



# BOSTON REGION METROPOLITAN PLANNING ORGANIZATION

Richard A. Davey, MassDOT Secretary and CEO and MPO Chairman  
Karl H. Quackenbush, Executive Director, MPO Staff

## MEMORANDUM

**DATE** February 20, 2014  
**TO** Boston Region Metropolitan Planning Organization  
**FROM** Karl H. Quackenbush  
CTPS Executive Director  
**RE** Work Program for: Greenhouse Gas Reduction Strategy Alternatives:  
Cost-Effectiveness Analysis

### Action Required

Review and approval

### Proposed Motion

That the Boston Region Metropolitan Planning Organization vote to approve the work program for the Greenhouse Gas Reduction Strategy Alternatives: Cost-Effectiveness Analysis presented in this memorandum.

### Project Identification

Unified Planning Work Program Classification

Technical Support/Operations Analysis Projects

CTPS Project Number

11151

Client

Boston Region Metropolitan Organization

CTPS Project Supervisors

*Principal:* Pam Wolfe

*Manager:* Anne McGahan

Funding

MPO Planning Contract #78890

MPO §5303 Contract #78922

## Impact on MPO Work

This is MPO work and will be carried out in conformance with the priorities established by the MPO.

## Background

The Massachusetts Global Warming Solutions Act (GWSA) was enacted in 2008 to create a framework for reducing greenhouse gas (GHG) emissions to levels that scientists believe would give us a chance of avoiding the worst effects of global warming. The Act requires reductions of GHG emissions of 25 percent from 1990 levels by 2020 and of 80 percent from 1990 levels by 2050. To help meet these requirements, the Massachusetts Department of Transportation (MassDOT) adopted its GreenDOT policy initiative to help reduce GHG emissions by doing the following:

- Implementing travel demand management projects
- Promoting healthy transportation modes by improving pedestrian, bicycle, and public transit infrastructure
- Supporting smart-growth development by making transportation investments that enable denser, smart-growth development patterns that can support reduced GHG emissions

As part of its current Long-Range Transportation Plan (LRTP), *Paths to a Sustainable Region*, the Boston Region MPO adopted its own vision on climate change to reduce GHG emissions to contribute appropriately to the statewide targets set in the GWSA. It also adopted a livability vision to make livability a hallmark for communities in the MPO region and to achieve mobility, foster sustainable communities, and expand economic opportunities and prosperity.

The responsibility of the MPO is to prioritize and fund projects, programs, and studies that help to advance its own visions and policies through its Unified Planning Work Program (UPWP), Transportation Improvement Program (TIP), and LRTP. Currently, the MPO tracks the projected GHG impacts of infrastructure projects.<sup>1</sup> GHG impacts are tracked at the regional level in the LRTP and at the project level in the TIP. A GHG and cost-effectiveness analysis is also done for TIP projects seeking funding under the Congestion Mitigation and Air Quality Improvement Program. Because reducing GHG emissions is an important goal of the MPO, this study is being undertaken to identify cost-effective GHG reduction strategies that can help inform MPO investment decisions.

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<sup>1</sup> The MPO defines greenhouse gas (GHG) emissions by tons of carbon dioxide (CO<sub>2</sub>), the primary GHG emitted through human activities. This study will also account for methane (CH<sub>4</sub>) emissions through their CO<sub>2</sub> equivalency, which is defined as the amount of CO<sub>2</sub> emissions that would have the same global warming potential over 100 years as a given amount of CH<sub>4</sub>.

## Objectives

The objective of this work program is to research various transportation strategies that support the reduction of GHG emissions in order to identify transportation investments that are the most cost-effective in reducing GHG emissions. Some examples of GHG reduction strategies are projects that improve traffic flow, support fleet upgrades, or shift travelers from single-occupant vehicles to biking, walking, or taking transit.

This study's tasks will include a literature review and research into work performed by federal, state, and regional transportation agencies; universities; and advocacy and nonprofit organizations that could yield information on the GHG impacts and the costs of implementing various reduction strategies across all transportation modes. MPO staff will inventory past and current MPO programming within the context of these strategies and will quantify the projected GHG impacts using various tools. This work will be coordinated with the task listed in the FFY 2014 TIP work program of updating the MPO's GHG Emission Spreadsheet Tool, which estimates the GHG impacts from future bicycle and pedestrian usage. MPO staff will then calculate the cost-effectiveness of each transportation strategy and identify those strategies that are most effective at reducing GHG emissions.

## Work Description

This work program describes the tasks that will be completed to research various GHG reduction strategies, inventory past and current MPO programming within these strategies, and calculate the cost-effectiveness based on cost and projected GHG impact.

### **Task 1 Conduct a Literature Review of MPO, State, Federal, and Other Organizations' GHG Reduction Strategies**

The literature review will focus on publications or documentation of ongoing activities from other, comparable MPOs; state and federal transportation agencies; professional, advocacy, and nonprofit organizations; and universities regarding the outcomes of GHG reduction strategies and their implementation costs. Information and data may be obtained from literature documenting the results of experiential work supporting mode shift and GHG reduction and from studies analyzing projected GHG reduction. This will include a review of planning studies, projects, and implemented programs for all transportation modes.

