Recommendations for MassDOT Project Selection Criteria

Project Selection Advisory Council Report to the Legislature

Stephanie Pollack, Chair
Frank DePaola
Linda Dunlavy
Jim Lovejoy
David Mohler
John M. Pourbaix
Jeffrey B. Mullan
Stephen Silveira

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Arabic: إن كنت بحاجة إلى هذه المعلومات بلغة أخرى، يُرجى الاتصال بأخصائي الفقرة السادسة على الهاتف 857-368-8580

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Introduction

The Project Selection Advisory Council (the Council) was established by Section 11 of Chapter 46 of the Acts of 2013 (the Act, see Appendix 1) and, "charged with developing a uniform project selection criteria to be used in the development of a comprehensive state transportation plan."

The eight members of the Council have worked for 18 months developing project selection criteria, holding public hearings across Massachusetts, listening to public testimony and input, and incorporating the legislatively recommended elements into this report.

The importance of investing strategically and transparently in our transportation network—nationally, as well as here in Massachusetts—is more critical today than it has ever been. Every resident, business and visitor of the Commonwealth is a customer of the Massachusetts transportation system, and MassDOT's ability to make capital investment decisions transparently is essential to building its credibility as a good steward of public resources. Given our aging transportation infrastructure, changing demographics, and evolving travel preferences, there needs to be a way to strategically prioritize our investments in order to achieve Commonwealth policy goals.

The recommendations documented in this report are a work in progress. The Council members have committed to continue to advise and monitor the implementation of these recommendations, and to suggest incremental improvements as MassDOT moves forward with the Council recommendations.

Project Priority Formula Recommendations

<u>Applicability of the Project Priority Formula</u>

The full universe of projects considered through the comprehensive state transportation planning process is very diverse, in terms of project scope, type (from routine operations and maintenance to billion dollar capital investments), mode, and cost. The Council strived to develop a project selection process that can be applied to as many of these project types as possible, while recognizing that – at least initially – certain categories of investments (for example, those prioritized through MassDOT's well-established and data-driven bridge and pavement systems) may warrant continued evaluation through their current processes. The Council's recommendations focus on the following broad classes of projects:

Modernization Projects are defined as those where the primary goal is to rehabilitate or replace existing assets in poor condition that have outlived their useful lives, but that need is then leveraged to "modernize" the asset to the greatest extent practicable.

Capacity Projects are those that add new connections to, or expand, the existing transportation network.

Criteria/Goals

The Council defined a set of overarching goals or "criteria" to guide transportation investment decision-making. These goals are as follows:

Scoring Systems

The Council came to recognize that developing a single scoring system that could accurately and appropriately evaluate every project would likely have a number of unintended consequences, including potentially disadvantaging certain important project types such as those advanced by Regional Transit Authorities (RTAs). Another challenge was that different project types – modernization vs. capacity – help advance different sets of goals. The Council ultimately recognized that the creation of separate scoring systems for different project categories would be necessary to fairly and effectively prioritize projects.

These six scoring system categories are as follows:

- Roads and Paths[1] Modernization
- Roads and Paths Capacity
- MBTA Modernization
- MBTA Capacity
- Regional Transit[2] Modernization
- Regional Transit Capacity

[1] Roads and Paths projects are those that are funded at least in part through MassDOT's Highway Division and include road, bridge, and multi-use path projects.
[2] Regional Transit projects are those funded through the Rail and Transit Division, excluding MBTA projects.

Weights

In determining how best to create a project prioritization formula based on the recommended goals/criteria for each of the scoring categories, the Council worked to adhere to the following principles:

- Focus on criteria that differentiate between projects
- Limit redundancy
- Maximize simplicity

To address these principles, the Council recommends applying different weights when scoring different types of projects. Table 1 provides an overview of the project priority formula with the goals/criteria and weights for each scoring system.

Table 1: Project Priority Formula Summary Table

Goals/Criteria	Roads & Paths Modernization	MBTA/Regional Transit Modernization[3]	Roads & Paths Capacity	MBTA/Regional Transit Capacity
Cost Effectiveness	15	20	20	25
Economic Impact	10		15	20
Environmental & Health Effects	10	5	10	10
Mobility	10	30	25	25
Policy Support	10	10	10	10
Safety	10	10	10	
Social Equity			10	10
System Preservation	35	25		
Total	**100**	**100**	**100**	**100**

Recommendations for Implementation

Framework

The Council's focus has been the development of a project priority formula that can effectively evaluate relative project merit. However, the formula represents only one step in the development of a balanced transportation investment program. A funding allocation by mode and asset category will be determined based on state of good repair needs, performance targets across modes, and the flexibility of available funding. A preliminary plan will then be developed based on the project priority ratings within each scoring system, project readiness, and the types of funding available. Next, the anticipated outcomes from the preliminary plan will be compared against the established performance targets and will also be reviewed for regional

[3] While the MBTA and Regional Transit scoring systems have the same set of measures and weights, those projects will not be directly compared against each other.

and social equity considerations. In cases where the program falls short of targets for investment levels in a particular asset category or mode, or where the distribution of funding appears unduly imbalanced by region, MassDOT may rebalance the program of investments. For example, if an asset falls short of its performance target, the highest scoring project not already in the plan that would improve that asset could replace the lowest scoring project of another asset.

Implementation Process

The Council anticipates the establishment of an **Implementation Committee** to be responsible for developing guidance for scoring projects and overseeing the initial implementation of the proposed framework as a whole. While the Implementation Committee will be led by MassDOT staff, its work will be informed by a **Stakeholder Advisory Committee** comprised of representatives from key external stakeholder groups. Both of these committees should be temporary, with their work considered complete once the initial implementation of the new project prioritization system has occurred.

The Council understands that these recommendations will, over time, transform the way MassDOT has selected and planned projects for many years. For that reason, the Council intends to monitor progress and adjust its recommendations over time. The work already completed, and the implementation work which begins with the submittal of this report to the Legislature, represent merely the first steps in a longer journey towards a transparent, data-driven approach to prioritizing investment decisions. And though much hard work remains to be done, the Council believes the implementation of the recommendations outlined in this report will place MassDOT on a much firmer foundation from which to strategically invest in the transportation needs of the Commonwealth.

1 Introduction

1.1 Establishment and Purpose of the Project Selection Advisory Council

The Project Selection Advisory Council (the Council) was established by Section 11 of Chapter 46 of the Acts of 2013 (the Act, see Appendix 1) and was "charged with developing a uniform project selection criteria to be used in the development of a comprehensive state transportation plan..." Among other requirements, the Act directs that the criteria developed by the Council, "shall include a project priority formula or other data-driven process that shall include, but not be limited to, the following factors: engineering; condition of existing assets; safety; economic impact; regional priorities; and the anticipated cost of the project." The eight members of the Council have worked for 18 months to respond to the requirements of the Act: developing project selection criteria; holding public hearings across Massachusetts; listening to public testimony and input; and incorporating all of the legislatively recommended elements into this report (See Appendix 2 for a listing of Council meetings and public hearings).

The recommendations in this report go beyond assets owned by MassDOT to all capital investments that are funded in whole or part by MassDOT. This includes Commonwealth-funded MBTA investments, and municipal and Regional Transit Authority (RTA) investments funded through the Metropolitan Planning Organization (MPO) federal-aid process that require state matching funds.[4]

1.2 Why a New Approach?

The importance of investing strategically in our transportation network—nationally, as well as here in Massachusetts—is more critical today than it has ever been, for the reasons described below:

Transparent Decisions Build Public Confidence. Every resident and visitor of the Commonwealth is a customer of the Massachusetts transportation system. In pursuit of an efficient and reliable experience for these customers, MassDOT makes significant investments in its capital assets every year. The need to do so transparently and in a way that can be simply communicated to the public and elected officials is essential to building the credibility of the transportation agencies as good stewards of our public resources.

