FOURSQUARE ITP
INTEGRATED TRANSPORTATION PLANNING

Performance-Based Statewide Project Prioritization

WHITEPAPER – JANUARY 2018

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Acknowledgements

Foursquare ITP would like to extend our deepest gratitude to the following staff of Massachusetts Department of Transportation (MassDOT) and North Carolina Department of Transportation (NCDOT) for their time and assistance in the development of this White Paper:

- Jennifer Slesinger, Transportation Planner, Office of Transportation Planning, MassDOT
- David Wasserman, P.E., Strategic Prioritization Office of Transportation (SPOT) and STIP Western Region Manager, NCDOT
- Jason B. Schronce, PE, Senior Transportation Engineer, SPOT, NCDOT
- Sarah E. Lee, Senior Transportation Engineer, SPOT, NCDOT

1. INTRODUCTION

Over the past decade, as the emphasis on performance-based planning has increased at both the Federal and state levels, state departments of transportation (State DOTs) have begun to develop new processes for project selection based on performance criteria and that use quantitative scoring to determine which projects are funded and ultimately implemented. This paper examines the approaches of three State DOTs, Virginia, North Carolina, and Massachusetts, in implementing performance-based, objective statewide project prioritization.

While each of the three case studies examined in this paper have unique approaches to performance-based project prioritization, there are several commonalities.

- **Scoring and prioritizing projects based on high-level criteria interpreted with technical measures:** In each of the three case studies examined, high-level criteria set either in legislation or a by a legislatively-appointed high-level committee establish the basis for the prioritization of projects. These criteria include goals such as cost effectiveness or cost/benefit, safety, mobility, accessibility, and economic impact or competitiveness. Actual technical measures associated with each of these measures, and their subsequent scoring, are conducted by technical staff in what can be an intensive technical process that requires the expertise of engineers and planners across each agency.
- **Use of a map-based application portal for managing applications:** In both North Carolina and Virginia, applications are submitted to the scoring process via a map-based application that captures all of the details needed for scoring and automates scoring to the greatest extent possible; Massachusetts is currently working on developing a similar portal. The use of these portals is an important component in capturing the right information and allowing it to be processed and collectively reviewed by the technical team conducting the scoring.
- **Close coordination and involvement with local applicants:** While the organizations eligible to apply to the process differ across the case studies reviewed, in each state there is close coordination between the State DOT and the applicants submitting projects for scoring. This coordination can include working directly with district staff for the State DOT to develop individual project applications, the provision of information on how the scoring process is conducted, and webinars or other opportunities for applicants to understand how to create applications that will score well in the process.
- **A commitment to process improvement over multiple cycles:** While making drastic changes between cycles in the prioritization process is not recommended, each of the State DOTs have processes to review and change aspects of the prioritization process between the cycles of prioritization. This review process includes using feedback from stakeholders throughout the project submittal and scoring process and ensuring that changes in scoring methodologies or other aspects of the process are made in a collaborative fashion that facilitates continued buy-in from all involved.

2. VIRGINIA'S SMART SCALE

2.1. Background

House Bill (HB) 2, signed into law in 2014, directed Virginia's Commonwealth Transportation Board (CTB)[1] to create an objective and quantitative transportation scoring process to bring transparency and accountability to projects selected for state transportation funding. The motivation for HB 2 was to develop a methodology by which the transportation projects that generate the highest benefits relative to costs are selected for implementation. ***SMART SCALE***, the framework created by the Virginia Department of Transportation (VDOT), in coordination with the governor's office, to implement House Bill (HB) 2, was developed over a 16-month period and formally adopted in June 2015. The CTB established the following goals which guided the development of SMART SCALE:

1. Promote performance in the selection of projects
2. Provide stability to the Six-Year Improvement Program
3. Establish project pipeline that links planning to programming

Virginia's Secretary of Transportation established an Executive Work Group to oversee SMART SCALE's implementation, with a sub-work group focused on establishing quantitative measures for SMART SCALE scoring. This sub-work group reviewed best practices of other state departments of transportation and Metropolitan Planning Organizations (MPOs), held a peer exchange workshop, and sought input from a broad array of key stakeholders through a total of 27 CTB hearings across the state. The group held outreach meetings in every VDOT District, individual meetings with every MPO, and made presentations at many other stakeholder meetings and association conferences. Before the measures and process were finalized, the sub-work group brought a pilot project evaluation to the CTB for review.

