11.0 Programming

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11.1 What Is Included?

This stage of greenhouse gas (GHG) assessment includes consideration of GHG emissions in the allocation of funding to transportation programs, projects, and strategies. This involves the selection of individual projects and project types for eventual construction in the development and approval of a statewide transportation improvement program (STIP) and/or the transportation improvement program (TIP) at the metropolitan planning level. Approval of the STIP and/or TIP as a whole, or projects contained within the STIP and/or TIP, could depend on the consideration and outcome of GHG impacts.

Elements of GHG considerations at the programming stage may include

- A qualitative discussion about the transportation program, its effect on transportation GHG emissions, and alignment with climate change policies at the State or regional level.
- A quantitative GHG emissions analysis of the program and a discussion of how the results of the analysis indicate progress toward meeting climate change policies or goals and objectives by adoption of the STIP or TIP.

11.2 Why Consider GHG in Programming?

The development of the STIP and TIP indicates a greater degree of certainty, detail, and commitment to projects and strategies by the State department of transportation (DOT) or metropolitan planning organization (MPO) than is possible in the long-range plan. The STIP and TIP schedule projects and assign funding, defining activity for the State DOT and MPO for 4 or 5 years. Advancing and including projects and strategies designed to reduce GHG emissions is a strong indication of the State DOT's or MPO's interest in reducing GHG emissions from the transportation sector. Assessing the entire program of a State DOT or MPO for its impact on GHG emissions also recognizes the potential effect that adoption of a transportation program, consisting of many individual projects, may have on transportation GHG emissions and success or failure in meeting climate change policies and objectives.

The State DOT's or MPO's degree of commitment can be indicated by factors that lead to the adoption of a STIP or TIP. Requiring consistency with legislation (for those States that have climate change legislation) or statewide policy requirements (for those States that have executive orders or other directives from their Governor regarding climate change) or internal DOT policy on climate change (as established by the Commissioner or Secretary) as a prerequisite to adoption indicates a recognition of the importance of climate change and the transportation sector's role in the problem. Quantification of the GHG emissions associated with the adoption of the STIP or TIP further solidifies that commitment to GHG reduction by reporting the direction and magnitude of emissions impacts to decision-makers and the public. It also allows them to judge the benefit of adopting the STIP or TIP and to evaluate the impact such adoption would have on meeting climate change goals in the State or region (if any).

State DOTs have a unique role in influencing the reduction of GHG emissions from the transportation sector based on their involvement in the programming phase of the transportation project development process. Namely:

- Federal transportation funding flows from the Federal level to the State DOTs, then on to the regional and local level through the metropolitan planning process. State transportation funding also is allocated by the State DOT to local and regional entities, such as MPOs. State DOTs often provide guidance or requirements to the MPOs on how to develop TIPs and allocate funding to meet State or Federal requirements or policies. Thus, State DOTs can strongly influence TIP development to consider GHG emission reduction through their guidance to the MPOs in their State.
- State DOTs are members of each MPO. In some States, the DOTs are more active and involved with their MPOs than in other States. In all cases, State DOTs can stress the importance of reducing GHG emissions from the transportation sector and work with the MPO members and MPO staff to include GHG emission consideration in the development of the TIP and other products.

The programming stage offers an important opportunity for the State DOT to play an active role in reducing GHG emissions from the transportation sector.

11.3 Level of Effort

The level of effort for addressing GHG emissions at the programming stage can vary considerably, depending on other related activities and whether the analysis will be qualitative or quantitative. For a qualitative analysis, the level of effort should be moderate (a few 10s of hours). For a quantitative assessment, the level of effort could range from moderate (for running an overall set of projects through the travel demand model) to significant (100s of hours) for a project-by-project quantitative estimate of GHG emissions. The level of effort will be reduced if the agency has developed or adopted a set of standardized tools to estimate GHG emissions along with other project impacts, such as criteria air pollutants. If GHG is simply added to an existing list of pollutants being evaluated, the additional level of effort will be modest.