Redefining and Maximizing the Return on our Investments. Transportation is not an end in itself, but an investment where the return is the advancement of other shared goals: a strong and sustainable economy; a high quality of life; equal access to jobs and opportunity; environmental stewardship; public health and safety. Throughout its work, the Council has acknowledged that taking these factors into account when prioritizing transportation investments

[4] Excluding Chapter 90 assistance.

is the only effective and responsible path to achieving these goals and maximizing the return on our transportation infrastructure investments.

A Network in Need. Large portions of our transportation network do not currently meet the standards for modern, well-maintained infrastructure. Whether it is the $6.7 billion "State of Good Repair backlog" at the MBTA or our 446 structurally deficient bridges across the Commonwealth, and despite measurable progress made in the last decade, the extent of our capital transportation needs is daunting. For the foreseeable future, state of good repair investments will dominate the comprehensive transportation plan. In FY 2016, approximately two-thirds of MassDOT's Highway capital program is going towards maintaining our existing system.

However, despite the need to be good stewards of our existing transportation infrastructure system, Massachusetts is growing and demographics and preferences are changing. The Commonwealth cannot solely rebuild the same transportation system it had decades ago. Any investments that are made to modernize our infrastructure or expand capacity must be strategic to maximize the return on the dollars we are able to spend on such investments. Using a data-driven project prioritization system will maximize the likelihood that we are selecting the right projects, at the right times, to meet our most pressing needs. The Council is aware that MassDOT has not yet developed all of the data-sets to compliment the scoring system that is being recommended, but that it is a priority of the agency, and that personnel have been dedicated to the task, including the identification of an Assistant Secretary charged with coordinating data collection efforts.

Prioritized Decision-Making. The combination of our aging transportation system, stagnant federal funding, and the long-term uncertainty from revenue sources like the fuel tax underscore the need to spend our capital dollars prudently, thoughtfully, and in service of established policy goals. Advancing projects simply because they are "next in line" and not because of merit can no longer be how business gets done.

Despite the progress represented by this report, the Council's recommendations are still a work in progress. The Council recognizes that some issues remain unresolved and that the scoring system developed needs to be monitored and tested. Assuming no objection from its appointing authorities, the Council intends to remain in place, to initially meet quarterly to monitor progress in implementing these recommendations, and to recommend improvements toward its goal of establishing the best project selection process in the nation. The Council's next meeting is anticipated to occur by October 2015, after MassDOT representatives have had an opportunity to consider and work with these recommendations.

1.3 About this Report

This report represents only the first step in the transition to the Act's goal of an easy to understand, transparent, data-driven, cross-modal approach to prioritizing transportation investments. During the course of its work, the Council gained an appreciation for the complexity inherent in developing a single tool capable of ranking all potential investments,

regardless of mode, scale, or location. Regional diversity, inflexible funding programs, existing asset management systems, legal mandates, diverging programming schedules, and the ever-present tension between modernizing and repairing our existing system and strategically expanding system capacity all pointed to the need for a more comprehensive prioritization process than a single, 'one-size-fits-all' scoring system.

In recognition of this complexity, this report describes additional steps beyond this *project prioritization system* to ensure that MassDOT pursues an equitable, diverse, and strategic *investment program*. These additional steps – to ensure regional and socioeconomic equity, a modally balanced program, and the most cost-effective use of scarce funding – must, like the project prioritization system itself, be both data-driven and transparent.

Chapter 2 identifies the universe of projects that should be evaluated using project prioritization criteria. Chapter 3 explains the set of criteria and the scoring systems recommended to be used for various project types. Chapter 4 outlines plans for implementation and illustrates how the project priority formula fits into the larger context of program development in furtherance of the goal toward a regionally- and modally-balanced transportation investment program.

The Council understands that the Baker-Polito Administration, through Secretary of Transportation Stephanie Pollack (who serves as Council Chair), is committed to using the recommendations from this report in the development of the FY2017-FY2021 MassDOT and MBTA programming documents. Work on those documents will begin soon, so the output from the Council process and the completion of this report represent the beginning of a comprehensive and iterative implementation effort to shape our fundamental capital investment practices.

2 Projects for Selection

2.1 Applicability of the Project Priority Formula to the Universe of Projects

The full universe of projects considered through the comprehensive state transportation planning process is very diverse, in terms of project scope, project type (from routine operations and maintenance to billion dollar capital investments), mode, and cost. Project origins are equally varied. Those originating from within MassDOT or the MBTA can evolve out of needs identified in a technically complex asset management program, from a regional effort toward an identified need, or from a corridor planning process with an extensive civic engagement campaign. Additional projects are proposed by other entities, including bridge, roadway, path and transit project requests from the Commonwealth's 351 cities and towns or Regional Transit Authorities (RTAs) that are funded through the Metropolitan Planning Organization federal-aid process, and require state matching funds.

Consistent with the requirements of the Act, the Council strived to develop a project selection process that can be applied to as many of these project types as possible, while recognizing

that certain categories of investments may warrant evaluation through their current process, at least in the initial rollout of the recommendations in this report.

2.1.1 Investments Subject to the Scoring System

The Council believes the value of the project priority formula is to help guide those decisions where MassDOT leadership has real choices—about where and how to invest in changes to the transportation system—and where those choices can be expected to have the greatest impact on quality of life and economic competitiveness. Moreover, MassDOT already has existing systems in place for prioritizing some categories of routine state of good repair investments. For these reasons, the Council recommends that, in its initial application, the project priority formula apply only to those capital investments that **modernize** or expand **capacity** of the Commonwealth's existing transportation system.

Modernization Projects are defined as those projects where the primary goal is to rehabilitate or replace existing assets in poor condition that have outlived their useful lives. But that need should be leveraged to "modernize" the asset to the greatest extent practicable. These improvements can include incorporating new technology or making other enhancements to support economic development, improve mobility, reduce environmental impacts, or increase safety.

Capacity Projects are those that add new connections to, or expand, the existing transportation network. While capacity projects may start with assets that are currently part of the Commonwealth's transportation system, the purpose of capacity projects is to add new assets to the system in order to meet increased or new demand, such as a new lane, roadway link, bridge, transit station, service or line, or multi-use path.

2.1.2 Investments Prioritized Outside of the Scoring System

Unlike modernization and capacity projects that make some change to the transportation system, some MassDOT-funded capital activities, such as programmatic contracts for particular purposes, are maintenance or basic state of good repair investments that fulfill baseline requirements for a safe and well-functioning system. The need significantly outweighs the funding available for state of good repair projects, so a mechanism by which to prioritize these investments is just as important as it is for modernization or capacity projects. However, unlike modernization and capacity projects, the scope of many maintenance and state of good repair investments is much more straightforward, making comparisons with other project types less instructive.

Many of these investments – such as the pavement and bridge programs, or certain MBTA state of good repair projects – are prioritized through established and rigorous evaluation and asset management systems (see Appendix 3). These asset management systems inform decision makers about the optimal set of projects to work towards asset performance targets given a certain funding level. The most recent federal transportation bill, Moving Ahead for Progress in the 21st Century (MAP-21), as well as state law, has put a greater emphasis on the development of more strategic asset management planning, target setting, and the prioritization of activities that improve the condition of the existing network. Considerable work has been done outside of

the Council activities to integrate systems and improve the effectiveness of asset management within MassDOT and the MBTA.