The first round of SMART SCALE funding applications, for fiscal year 2017, closed in September 2015. MPOs, planning district commissions, counties, cities, towns, and transportation providers submitted a total of 321 applications through the first round of SMART SCALE, with 131 unique organizational entities applying for funding. A total of 287 applications completed the validation and screening process successfully; of these, 163 were selected for funding and received collectively a total of $1.7 billion. A total of 436 applications for SMART SCALE were submitted for funding in Round 2, which closed in October 2016. Of these, 404 completed the validation and screening process and a total of 147 applications, receiving in total $1.03 million in SMART SCALE funding, were recommended for funding. Including other funding, the applications recommended for funding through SMART SCALE Round 2 are worth $2.35 billion.

2.2. Process

The SMART SCALE funding application process includes five steps:

1. Eligibility and Funding
2. Project Application
3. Project Screening
4. Evaluation and Scoring

[1] The CTB is 17-member board appointed by the Governor of Virginia. The CTB is responsible for overseeing transportation projects and initiatives in the state, including allocating construction funds and programming funds for capacity enhancing projects.

5. Prioritization and Programming by the CTB, following public review and comment.

2.2.1. Eligibility

SMART SCALE funds capital and operations improvements for all surface modes of transportation, including highway, transit, rail, bicycle and pedestrian, and transportation demand management (Park and Rides). State of good repair projects, such as bridge and pavement repair/replacement, are not eligible for funding under SMART SCALE. Studies, projects lacking a preferred alternative, and interchange improvements not substantiated with a study or interchange justification report are also not eligible for SMART SCALE.

Local and regional entities, including Metropolitan Planning Organizations (MPOs), Planning District Commissions (PDCs), public transit agencies, and counties, cities, and towns that maintain their own infrastructure are all eligible to submit SMART SCALE applications.

Beginning in 2018, Virginia will limit on the number of SMART SCALE applications by applicant, based on population. Localities with a population below 200,000, and MPOs/PDCs/transit agencies that serve a population below 500,000, can submit up to four applications per cycle; localities with a population above 200,000, and MPOs/PDCs/transit agencies that serve a population above 500,000, can submit up to 10 applications per cycle.

2.2.2. Funding

Virginia's transportation funding formula distributes funding (after specialized programs) as follows:

- State of Good Repair: 45% (not eligible for SMART SCALE)
- District Grant Program (DGP): 27.5%
- High-Priority Projects Program (HPPP): 27.5%

DGP and HPPP funds are disbursed via SMART SCALE.

- **District Grant Program (DGP):** DGP funds are for projects submitted by eligible localities that address a need for a corridor of statewide significance, regional network, improvements to promote urban development areas, or safety improvements identified in VTrans2040, the statewide long-range multimodal transportation plan.[2] Under DGP, projects from localities within a Virginia DOT District compete for funding against projects within the same district.[3]
- **High-Priority Projects Program (HPPP):** HPPP funds are for projects of regional or statewide significance that address a transportation need identified for a corridor of statewide significance or a regional network in VTrans2040. In this program, projects and strategies compete for funding against projects and strategies submitted statewide.

Projects seeking funding from most state and federal discretionary fund categories are required to go through the SMART SCALE process, with the exception of Congestion Mitigation and Air Quality Improvement (CMAQ) Program funds, Highway Safety Improvement Program (HSIP) funds, Surface Transportation Block Grant Program (STBG) funds, Transportation Alternatives (TA) Set-Aside funds, funds through the Revenue Sharing program, and regional funds for Northern Virginia and Hampton Roads. However, these funds may be used as matching funds for SMART SCALE applications.

