. Because this service is run by a private company, there is little that FRCOG can directly do to locate a vehicle in the county. However, Zipcar makes its vehicle-siting decisions based on the interest the company receives on its website. To promote interest in a Zipcar in the county, FRCOG could organize a "Zipcar Drive" to encourage residents to notify Zipcar of their interest.

Promote Walking and Bicycling

There has been a lot of support in Franklin County for increased walking and bicycling. Bicycling and walking play a large role in community livability by impacting the environment, community health and wellness, and the transportation network. Shifting

to these transportation modes can result in a significant decrease in transportation-related GHG emissions, while promoting the health of residents. In Franklin County, several reports and studies have examined the safety and security of the pedestrian and bicyclist transportation network and has sought to increase the quality and quantity of these facilities. The following studies and reports have encouraged bicycling and walking in the county: *Alternative Transportation Plan, Franklin County Bikeway Plan, Franklin County Pedestrian Plan,* and *Safe Routes to School Preliminary Examination.*

Canalside Trail in Turners Falls, Montague

Increase Use of the Public Transit System

In Franklin County, several reports and studies have examined the demand for public transit in the region. The following studies and reports have focused on transit service and include: *Alternative Transportation Plan, West County Transit Study, Northfield/Bernardston Transit Study*, and Regional Transit Center Planning. The major strength of the transit system is that most of the major commuting routes within Franklin County are currently being served by public transit. Another beneficial aspect of the public transit system is the inclusion of bicycle racks on all of the buses. This coordination between various modes of transportation can help decrease dependence upon the single occupant motor vehicle and help mitigate GHG emissions. On the other hand, these studies found that a weakness with the current status of transportation options within Franklin County is the limited service of public transit. This is primarily due to the high cost of providing transit service to such a rural population. See Chapter 9: "Transit and Paratransit Services," for recommendations on how to improve the public transit system in Franklin County.

Passenger Rail in the Region

The Knowledge Corridor Passenger Rail Study examined the feasibility of expanding passenger rail to the region by extending service from Springfield, MA to White River Junction, VT while passing through Franklin County. This report included an examination of bringing passenger rail into Greenfield via the new Regional Transit Center being constructed in 2011. The Regional Transit Center will be located directly along a railroad line to allow for the future facilitation of passenger rail to the region. In 2010, federal stimulus funds were awarded to improve this rail line for passenger rail and to construct a passenger platform at the Regional Transit Center. This new service to the region will provide residents with another travel option to the singly-occupied vehicle. See Chapter 7: "Passenger Rail," for more information on bringing passenger rail to the region.

Telecommunications

Telecommuting can help decrease GHG emissions by allowing workers to not have to commute daily to their jobs and instead work from home. It is anticipated that the number of employees telecommuting in Franklin County will continue to increase in the future. This is largely in part due to the recent and pending expansion of the telecommunications infrastructure and high-speed internet services in the region. For more information on this topic, see Chapter 11: "ITS & Telecommunications."

Improve Traffic Operations

Reduce Congestion and Travel Time

The time vehicles spend idling in traffic congestion is a direct contributor to GHG emissions. In order to prevent idling and decrease time spent in traffic, the efficiency of the transportation network needs to be examined. The recent Greenfield Signals

Improvement Project included the redesign of eight signalized intersections in Greenfield. The redesign of these intersections included improvements to pedestrian facilities as well as updated signal timings, which will help improve the efficiency of the transportation network and decrease emissions.

Improve Communication and Notification

Technology can help improve the efficiency of the transportation network through driver communication and advanced notice of incidents to users of the transportation network. Improvements in communication may include better and more frequent use of variable message signs to notify drivers of upcoming construction schedules or delays. Another form of notification is the Massachusetts Travel Advisory System which is a free service provided for the Commonwealth in which a motorist can call 511 to see if a select number of major roadways are experiencing congestion. This service was recently expanded to Interstate 91 and Route 2 in Western Massachusetts. Motorists who are aware of an incident can take an alternate route, which will result in an avoidance of the congestion and a decreased travel time.