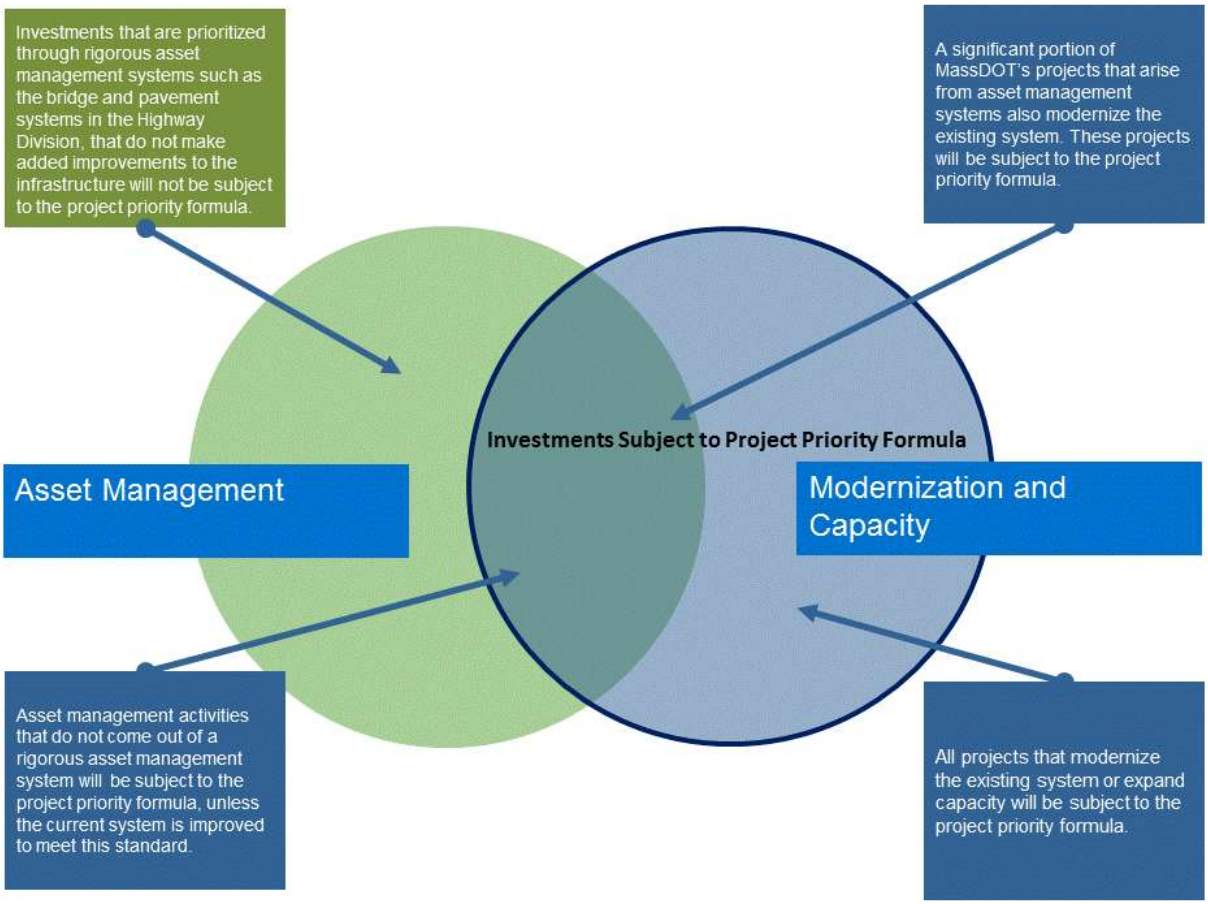
The Council has debated considerably over whether and how to fairly integrate projects that arise from the existing systems designed to optimize asset management decisions into a uniform project evaluation system that is focused on evaluating improvements to the system. While the Council agrees that basic maintenance contracts do not rise to the level of an investment that should be screened by a project priority formula, some of the projects prioritized through asset management programs go beyond basic state of repair and actually modernize the existing system.

The Performance and Asset Management Advisory Council (PAMAC), has been charged by the Legislature[5] to advise MassDOT on how to improve its asset management processes in accordance with state and federal regulations. The Council will continue to work with PAMAC and MassDOT asset managers to determine how to best define a subset of projects originating from these asset management systems that should be considered modernization projects and therefore subject to the project priority formula.

The graphic below illustrates how the various types of investments fit in to the process being recommended by the Council.

[5] M.G.L. Chapter 46 of the Acts of 2013, Section 12

Figure 1: Purpose of Investment and Inclusion in Project Priority Formula



While MassDOT's bridge and pavement asset management programs adhere to the U.S. DOT definition of asset management[6], asset management systems for other MassDOT assets or projects receiving state funding have not been fully vetted by the Council. Until the Council has had an opportunity to better understand these systems, investments prioritized through them should be subject to the project priority formula as a secondary screen to determine the appropriateness of a state funding commitment. As project initiators continue to work towards meeting state and federal requirements for asset management, these projects may become excluded from the project priority formula review.

As will be outlined in Chapter 4, even those investments that come out of asset management systems that will not be subject to the project priority formula should still be incorporated into the

[6] The US Department of Transportation defines asset management as follows: Asset Management is a strategic and systematic process of operating, maintaining, and improving physical assets, with a focus on engineering and economic analysis based upon quality information, to identify a structured sequence of maintenance, preservation, repair, rehabilitation, and replacement actions that will achieve and sustain a desired state of good repair over the lifecycle of the assets at minimum practicable cost. (23 U.S.C. 101(a)(2), MAP-21 § 1103)

broader project selection framework recommended by the Council. Incorporating these projects into this framework will lend fairness and transparency to decisions about how much funding to allocate to these asset programs, representing an improvement over current practice.

3 Project Priority Formula

This chapter provides an overview of the recommended criteria against which projects should be evaluated; describes six scoring systems designed specifically to ensure that like projects can be fairly compared against each other; reviews the specific criteria and weights applied to each scoring system; and highlights the major data needed for the proposed formula to be effective.

3.1 Goals/Criteria

The first step taken by the Council was to define the set of overarching goals or criteria that should guide transportation investment decision-making. The Act requires that at a minimum the following considerations be incorporated into the uniform project prioritization system:

- Condition
- Engineering
- Anticipated Cost
- Economic Impact
- Safety
- Regional Priorities

The Council incorporated these factors, in addition to others, into its recommended set of project selection goals/criteria, as described below. The Council recognizes the challenge inherent in reducing the broad scope of transportation investment benefits to seven goals/criteria. At the same time, it would be impossible to design a prioritization system that captured every potential project benefit or burden without reducing the importance of the recommended criteria listed above. For that reason, the Council identified the following goals/criteria as the key principles by which proposed investments should be judged.

System Preservation (Condition[7]): Projects should contribute to the overall state of good repair of the transportation system.

The functioning of our existing system is critical to the economic health and livability of the Commonwealth. The Council's goal was to develop a prioritization system that places significant emphasis on state of good repair issues, and does so in a way that favors proactive and cost-effective investments in existing assets rather than reliance on a reactive approach to

[7] The terms in parentheses reflect the language in the Act. The Council had been using alternative language through much of the process, but wanted to note where they correspond to what was requested in the Act.

preservation. This goal/criterion will contribute to other asset management targets as set by MassDOT or the U.S. DOT.[8]

Mobility (Engineering): Projects should provide modal options efficiently and effectively.

Mobility is the core of transportation – the ability to get people and goods to their destination safely and reliably, in a reasonable amount of time and in a cost-effective manner. The Council embraced the principle that moving people and goods is key to successful and sustainable mobility. This idea represents a fundamental shift away from the conventional focus of transportation engineers solely on the movement of vehicles, regardless of the number of people carried in each vehicle.

Cost Effectiveness (Anticipated Cost): Given limited resources, projects should result in benefits commensurate with costs and should be aimed at maximizing the return on the public's investment.

The Council believes the cost effectiveness of proposed solutions is of critical importance. The Council also believes that a project's cost is not a factor that can be divorced from a project's merit.

Economic Impact: Projects should support strategic economic growth in the Commonwealth.