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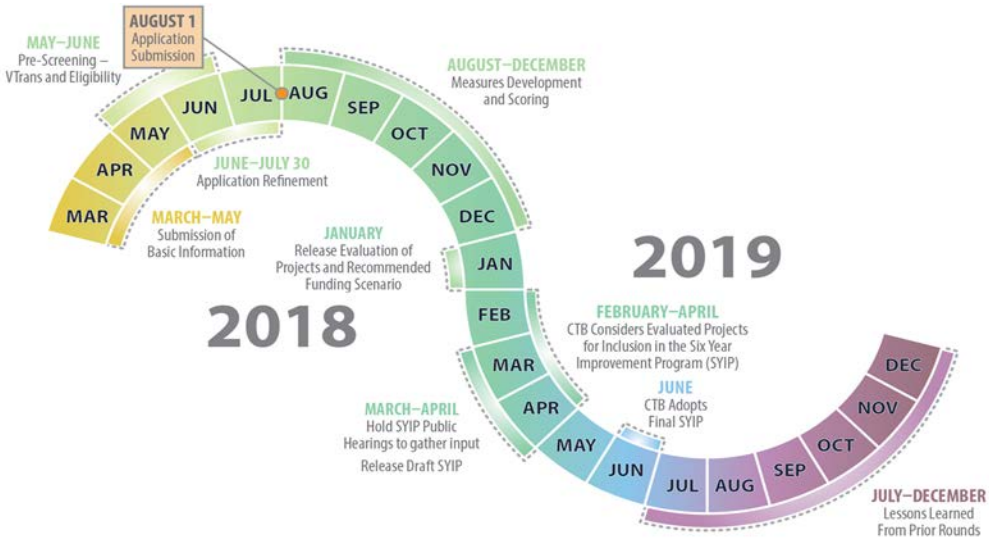
[2] VTrans2040, http://www.vtrans2040.com/
[3] Virginia DOT Districts. http://www.virginiadot.org/about/districts.asp, as of November 22, 2017.

2.2.3. Project Application Period: Timeline and Process

SMART SCALE is conducted on a biennial basis. In the first year, during the project application period, Commonwealth transportation agencies[4] conduct wide-ranging outreach and education to potential applicants on the SMART SCALE application process, and VDOT District Offices provide technical assistance with the development of grant applications. The SMART SCALE website provides FAQs and an extensive Technical Guide to the SMART SCALE process.[5] Final project applications must be submitted by August of the first year; once all projects have been submitted, evaluation teams work through December to screen and score all projects and provide project rankings to the CTB in January of the next year, which uses the rankings to help develop a draft SYIP. After developing the draft SYIP and conducting public outreach, the CTB adopts the final SYIP in June of the second year (**Figure 1**).

Figure 1: SMART SCALE Timeline[6]



Applications for SMART SCALE are submitted through the web-based Smart Portal, which is designed to capture all the required application information and includes a web-based mapping tool for use in indicating the project's geographic extent. The Smart Portal is also used for applications for other state grant programs, including Transportation Alternatives, Revenue Sharing, Bicycle and Pedestrian Safety, and Highway Safety Improvement Program funds. Application information from one grant application is easily copied to another.

2.2.4. Project Screening and Project Scoring

SMART SCALE project screening links planning to programming; a project application must meet a need identified in VTrans. Once it has been determined that a project meets an identified need, the project is

[4] The Secretary of Transportation's Office of Intermodal Planning and Investment, Department of Rail and Public Transportation (DRPT), and the Virginia Department of Transportation (VDOT)
[5] SMART SCALE Guidance Documents: http://vasmartscale.org/resources/default.asp
[6] SMART SCALE, "About," available at http://smartscale.org/about/default.asp, as of July 28, 2017.

evaluated and scored. By Virginia law (HB 2)[7], all projects applying for SMART SCALE funding, regardless of mode, are scored against the same factors and associated quantitative measures (**Table 1**). A team of technical staff across VDOT and DRPT review the applications and utilize the information and data submitted by the applicant to evaluate the measures. During the scoring process, VDOT and DRPT staff work with the applicants to obtain additional data that may be needed (for example, traffic counts) to complete the scoring process. For each project, the team calculates scores for each factor and weights them by the area type in which the project is located; the area types were created to allow the criteria to be weighted differently relative to the needs of different types of land uses, transportation needs, and demographics across the Commonwealth (Figure 2). After weighting and summing all factor scores, the team calculates a final score by dividing the total factor score by the SMART SCALE project cost. Projects are then ranked and provided to the CTB for funding consideration.