11.4 Complementarity/Consistency with Other Transportation Goals

Programming is normally conducted in-line with goals established in the long-range transportation plan (LRTP). In practice, this linkage is generally made by evaluating, selecting, and prioritizing individual projects, as well as evaluating the overall program of projects, against metrics that relate

to the goals set forth in the LRTP. GHG reduction goals are often consistent with other established goals, such as reducing criteria pollutant emissions and improving air quality, improving sustainability, and making investments that improve public health. Depending upon the specific strategy, reductions in GHG emissions may also align with other evaluation metrics, such as improved safety and equity.

11.5 Who—Roles and Responsibilities

Executive	Admin	**Planning**	**Programming**	Environmental
Design	Construction	Maintenance	Operations	**Regions/Districts**

Potential roles in GHG consideration in this functional area include

- **Executives—**Send a clear signal to staff that GHG emission reductions are to be considered and should shape the selection of projects for the program. The degree of weight ascribed to GHG reduction compared to other considerations will likely be a function of the State's and the DOT's priorities.
- **Planning/Programming Staff—**Ensure that necessary data and other information are available. Work with MPOs and other partners so the analysis is completed.
- **Environmental Staff—**Assist in emissions analysis. Ensure that analysis is done in a technically sound manner. Work with MPOs and other partners to explain the outcomes to interested parties.
- **Communications Staff—**Prepare information for the public and decision-makers regarding the program and its GHG effects. Work with MPOs and other partners and share information with affected agencies.
- **Region/District Staff—**Using local knowledge, assist in developing the program. Work with partner agencies to include consideration of GHG emissions in program development and approval.

11.6 Goal and Target Setting

GHG reduction goals and targets for the overall transportation system will typically be set in policy development (Section 5.0) or long-range/systems planning (Section 10.0), with programming being

a means of implementing the systems plan. However, the DOT may conduct quantitative evaluation of anticipated GHG reductions from the transportation program to compare against reduction goals set in the policy or planning stage.

11.7 Strategy Identification

Identifying GHG-reducing strategies as part of programming is inherent in the project evaluation and prioritization process that leads to the development of the program and also is covered in the design of individual projects (covered in Section 12.0). At the program development stage, therefore, the major "strategy identification" activity is to include GHG effects as a scoring/project selection criterion (see Section 11.8).

11.8 Strategy Evaluation

11.8.1 Evaluation of Individual Projects

Project evaluation and selection criteria may include GHG emissions either from a qualitative or quantitative standpoint. Quantitative data are most likely to be available for major projects, so a hybrid scoring system may be needed that considers quantitative data, where available, and otherwise assigns a qualitative rating. The project-specific GHG effects may be reported as part of environmental documentation developed for the project. The State DOT could also use tools such as Federal Highway Administration's (FHWA's) Congestion Mitigation and Air Quality (CMAQ) project calculators to estimate project-specific GHG emissions benefits. Tools for project-level GHG evaluation are described in Section 12.8.

11.8.2 Evaluation of the Overall Program

The evaluation of the effects of the TIP on GHG emissions may be either qualitative or quantitative. In some cases, it may be possible to evaluate the overall program for the change in GHG emissions compared to existing plus committed projects, before new projects are included. If a quantitative air quality analysis will be performed for the STIP, GHG can be easily included in this analysis. It

consists of adding another pollutant, usually atmospheric carbon dioxide (CO_2), to the Pollutant and Processes Panel in the Motor Vehicle Emission Simulator (MOVES) run specification [or Emission Factor (EMFAC) model in California]. If other GHG emissions are desired (such as CH_4), they can also be added to the panel. The results of the MOVES emission run(s) will then be compiled and compared either to a No-Build analysis (if one is done) or to previous analyses for different analysis years.