Transportation infrastructure increases economic activity by increasing access. It may also increase the attractiveness of the region to residents and for investment. The Council believes it is important to target transportation investments strategically to support local economic development plans in order to maximize our returns.

Safety: Projects should contribute to the safety and security of people and goods in transit and the safety and security of the system itself.

While any safety-critical issues should always be addressed expeditiously, the Council believes it is important to prioritize projects that address identified safety concerns, such as high crash locations on the roadway network.

Social Equity & Fairness: Projects should equitably distribute both benefits and burdens of investments among all communities.

The Council's recommended criteria are intended to help prioritize spending that ensures equitable investing.

Environmental & Health Effects: Projects should maximize the potential positive health and environmental aspects and minimize any negative environmental impacts and/or health consequences of the transportation system.

MassDOT has a legal obligation to reducing greenhouse gas emissions from the transportation sector in the Commonwealth and to incorporate project-level impacts into project selection.

[8] M.G.L. Chapter 46 of the Acts of 2013, Section 4

Beyond this legal commitment, transportation projects can have a significant impact on public health, as well as on the health of our wetlands, water supply, and wildlife. MassDOT must take all of these factors into consideration when evaluating transportation investments.

Policy Support (Local, Regional, or State Priorities): Projects should get credit if they support local or regional policies or plans; or state policies not addressed through the other criteria. This may include adherence to American with Disabilities Act (ADA) compliance planning, addressing resiliency plans for severe weather, supporting housing creation plans, or other clearly defined plans or policies.

3.2 Creation of Multiple Scoring Categories

As the Council worked to translate these broad goals/criteria into a project prioritization system, it was confronted with a challenge. The Council shares MassDOT's focus on multi-modalism and on the importance of identifying the most appropriate and cost-effective mobility solutions, regardless of mode. This outlook initially suggests that projects should be evaluated against each other and across modes, particularly as a large portion of transportation funding is flexible and not restricted to a single mode or project type. This is particularly true given MassDOT's multi-modal mandate and the widespread support of the "one transportation agency" concept that resulted in the creation of MassDOT in 2009.

However, the Council came to recognize that developing a single scoring system that could accurately and appropriately evaluate every project would likely have a number of unintended consequences, including potentially disadvantaging certain important project types. As an example, by separating out transit projects from roadway and multi-use path projects, MassDOT can ensure that the best projects from both categories will be included in the final program. It was also feared that the scope and scale of MBTA projects would frequently dwarf Regional Transit Authority projects. So, these projects will also initially be looked at separately.

Another example of this challenge of comparing all projects against the same set of criteria came with the application of the System Preservation criterion. Modernization projects, whose primary rationale is to rehabilitate or replace existing assets in poor condition, should obviously have their merits determined largely on their ability to meet system preservation goals. Applying the System Preservation criterion in the same manner to Capacity projects would only serve to discount some of the primary goals of those projects – new or expanded access in pursuit of improved mobility and economic development, for example.

The Council ultimately recognized that a separate set of metrics was necessary to fairly and effectively evaluate projects by type: Roads and Paths vs. MBTA vs. Regional Transit; as well as by goal: Modernization vs. Capacity. For these reasons, the Council accepted the legislative requirement to categorize projects for the purposes of scoring, with each category representing a set of measures and weights most appropriate for the category. The Council believes that dividing projects in this manner affirms, rather than discounts, the multimodal needs of the Commonwealth by ensuring that all modes and goals are given due consideration and that projects of various types are fairly evaluated and ranked as MassDOT balances its program and

develops the statewide plan. As will be described in Chapter 4, the Council is also proposing recommendations for a broader project selection framework that will ensure that funding decisions across scoring categories are based on a unified understanding of the tradeoffs in investment decisions across modes.

The six scoring system categories are:

Roads and Paths projects included in the framework refer to all capital investments that are funded at least in part through the MassDOT Highway Division, including bicycle and pedestrian facilities, roadway, and bridge projects. These include municipally proposed projects on municipal assets requiring state funding.

MBTA projects refer to all capital investments related to MBTA service. This would include any projects related to the vehicles, track, stations, transit stops, signals, and power, as well as maintenance facilities that support the functioning of the transit service.

Regional Transit projects refer to non-MBTA transit service including Regional Transit Authority (RTA) capital projects, intercity bus service, statewide paratransit projects, and non-MBTA rail service.

3.3 Project Scoring System by Category

In determining how best to create a project prioritization formula based on the recommended goals/criteria for each of the scoring categories, the Council worked to adhere to the following principles:

Focus on criteria that differentiate between projects
In recommending goals/criteria and then applying weights to the various scoring categories, the Council strived to ensure that each criterion would have the potential to differentiate among projects. For example, if a MassDOT or federal policy effectively enshrined certain goals into project design such that all projects would score positively for that criterion, the Council de-emphasized that criterion. As an example, all transit expansion projects are inherently designed with safety as a top priority, rendering that criterion unhelpful to differentiate among competing projects.

Limit redundancy
Many criteria are inter-related. For example, improving safety can improve mobility and improving mobility has an economic impact. To reduce redundancy in the prioritization process, the Council worked to develop measures that focused as much as possible on the specific criterion, with the understanding that any overlapping benefits would be captured collectively by the full set of criteria.

Maximize simplicity
Making the project selection process more understandable and transparent is one of the most important reasons for the creation of the Council. Given the variety of project types, operating entities, system needs, and project purposes, developing a system that is easy to understand is a very challenging task. The Council worked hard to simplify the proposed process so that it can be most easily applied and understood by as broad an audience as possible to foster the greatest participation and level of acceptance.

Figure 2 provides an overview of the project priority formula with the criteria and weights for each scoring system.

Figure 2: Project Priority Formula Summary Table

Goals/Criteria	Roads & Paths Modernization	MBTA/Regional Transit Modernization	Roads & Paths Capacity	MBTA/Regional Transit Capacity
Cost Effectiveness	15	20	20	25
Economic Impact	10		15	20
Environmental & Health Effects	10	5	10	10
Mobility	10	30	25	25
Policy Support	10	10	10	10
Safety	10	10	10	
Social Equity			10	10
System Preservation	35	25		
Total	**100**	**100**	**100**	**100**

The sections below explain the rationale for each scoring system as well as the anticipated data needs for each scoring system. The italicized data-sets in the tables are those that may not be consistent across project types within that scoring system. Examples of inconsistencies include asset management inventory, condition, and maintenance data on non-state owned or maintained roadways. Another example is the limited data on bicycle and pedestrian usage or demand.

3.3.1 Roads and Paths Modernization

Figure 3: Roads and Paths Modernization Scoring System

Criteria	Weight	Objectives	Data Needs
Cost Effectiveness	15	• Minimize public cost per persons served	• *Current number of road/path users* • *Anticipated number of road/path users as a result of the project* • Capital cost of the project • *Future maintenance costs of the project* • Availability and amount of private or municipal funding, or certain types of federal funding which are restricted to the specific project in question

Economic Impact	10	• Support local, regional, and state economic development plans and strategies	• *Investment priority areas defined by EOHED*[9] • Corridor development plans • Local or regional plans • Documentation on how project could support development
Environmental & Health Effects	10	• Reduce health and environmental impacts of criteria air pollutants and greenhouse gas emissions • Reduce impact to natural and cultural resources	• Transportation demand modeling outputs • Federally required air quality analysis modified to incorporate greenhouse gases • GPS data of environmental resource areas
Mobility	10	• Improve persons per hour throughput in a congested area • Strategically improve bicycle, pedestrian, and transit access and connectivity	• Average Daily Traffic (ADT) • Transit trips and ridership along the corridor • *Bicycle and pedestrian usage in the area* • Bicycle, pedestrian, and transit planning documents • Travel demand model output
Policy Support	10	• Support local, state, or regional policies or goals not accounted for in other criteria.	• Existing written documentation on policies or goals and how project will contribute.
Safety	10	• Reduce fatalities and severe injuries	• *Vehicle crash data (property, injury, fatality), bicycle and pedestrian crash data*
System Preservation	35	• The extent to which the project meets a need identified in an asset management plan, fulfills asset management goals, and is supported by asset management data. • The extent to which expensive ongoing maintenance is required unless the capital project is completed.	• *Asset condition* • Ideal treatments and timing • *Current and anticipated maintenance costs on corridor as a result of delaying the project*

Given the enormous need for repair and upgrade within our roadway network, the Roads and Paths Modernization scoring system puts significant emphasis on selecting projects that contribute to System Preservation goals.