Figure 2: SMART SCALE Area Types[8]

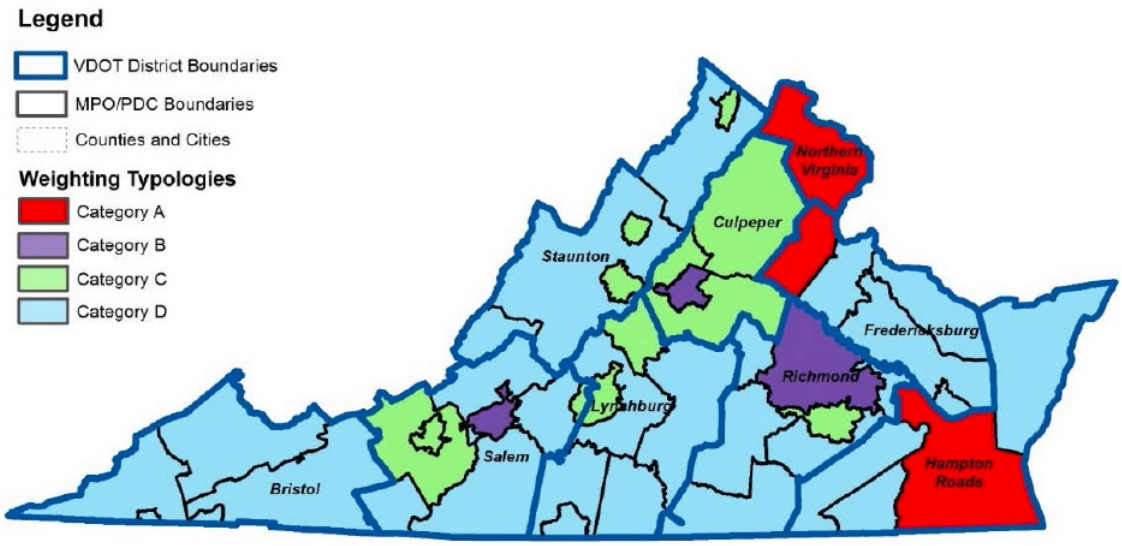


Table 1: SMART SCALE Measures

Factor	Measures (Weights)
Safety	Number of Fatal and Injury Crashes (50%)
	Rate of Fatal and Injury Crashes (50%)
Congestion Mitigation	Person Throughput (50%)
	Person Hours of Delay (50%)
Accessibility	Access to Jobs (60%)
	Access to Jobs for Disadvantaged Populations (20%)

[7] Virginia Legislative Information Session, 2014 Session. https://lis.virginia.gov/cgi-bin/legp604.exe?141+ful+HB2ER
[8] 2017 SMART SCALE Policy Guide, available online at: http://vasmartscale.org/resources/default.asp, as of November 22, 2017.

Factor	Measures (Weights)
	Access to Multimodal Choices (20%)
Environmental Quality	Air Quality and Energy Environmental Effect (50%)
	Impact to Natural and Cultural Resources (50%)
Economic Development	Project Support for Economic Development (60%)
	Intermodal Access and Efficiency (20%)
	Travel Time Reliability (20%)
Land Use *(only for areas over 200,000 in population)*	Transportation Efficient Land Use (70%)
	Increase in Transportation Efficient Land Use (30%)

2.2.5. Six Year Improvement Program (SYIP) Development

In each SMART SCALE cycle, the CTB and the public review the screening, scoring, and ranking results. After review, the CTB provides guidance on program development, and staff develop a draft SYIP based CTB direction and SMART SCALE scoring results. After the draft SYIP is developed, VDOT holds public hearings to gather public comment on the draft SYIP, as well as scoring results for individual projects. The CTB takes public comments into account, and ultimately finalizes and approves the final SYIP for implementation (**Figure 3**).