If a quantitative air quality analysis is not being considered for the program, but a quantitative GHG analysis is desired, then the level of effort becomes more extensive. If a programmatic analysis is being done using the statewide travel demand model and an emission factor model, sufficient data will need to be gathered to set up the necessary MOVES run(s) to generate GHG emissions. This will involve compiling traffic information, such as volumes, speeds, congestion, vehicle fleet mix, etc., as well as inputs specific to MOVES, such as scale of analysis, grade, years of analysis, temperature, road type, etc. To generate transportation network estimates of the necessary traffic variables, a transportation demand model may need to be used with the projects modeled into the network. The model may be run prior to entering the project information to generate a No-Build scenario and allow for a direct comparison of GHG emissions prior to and after completion of the program. In the absence of a transportation demand model, in order to generate quantitative estimates of GHG emissions, it will be necessary to develop estimates of vehicle miles traveled, speeds, and other data with the completion of the program. This could be done using historical trends, spreadsheet or worksheet tools, or other techniques to generate the needed data. The results of the MOVES emission run(s) would then be compiled and compared either to the No-Build analysis (if one is done) or to previous analyses for different analysis years.

Regardless of whether the assessment is qualitative or quantitative, the STIP narrative could then report

- A brief description of the program, highlighting projects, project types, or activities that are expected to result in a reduction of GHG emissions, as well as any projects and activities that might increase GHG emissions.
- A discussion of the effect of the program on various traffic variables such as volumes, speeds, congestion, transit ridership, vehicle fleet mix, etc., and how the resulting changes in these parameters will affect GHG emissions. Include the results of the GHG emissions analysis, if performed.

- A summary of whether the program, once complete, is expected to result in less or more GHG emissions from vehicles operating on the facility and other activities or funding (such as installation of electric vehicle charging infrastructure).
- A description of any regional or statewide GHG analyses that may exist, either from climate action plans or stand-alone analyses, and how the program aligns with those analyses. If the climate plans or stand-alone analyses have quantified GHG emissions, discuss how the program and its emissions analyses are consistent with or support the climate plans or stand-alone analyses.
- An overall conclusion regarding the program and its impact on GHG emissions, considering all the factors as described above.

11.9 Implementation

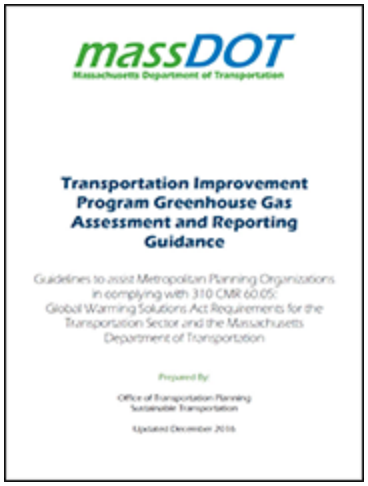
Implementation of GHG reduction strategies identified in the programming process is inherent in the adoption and implementation of the program.

11.10 Monitoring, Evaluation, and Reporting

Monitoring of GHG reduction impacts of programmed projects may be conducted as part of agencywide monitoring, evaluating, and reporting procedures, as described in Section 18.0.

How Massachusetts Considers GHG in Programming

Massachusetts requires consideration of GHG in both State- and metropolitan-level programming, including both project-level and program-level assessment. The Massachusetts Department of Transportation (MassDOT) provides guidance for MPOs to follow on this topic.



Project-level assessment requirements include the following:

- All STIP and regional TIP projects are subject to GHG assessment.
- For most projects, this will be a qualitative assessment of the direction of impact (increase, decrease, no impact) and its cause.
- Quantitative assessment is required for major projects per state guidelines.
- Reporting is required for each program cycle.

Program-level assessment requirements include the following:

- Program-level GHG evaluation for all TIPs and the STIP.
- Evaluation of programs for consistency with State GHG reduction targets.

MassDOT provides CMAQ spreadsheet project calculator tools to support quantitative project-level assessment.

11.11 Self-Assessment: Programming

A self-assessment worksheet is provided to assist State DOT staff in determining where their agency falls on the GHG engagement spectrum and what additional actions their division or unit may wish to take to measure and reduce GHG emissions. This worksheet pertains to DOT units and staff with responsibilities for the development of the State TIP and/or other capital programs.

Click to download – Self-Assessment: 11.0 Programming

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