[9] As of the release of this document, EOHED has only defined priority areas for certain regions, but plans to coordinate with all regions to develop priority areas statewide.

Other policy benefits of Modernization projects receive roughly equal weight. Social Equity is not included in this scoring category because the Council believes that equity is less relevant on a project level basis for modernization projects, as opposed to capacity projects that result in major changes to mobility or access. This is also an example of the Council's intent when it created the Policy Support criterion, as those Modernization projects deemed to be beneficial to social equity would get credit under Policy Support.

The Environmental & Health Effects criterion, while important, was not weighted more heavily because there was consensus among the Council that this factor would not be a significant differentiator. In addition to being a national leader in this area, MassDOT is subject to rigorous federal and state laws and regulations related to environmental impacts and greenhouse gas. Projects that would set MassDOT backwards in achieving its greenhouse gas reduction goals, or that would cause significant harm to the environment or public health, should be eliminated from consideration prior to initiation.

3.3.2 Roads and Paths Capacity

Figure 4: Roads and Paths Capacity Scoring System

Criteria	Weight	Objectives	Data Needs
Cost Effectiveness	20	• Minimize public cost per persons served	• *Current number of road/path users* • *Anticipated number of road/path users as a result of the project* • Capital cost of the project • *Future maintenance costs of the project* • Availability and amount of private or municipal funding, or certain types of federal funding which are restricted to the specific project in question
Economic Impact	15	• Support local, regional, and state economic development plans and strategies	• *Investment priority areas defined by EOHED* • Corridor development plans • Local or regional plans • Documentation on how project could support development

Environmental & Health Effects	10	• Reduce health and environmental impacts of criteria air pollutants and greenhouse gas emissions • Potential impacts to natural and cultural resources	• Transportation demand modeling outputs • Federally required air quality analysis modified to incorporate greenhouse gases • GPS data of environmental resource areas
Mobility	25	• Improve persons per hour throughput in a congested area • Strategically improve bicycle, pedestrian, and transit access and connectivity	• Average Daily Traffic (ADT) • Transit trips and ridership along the corridor • *Bicycle and pedestrian usage in the area* • Bicycle, pedestrian, and transit planning documents • Travel demand model output
Policy Support	10	• Supports local, state, or regional policies or goals not accounted for in other criteria	• Existing written documentation on policies or goals and how project will contribute
Safety	10	• Expected reduction in fatalities and severe injuries	• *Vehicle crash data (property, injury, fatality), bicycle and pedestrian crash data*
Social Equity/Fairness	10	• Project provides mobility and/or environmental benefits to residents of Title VI or environmental justice communities • Title VI community has demonstrated support for the project	• GPS data on environmental justice and Title VI communities

Although the Roads and Paths Capacity and Modernization scoring systems are similar, a greater emphasis was given to Mobility and Economic Impact for capacity projects than for modernization projects.

Cost Effectiveness is also given a greater weight in order to ensure that the Commonwealth's investments in new transportation infrastructure are strategic in terms of impact and cost.

Although all projects will be designed with safety as the number one priority, Safety is included as a criterion and differentiator in this category because some Roads and Paths Capacity projects will be able to address existing safety concerns in a corridor or at a particular location.

3.3.3 MBTA and Regional Transit Modernization

Figure 5: MBTA and Regional Transit Modernization Scoring Systems

Criteria	Weight	Objectives	Data Needs
Cost Effectiveness	20	• Minimize public cost per persons served • Minimize net impact on operating costs	• Current number of users on facility • Anticipated number of users as a result of the project and other growth • Capital cost of the project • *Future maintenance costs of the project* • Availability and amount of private or municipal funding, or certain types of federal funding which are restricted to the specific project in question.
Environmental & Health Effects	5	• Potential to reduce pollution and consumption of natural resources • Potential to promote mode shift	• Transportation demand modeling outputs • Federally required air quality analysis to incorporate greenhouse gases • GPS data of environmental resource areas
Mobility	30	• Potential to improve persons per hour throughput, reliability, efficiency, accessibility, or service quality	• Types of improvements • User demographics
Policy Support	10	• Supports local, state, or regional policies or goals not accounted for in other criteria.	• Existing written documentation on policies or goals and how project will contribute.
Safety	10	• Project is specifically intended to address significant identified safety threat.	• Project is specifically intended to address identified safety threat.
System Preservation	25	• The extent to which the project meets a need identified in an asset management plan, fulfills asset management goals, and is supported by asset management data. • The extent to which maintenance is required.	• *Asset condition* • Ideal treatments and timing • *Current and anticipated maintenance costs as a result of delaying the project*

The MBTA already utilizes a prioritization process that is generally in line with the investment priorities agreed to by the Council. Consequently, the recommendation here strikes a balance between the MBTA's existing scoring concepts and framework, and certain adjustments and additional criteria deemed necessary by the Council.

The additional criteria include Cost Effectiveness, Safety, and Policy Support. The Safety criterion was included due to the concern that the existing MBTA scoring system could potentially undervalue projects with justifiable safety benefits that do not reach the point of being safety critical.

As with Road and Path Modernization, MBTA Modernization does not include Social Equity as a separate project selection criterion.

The Council recommends applying the same criteria and weights for Modernization to both the MBTA and Regional Transit scoring systems. Although the project scopes may differ, a good transit project should have the same types of benefits.

3.3.4 MBTA and Regional Transit Capacity

Figure 6: MBTA and Regional Transit Capacity Scoring System

Criteria	Weight	Objectives	Data Needs
Cost Effectiveness	25	• Minimize public cost per persons served • Minimize net impact on operating costs	• Current number of users on the facility • *Anticipated number of users as a result of the project and other growth* • Capital cost of the project • *Future maintenance costs of the project* • Availability and amount of private or municipal funding, or certain types of federal funding which are restricted to the specific project in question.
Economic Impact	20	• Support local, regional, and state economic development plans and strategies	• *Investment priority areas defined by EOHED* • Corridor development plans • Local or regional plans • Documentation on how project could support development

Environmental & Health Effects	10	• Potential to reduce pollution and consumption of natural resources • Potential to promote mode shift	• Transportation demand modeling outputs • Federally required air quality analysis modified to incorporate greenhouse gases • GPS data of environmental resource areas
Mobility	25	• Potential to improve persons per hour throughput, reliability, efficiency, accessibility, or service quality	• Types of improvements • User demographics
Policy Support	10	• Supports local, state, or regional policies or goals not accounted for in other criteria	• Existing written documentation on policies or goals and how project will contribute.

The Council recommends that both MBTA and Regional Transit Capacity projects also be evaluated against the same set of criteria (although, again, MBTA projects will not be directly compared to Regional Transit projects). As with the Roads and Paths Capacity scoring system, more points are allocated to Mobility and Economic Impact as they are often the primary impetus for capacity projects.

Cost Effectiveness is given more weight under these scoring systems than Roads and Paths Capacity. The Council felt that cost effectiveness is a more important differentiator for transit projects than it is for Roads and Paths projects.

Safety is not included in these scoring systems because unlike Road and Path Capacity projects, it is not a differentiator for transit capacity projects. Because of the nature of transit capacity projects, the Council could not envision a case where a new transit asset would result in a clear safety improvement along the existing network. And as with Road and Path Capacity projects, all transit capacity projects should be designed with safety as the number one priority.