#### *Product of Task 1*

Summary of findings from the literature review and a list of GHG reduction strategies and related cost-effectiveness (if available) for consideration in this study

## Task 2 Inventory Past and Current MPO Programming within Each GHG Reduction Strategy

Based on the GHG reduction strategies derived from the literature review, MPO staff will inventory past and current MPO transportation investments that are consistent with these strategies. At a minimum, these projects will include:

- Transit expansion projects
- Major highway expansion projects
- Arterial expansion projects
- Intersection improvement projects
- Bicycle and pedestrian expansion projects

MPO staff will seek to quantify the GHG impact associated with each project. For some projects, MPO staff will utilize GHG impact calculations that have already been completed for TIP projects. For other projects, MPO staff will rely on available tools to calculate GHG impacts. These tools may include the MPO's regional travel demand model, US Environmental Protection Agency's (EPA) Motor Vehicle Emissions Simulator (MOVES), and other tools developed by the EPA and Federal Highway Administration (FHWA).

In addition to the types of projects listed above, there may be other possible ways to further evaluate the projected GHG reductions of some modernization projects that are known to provide GHG emission benefits. Some components of these modernization projects can be analyzed with existing tools; however, some components are often not captured. One example of the latter is arterial modernization projects, which are often referred to as "complete street" projects. Currently, the intersection components of these projects are analyzed, but the bicycle and pedestrian components are not considered. Staff may seek ways to identify new methods of capturing the impacts of these improvements.

### *Products of Task 2*

- List of GHG impacts for MPO investments by GHG reduction strategy
- Summary of existing evaluation tools for calculating GHG emissions associated with various strategies

## Task 3 Calculate the Cost-Effectiveness of Various GHG Reduction Strategies

MPO staff will use the GHG inventory results and project costs to determine the cost-effectiveness of each MPO investment. MPO staff will produce cost ranges for each type of GHG reduction strategy. This range will be informed by both MPO staff calculations and the information on cost-effectiveness gathered in Task 1. These results will provide a better understanding about which MPO projects are the most cost-effective in reducing GHG emissions, and will help inform future investment decisions by the MPO, state agencies, and

municipalities. Based on these results, MPO staff will identify the potential next steps for implementing these cost-effective GHG reduction strategies through the UPWP, TIP, and LRTP. This information will also be useful to MassDOT in meeting its goal of reducing GHG emissions.

#### *Products of Task 3*

- Results of GHG cost-effectiveness assessments (cost per ton of CO<sub>2</sub> reduced) of MPO transportation investments that reduce GHGs
- Results of research on the cost-effectiveness of other strategies identified in the literature review
- List of staff recommendations for implementing cost-effective GHG reduction strategies

#### **Task 4 Document and Present Results**

The results of the three tasks described above will be documented in a memorandum and presented to the MPO at a regularly scheduled meeting.

#### *Product of Task 4*

- Final memorandum
- PowerPoint presentation summarizing the results of the study

### **Estimated Schedule**

It is estimated that this project will be completed seven months after work commences. The proposed schedule, by task, is shown in Exhibit 1.

### **Estimated Cost**

The total cost of this project is estimated to be \$54,923. This includes the cost of 23.6 person-weeks of staff time and overhead at the rate of 97.42 percent. A detailed breakdown of estimated costs is presented in Exhibit 2.

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**Exhibit 1**  
**ESTIMATED SCHEDULE**  
**Greenhouse Gas Reduction Strategy Alternatives: Cost Effectiveness Analysis**

Task	Month						
	1	2	3	4	5	6	7
1. Conduct Literature Review	█						
2. Inventory MPO Programming within GHG Strategies				█			
3. Calculate Cost-Effectiveness of Strategies					█		
4. Document and Present Results							█ A

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Products/Milestones  
 A: Memorandum and presentation

**Exhibit 2**  
**ESTIMATED COST**  
**Greenhouse Gas Reduction Strategy Alternatives: Cost Effectiveness Analysis**

<b>Direct Salary and Overhead</b>	<b>\$54,923</b>
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Task	Person-Weeks						Direct Salary	Overhead (97.42%)	Total Cost
	M-1	P-5	P-4	P-3	Temp	Total			
1. Conduct Literature Review	0.1	0.5	0.0	1.0	3.0	4.6	\$3,590	\$3,497	\$7,087
2. Inventory MPO Programming within GHG Strategies	0.2	3.0	0.5	4.0	1.5	9.2	\$11,049	\$10,764	\$21,813
3. Calculate Cost-Effectiveness of Strategies	0.1	1.5	0.0	4.0	0.0	5.6	\$6,952	\$6,772	\$13,724
4. Document and Present Results	1.0	1.6	0.6	1.0	0.0	4.2	\$6,229	\$6,069	\$12,298
Total	1.4	6.6	1.1	10.0	4.5	23.6	\$27,820	\$27,102	\$54,923

<b>Other Direct Costs</b>	<b>\$0</b>
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<b>TOTAL COST</b>	<b>\$54,923</b>
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**Funding**

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