Adaption of Transportation Infrastructure to Climate Change

Transportation-related GHG emissions contribute significantly to climate change. In turn, however, climate change will also have an impact on the transportation system. A special report from the Transportation Research Board (TRB), "Potential Impacts of Climate Change on U.S. Transportation," determined that the following impacts on the transportation system can be expected:

- Prolonged hot days lead to increased risk of wildfire;
- Compromised pavement integrity (hotter weather = softer pavement and increased rutting from traffic);
- Deformed rail lines;
- Adversely affected bridge operation due to thermal expansion of bridge joints;
- Increased flooding and inundation of bridges, roads and rail lines; and
- Heavier rainfall will require redesign and replacement of drainage structures.

It is clear that not only does the county need to take an active effort to reduce GHG emissions by promoting sustainable transportation, but it also needs to plan for these potential changes and their impact on transportation infrastructure. The following strategies are aimed at preparing for the impacts of climate change on the future of the transportation system and the incorporation of this concern into planning practices.

Plan for More Severe and Frequent Flooding in the Region

A safe transportation system protects users from hazards, including hazards resulting from climate-related stresses on the system. It is expected that more extreme weather events will lead to more precipitation and flooding. It is critical that infrastructure be planned and maintained to be able to withstand a higher frequency of these events. Furthermore, such events may be more severe in the future, so a revised examination of potential flooding areas and critical infrastructure should be performed for the whole region. The FRCOG has prepared updated flood maps for the county to assess changes in flooded areas as a result of climate change. Additionally, a recent exercise which examined transportation infrastructure and critical facilities in the aftermath of a potential failure of the Harriman Dam (in Vermont) was performed. Such exercises should be standard for all potential dam failures in the county as the threat of these events increases. These exercises will help prepare the region for appropriate transportation / disaster planning. This has recently proved especially important during Hurricane Irene in August 2011, which flooded and washed out many roads and bridges in the region.

Preserve Aspects of the Transportation System that are Threatened by Climate Change

More prolonged heat spells and hotter days are expected with climate change, along with increased precipitation events. These effects will directly impact pavement condition. Warmer days will result in the softening of the pavement for longer periods of time and may lead to more rutting. Additional concerns regarding stormwater runoff should be

examined when updating, maintaining, and redesigning the roadway network to accommodate the potential need for more drainage. To help prepare for the impacts of climate change on the transportation network, FRCOG is currently developing a Pavement Management Program for the region to monitor this critical component of the transportation infrastructure.

Improve Emergency Response Times via an Updated GIS Network

There are several tools which can aid in improving emergency response to an event. Emergency vehicle preemption is one proactive tool that can be used. Another aspect of emergency response is the accuracy of the information emergency responders use to reach an event. The transportation network is dynamic in nature as road conditions and accessibility may change over time. The FRCOG is currently working on identifying potential changes to the Road Inventory File (RIF), which contains information used by emergency responders about the transportation network. An updated RIF will help improve emergency response times.

Recommendations for Transportation and Climate Change

Transportation and climate change are closely related. The transportation sector is the second largest contributor to GHG emissions, which are a primary cause of climate change. In turn, however, changes in weather patterns and extreme weather events have a direct impact on the integrity of the transportation system. In order to help decrease transportation's role in climate change, transportation-related GHG emissions need to be reduced. There are many steps that have already been taken in the region to help mitigate GHG emissions. The region has also taken a proactive role in preparing for the impact of climate change on the regional transportation system. This chapter demonstrates how Franklin County is working towards the state's goal of reducing GHG by 25 percent by the year 2020 as laid forth in the Massachusetts Clean Energy and Climate Plan for 2020.

Recommendations

- Continue to promote a **reduction in GHG emissions** in the region through the mitigation strategies described in the chapter.
- Continue to **promote sustainable and alternative forms of transportation** to the singly-occupied motor vehicle as outlined in the *Alternative Transportation Plan, the Franklin County Bikeway Plan, the Franklin County Pedestrian Plan* and others mentioned in this chapter.
- Develop local and regional **emergency action plans** for events related to climate change.
- Continue to develop a **Pavement Management System** for the county and work to implement it.