4 Implementation

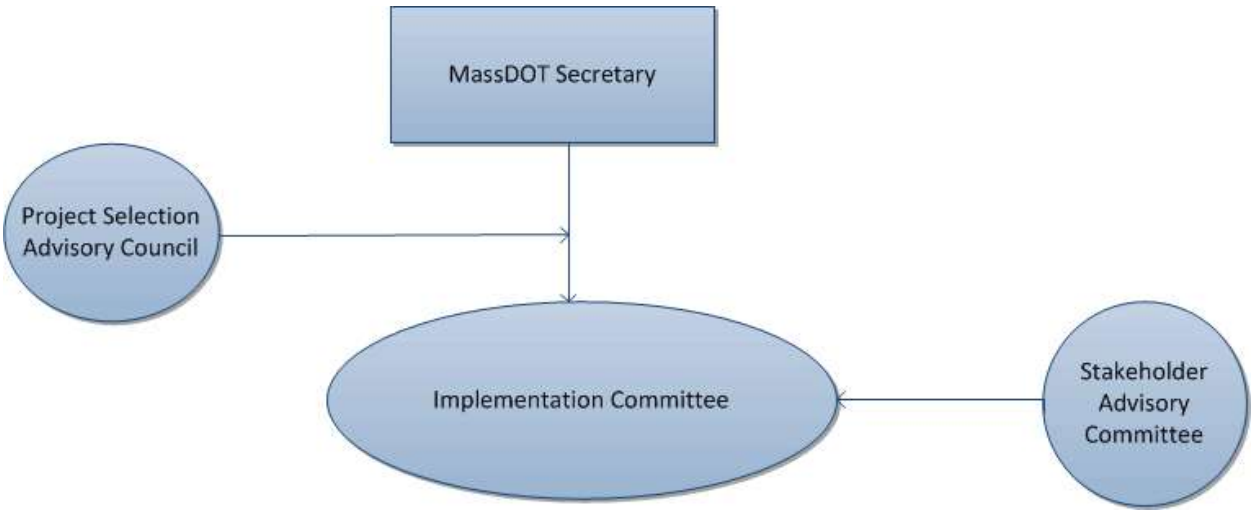
4.1 Process for Implementation

The Council's focus has been the development of a project priority formula that can effectively evaluate relative project merit, as described in Chapter 3. However, the formula represents only one step in the development of a balanced program. The Commonwealth needs to meet state and federal performance goals in a manner that is both regionally balanced and socially equitable – an outcome that can't be secured solely through an assessment of merit at the project level. The Council proposes the following framework, of which the project priority formula

is the centerpiece, in order to ensure transparency and technical rigor in the development of the comprehensive statewide transportation plan and MassDOT's capital program.

The Council anticipates the establishment of an Implementation Committee to be responsible for developing the guidance for scoring projects and for the implementation of the proposed framework as a whole at MassDOT. While the Implementation Committee will be led by MassDOT staff, its work will be informed and supported by a Stakeholder Advisory Committee that will include representatives from key external stakeholder groups including other state agencies such as the Executive Office of Housing and Economic Development, metropolitan planning organizations, RTAs, municipalities, advocacy organizations and other stakeholder groups. The role of the Stakeholder Advisory Committee should be temporary (during the initial implementation period of the Council's recommendations) and should focus on the mechanics of how to apply various criteria and other specific details of implementation – not on revisiting the Council's broader recommendations. Figure 7 illustrates the relationships between these entities and the Council, which will provide oversight and advise the work of the Implementation Committee. From time to time, the Council anticipates that it will supplement this report with additional recommendations.

Figure 7: Structure for Implementation Activities



This Implementation Committee, under the oversight of the Council, should be responsible for implementing the recommendations of the Council and for determining what the Council has not explicitly determined in terms of the 'who' and 'how' of implementation, including addressing the following items not finalized by the Council:

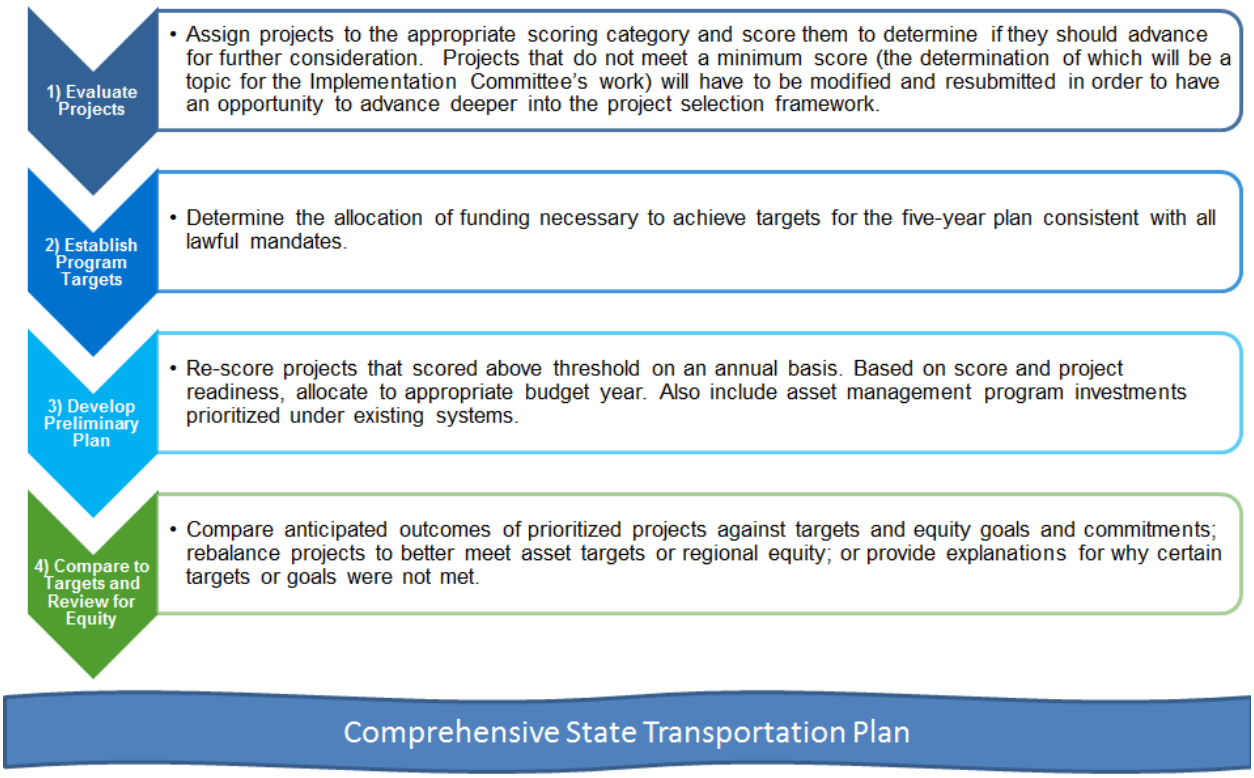
- Defining at what **threshold projects should not advance** past Step 1 of the framework laid out in Section 4.2.1.
- Developing guidance for **reviewing the existing backlog of projects** that have not been funded or have not advanced significantly through the design process.
- Identifying the best approach for **considering MPO priorities** that evolve out of their existing evaluation systems.

- Establishing who will be scoring which projects and the specific guidance for scoring. The Council recommends that the responsibility for scoring individual projects will lay with **category-specific scoring committees** comprised of relevant subject matter experts. These committees may include representatives from non-transportation agencies such as the Executive Office of Energy and Environmental Affairs or the Executive Office of Housing and Economic Development. All scoring results will be made publicly available to ensure transparency.
- Developing **a proposed calendar** of the overall process so project proponents and other stakeholders understand what opportunities **for public review and input** exist and when they will occur.
- Addressing data challenges for fair project evaluation. The Council identified **gaps in data and data inconsistency** between MassDOT- and municipally- owned roads, or across municipalities, as an issue that will need to be addressed. Work will need to be done to ensure that until data-sets are complete and robust, accommodations can be made to ensure the scoring is fair across projects.

Beyond the establishment of initial guidance, the Implementation Committee will be responsible for monitoring the success of the process and recommending any adjustments that would improve upon the formula or framework. In addition to oversight by the Council, these recommendations will be made as part of a public process. MassDOT should develop and maintain a website dedicated to the project selection process and progress.

4.2 Project Selection Framework

The four-step framework for capital program development can be summarized follows:



4.2.1 Step 1: Project Evaluation

The project priority formula recommended in Chapter 3 should be applied to projects at two different points in their development. The first time will be at project initiation. MassDOT will assign projects to one of the six scoring categories described in the previous chapter. Each of the six scoring categories will have their own scoring committee of subject matter experts. Only projects scoring above a (to be determined) minimum threshold would advance through the subsequent steps in this framework. These minimum thresholds may differ by scoring category and may change over time. Initial evaluation scores will be made available to the public.

4.2.2 Step 2: Establish Program Targets

The MassDOT Secretary will set the desired investment levels – across asset categories and modes—based on available funding for the comprehensive statewide transportation plan and taking into account consideration of legislative requirements and other legal mandates. A multi-modal scenario-planning tool, like the MassDOT-developed *Planning for Performance* tool (see sidebar) should inform this decision, by advising MassDOT leadership of the potential program performance implications of various investment scenarios and permitting those decisions to be easily understood and discussed.

4.2.3 Step 3: Develop Preliminary Program

Once funding targets are established, all projects under consideration for inclusion in the comprehensive statewide transportation plan will be evaluated (including those scored under pre-existing scoring systems), and a recommended plan will be generated based on project scores and the program targets established in Step 2. Projects should be rescored on an annual base to ensure that any modifications to scope or cost are reflected in their score. Significant changes in a project score could have an impact on whether or what year it would be programmed for funding.

4.2.4 Step 4: Comparison to Targets

In this step, MassDOT should compare the proposed program developed in Step 3 against the targets established in Step 2. MassDOT should also consider whether the proposed program is regionally balanced and meets federal Title VI requirements for an equitable program, as described below.

Modal and Asset Balance: As described above, the *Planning for Performance* or a similar scenario-planning tool will be used to assist MassDOT leadership in setting modal and asset-level performance targets relative to available funding. A comparison of the anticipated outcomes of the proposed program to the targets set in Step 2 will be determined and made available on the project selection process website.

Sidebar: Planning for Performance Tool Update

In the Council's review of existing tools and systems, the Council has found that the weMove Massachusetts's *Planning for Performance* tool has the potential to allow for robust, data-driven decision making in the allocation of funding across modes and asset classes. *The Planning for Performance* tool can help inform MassDOT's decisions on how to spend resources to maximize return on investment in terms of performance. The tool allows decision-makers to allocate funding to divisions and then to asset categories to understand the impact that a given funding level will have on performance for each asset category to help determine the most cost effective investment strategy.

MassDOT is in the process of modifying the *Planning for Performance* tool to address the recommended framework for project prioritization. Modifications will introduce additional asset categories, adjust performance measures to better accommodate MAP-21 and MassDOT specific measures of performance, and better incorporate MassDOT specific data instead of national averages. Asset performance projections generated by the tool should be made publicly available.

Regional Balance: MassDOT is charged in its enabling legislation with ensuring "regional equity related to transportation planning, construction, repair, maintenance, capital improvement, development and funding."[10] Accordingly, one of the major considerations in the Council's development of a project priority formula was to ensure that funding is distributed in a regionally balanced way across the Commonwealth.

The Council considered using the Chapter 90 formula, which is distributed to municipalities for roadway improvement based on population (20.83%), employment (20.83%), and lane miles (58.33%), as a benchmark against which a proposed program of Road and Path projects could be measured. Since Chapter 90 is based on current population and employment, it may not be

[10] M.G.L. Chapter 6C, Section 3

the best barometer for programming funds in a way that addresses expectations for where future population and employment growth will occur. This feature makes it less useful for evaluating regional balance for Road and Path projects designed to expand system capacity and it is not applicable to transit projects of any type.

However, the Council recommends that MassDOT use the Chapter 90 formula as one factor in evaluating the regional balance of the package of Road and Path capital investments recommended through the project priority formula. The Council is prepared to work with MassDOT, MPOs, and other partners going forward to identify new tools to better evaluate regional equity – not just for Road and Path projects but across modes – that reflects the long-term needs of the Commonwealth's regions and Massachusetts' competitiveness as a whole.

Socioeconomic Balance: Although Social Equity & Fairness is a criterion for evaluating capacity projects, the Council feels that it may also need to be considered on a program level to ensure that benefits and burdens of transportation projects are equitably distributed across community types. Assessing the distribution of projects between minority and non-minority, and low-income and high-income communities across the Commonwealth will ensure that MassDOT is meeting its Title VI and Environmental Justice commitments.

In all of the areas described – proposed capital funding by mode or asset category, by region, and through the Title VI lens – coming up short in comparison to established targets may have a logical explanation. Major generational investments may tend to skew the dollars programmed for an asset class, or a region, within the brief five-year window of the capital program.

In cases where the program falls short of goals for investment levels in a particular asset category or mode, or where the distribution of funding appears unduly imbalanced by region, MassDOT may rebalance the program of investments. For example, if the investment level in bridges falls short of the target established in Step 2, then the highest scoring bridge project not already included in the proposed program may replace the lowest scoring project from another asset category. The same rebalancing could occur at a regional level if it is determined that a particular area in the Commonwealth is receiving too little investment without a defensible explanation.

In the final analysis, after the results from Steps 1 - 4 have been completed and publicized via the website and through public meetings with the required public notice and at the conclusion of a public comment period, MassDOT should publish the comprehensive statewide transportation plan or the five-year capital program.

5 Conclusion

The Commonwealth's transportation system faces today, and will continue to face well into the future, an enormous backlog of state of good repair needs and a limited amount of resources with which to address them. A growing population and a strong economy will argue that we balance those priorities with new connections and expanded capacity to meet future demand. Yet, even with the considerable backlog of projects put forth internally by MassDOT and the

MBTA, by cities and towns, and by other stakeholders, there has historically been too little rigor and even less transparency in how major investment decisions are made. Worse, the system the Commonwealth has used has become so complex and hard to understand that even the most involved constituencies have expressed frustration and, at times, opted out. The Act mandates that we all must do better.

In this context, the Project Selection Advisory Council's work should be seen for what it is—a necessary and long overdue step on the path toward a more competitive and livable Commonwealth. The Massachusetts Legislature understood the importance of a better and more transparent approach to prioritizing transportation investments, and acted on this need through the creation of the Council in Chapter 46 of the Acts of 2013.

The eight members of the Council have considered these issues carefully, participating in 18 meetings over the course of the last year and half, reviewing documents, attending conferences, and exploring the efforts being advanced by other states. Each member of the Council undertook this work with the utmost commitment, seriousness, and – despite occasional differences in philosophy – a single-minded focus on creating a system that would facilitate the improvement of our transportation system and, by extension, Massachusetts.

This report offers recommendations in pursuit of that shared goal. The **project priority formula**, based on a set of criteria closely aligned with our shared goals, will help MassDOT strategically modernize and expand our multimodal transportation system. A proposed **project selection framework** will ensure that these investments contribute to a modally balanced and regionally equitable program of improvements that moves us closer to meeting our state and federal system performance goals. A new **Implementation Committee** of internal subject matter experts, supported by an **Advisory Committee** of key external stakeholders, will translate those recommendations into action.

These recommendations are, however, a work in progress. The Council understands that these recommendations will alter the very way much of MassDOT does its core business. For that reason, the Council endorses the immediate implementation of these recommendations while the Council monitors progress and adjusts its recommendations over time. The work already completed, and the efforts of the implementation and advisory committees which begins now, represent merely the first steps in a longer journey towards a transparent, data-driven approach to prioritizing investment decisions as incremental progress is made. The Council has committed to continue evaluating MassDOT progress in implementing these recommendations. But though much hard work remains to be done, the Council believes the implementation of the recommendations outlined in this report will place MassDOT on a much firmer foundation from which to strategically invest in the transportation needs of the Commonwealth.

Appendix 1: Section 11 of Chapter 46 of the Acts of 2013

SECTION 11. Said chapter 6C is hereby further amended by inserting after section 11 the following section:-

Section 11A. (a) There shall be a project selection advisory council which shall be charged with developing a uniform project selection criteria to be used in the development of a comprehensive state transportation plan as required by section 11.

(b) The council shall consist of the following members: the secretary or the secretary's designee, who shall serve as chair; 3 members to be appointed by the governor, 1 of whom shall have practical experience in transportation planning and policy, 1 of whom shall be a registered civil engineer with at least 10 years' experience and 1 of whom shall be a member of a regional planning agency; 1 member to be appointed by the president of the senate, who shall be an expert in the field of transportation finance; 1 member to be appointed by the minority leader of the senate, who shall be a member of the construction industry; 1 member to be appointed by the speaker of the house of representatives, who shall be a representative of a transportation consumer organization or other public interest organization; 1 member to be appointed by the minority leader of the house of representatives, who shall be a member of a business association; and a representative of the Massachusetts Municipal Association. The department shall provide the council with qualified administrative staff and the regional planning agencies may provide qualified technical assistance to the council.

(c) The project selection criteria developed under this section shall include a project priority formula or other data-driven process that shall include, but not be limited to, the following factors: engineering; condition of existing assets; safety; economic impact; regional priorities; and the anticipated cost of the project. The council may divide projects into several categories including, but not limited to: preservation and maintenance of existing assets; modernization of existing assets that improve safety; expansion projects that add to the existing system; and local construction. The factors chosen by the council may be weighted to prioritize specific factors and such weighting of factors may differ by project category as determined by the council.

(d) The council shall conduct at least 6 public hearings, 1 in each of the department's highway districts, before final approval of the project selection criteria. The council shall provide interested persons with an opportunity to submit their views orally and in writing and the department may create and maintain a website to allow members of the public to submit comments electronically and to review comments submitted by others. The council shall provide notice of each public hearing by publication in a newspaper of general circulation in the highway district in which the hearing is to be located in each of 2 successive weeks, the first publication to be at least 14 days before the day of the hearing and, if feasible, by posting a notice in a conspicuous place in the cities or towns within the highway district for at least 14 consecutive days immediately prior to the day of the hearing.

Appendix 2: Project Selection Advisory Council Meetings

The Project Selection Advisory Council has met 18 times since January 2014, including a public hearing in each of the six Highway Districts, as required per the Act. All meetings were publicly noticed and followed regulations and MassDOT policies with regards to open and public meeting laws.

The Council also released a report of preliminary recommendations for public comment.

Meeting agenda, summaries, and presentations have been made available throughout the process on the Project Selection Advisory Council website at: http://www.mass.gov/massdot/projectselection.

1. January 28, 2014: Boston
2. March 13, 2014: Worcester
3. April 1, 2014: Worcester
4. April 16, 2014: Worcester
5. April 29, 2014: Greenfield
6. May 20, 2014 – District 1 Public Hearing: Pittsfield
7. July 29, 2014 – District 6 Public Hearing: Boston
8. September 16, 2014 – District 2 Public Hearing: Springfield
9. September 24, 2014 – District 4 Public Hearing: Haverhill
10. October 20, 2014 – District 5 Public Hearing: Barnstable
11. November 12, 2014 – District 3 Public Hearing: Worcester
12. February 18, 2015: Boston
13. March 3, 2015: Boston
14. March 18, 2015: Boston
15. April 14, 2015: Boston
16. April 30, 2015: Boston
17. May 14, 2015: Boston
    May 20, 2015-June 5, 2015 Public Comment Period on Draft Report
18. June 17, 2015: Boston

Appendix 3: Asset Management Systems

MassDOT's bridge and pavement highway asset management systems utilize nationally recognized systems and strategies for asset management.

In addition, the MBTA utilized Federal Transit Administration Transportation Asset Management Pilot Program funds to advance its asset management practices and publish a final Transportation Asset Management Plan in February 2014, putting it well ahead of other transit agencies.

This appendix provides an overview of these asset management systems. More information can be found on the Project Selection Advisory Council website.

- **MassDOT Bridge Prioritization System:**

  The MassDOT Bridge Program includes all bridges in the Commonwealth as MassDOT is responsible for all bridge inspections. The Bridge Program's prioritization system uses three criteria to assess the association between a bridge's condition and the potential risk posed to the transportation network by the current condition. The three factors are:

  - Condition Loss (CL): Based on the National Bridge Inspection Standards Condition Rating System
  - Change in Health Index (HI): A composite measure of the condition of each element of a bridge. The change in HI is an estimate of the deterioration rate of a bridge.
  - Highway Evaluation Factor (HEF): A composite measure of the criticality of the bridge based on the following five factors:
    - Roadway classification
    - Detour length
    - Average daily traffic
    - Load carrying restrictions
    - Deck geometry deficiency

  The final bridge ranking formula is: 3 CL + .4 HI + .3 HEF = rank value, where a higher rank value equals higher priority.

  Priority bridges are currently selected in a manner that results in comparable average health indices across the six Highway Districts and also takes into consideration input from District Offices for such factors not included in the formula such as high costs to maintain, key destinations near the bridge, or safety concerns that are not apparent via the formula.

  Bridges are selected for rehabilitation, reconstruction, or replacement for the Transportation Improvement Program based on this system and then go through the design process where it is determined what types of improvements will be made in accordance with MassDOT policies. It is typically a two year period between bridge selection and when the construction project goes out to bid.

- **MassDOT Pavement Management Prioritization System:**

  The Highway Division uses the Deighton Total Infrastructure Management System (dTIMS) Pavement Management Software to manage pavement condition for all Interstates, State numbered routes, and most of the National Highway System. Potential projects are identified by two key factors – Pavement Condition through the Pavement Serviceability Index (PSI) and Ride Quality using the International Roughness Index. These two performance measures are the foundation of MassDOT's Pavement Management Project Selection Process. The PSI composite index uses data for pavement distress, raveling, rutting and ride quality, which are collected using the semi-automated "Pathrunner" vehicle, which has full GPS and GIS integration.

  The Highway Division then uses dTIMS to determine the "ideal timing" and "ideal treatment" for the section under a given funding amount based on incremental benefit cost[11]. In developing a potential multi-year pavement program, the Highway Division considers safety projects, such as those projects in high crash locations, and sustainability factors before assigning a final ranking.

- **MBTA Project Prioritization System:**
  The MBTA employs a State of Good Repair (SGR) database to help guide its capital decisions. Based on an inventory of all existing MBTA capital assets, the model allows the MBTA to track the capital investment needs for the MBTA's existing infrastructure, and to develop scenarios for capital investment to maintain the system in a state of good repair. All MBTA proposed projects are scored using the SGR database rating and other factors as defined in the MBTA enabling legislation including operations impact (which includes mobility measures), environmental impact, and financial considerations.

[11] IBC assesses the differences in the benefit/cost ratio of a series of alternatives, in this case the timing and treatment for each pavement section.