All project scores and funding recommendations are available publicly on the SMART SCALE website, and SMART SCALE project implementation is tracked via a regularly updated dashboard on the same website. Typically, once a project is selected for inclusion in the SYIP it will remain in the SYIP as a funding priority. A project may also be re-evaluated by the CTB if there is a significant reduction in the locally/regionally leveraged funds available for the project.

Figure 3: SMART SCALE Scoring Incorporation in the SYIP9

[9] Graphic Source: 2017 SMART SCALE Policy Guide, available online at: http://vasmartscale.org/resources/default.asp, as of November 22, 2017.

2.3. Key Lessons Learned

Following the conclusion of each SMART SCALE round, VDOT sends a survey to applicants to get feedback on their experience with SMART SCALE, and to solicit suggestions for improvements; after each round, VDOT also conducts internal workshops with staff involved in SMART SCALE. Following the first round of SMART SCALE, VDOT assembled an External Review Group to review the measures development and scores; after the second round, VDOT hosted a series of regional workshops in 2017 to solicit in-depth feedback on the process. Feedback on SMART SCALE is also accepted on an ongoing basis via the SMART SCALE website.

Starting in Round 3, SMART SCALE will become a biennial process, rather than an annual one. This change will create a longer application period, with more opportunities for applicant assistance and time to develop robust analysis required for SMART SCALE measures. This change will also help applicants identify other state funding sources as a match for SMART SCALE projects.

SMART SCALE's broad-based buy-in relies, in part, on key features that have made it both politically and practically advantageous:

1. HB 2, the legislative foundation of SMART SCALE, was a bipartisan effort between a Democratic Governor and Republican legislature.
2. Extensive stakeholder involvement has been a hallmark of the SMART SCALE process since the beginning.
    a. SMART SCALE measures were developed – and later, revised – with extensive stakeholder outreach to jurisdictions, agencies, and other stakeholders.
    b. During the SMART SCALE application period, VDOT conducts extensive outreach with potential applicants to support the development of project applications. VDOT District Offices, upon request, provide technical assistance to applicants in the development of SMART SCALE applications.
3. The SMART SCALE process was designed for transparency in project funding. SMART SCALE uses quantitative scoring measures, extensive stakeholder education and outreach, and public posting of all project scores and rankings.
4. Significant resources, in terms of staff time and consultant assistance, are invested in ensuring that SMART SCALE's implementation is robust and well supported. The SMART SCALE process is continually improved through open communication with applicants and among the staff, contractors, and consultants involved in its implementation.

3. NORTH CAROLINA'S STRATEGIC TRANSPORTATION INVESTMENTS – PRIORITIZATION 1.0-5.0

3.1. Background

North Carolina has been at the forefront of establishing project prioritization processes to allocate state transportation funding, beginning work on the current framework in 2008. In 2009, the North Carolina Department of Transportation's (NCDOT) Strategic Prioritization Office of Transportation (SPOT) introduced ***Prioritization 1.0 (P1.0),*** a precursor of today's prioritization process. NCDOT used P1.0 to evaluate highway projects, using a combination of quantitative metrics (safety, pavement quality, and congestion), and rankings by metropolitan planning organizations (MPOs), rural planning organizations (RPOs), and NCDOT Divisions. P1.0, and its subsequent iterations, have been used to develop projects included in North Carolina's biennial State Transportation Improvement Plan (STIP), the 10-year construction schedule for all capital projects across all modes (highway, aviation, ferry, rail, transit, and bicycle/pedestrian). The second iteration of this process, Prioritization 2.0 (P2.0), added prioritization of bicycle and pedestrian projects, as well as project scoring based on assessments of highway projects.

In 2013, the North Carolina General Assembly enacted North Carolina's Strategic Transportation Investments (STI) law, which requires NCDOT to use a Strategic Prioritization Process to allocate state transportation funding across all modes for expansion and modernization projects. The Strategic Mobility Formula, established in the law, provides the framework for allocating funding across geographies as well as the scoring criteria for each mode. This formula dictates the criteria (i.e., Congestion) that will be used, however, it does not determine what the actual scoring measures (i.e., Volume/Capacity ratio) for the individual criteria will be as well as how the individual criteria will be weighted in the prioritization process. While local input is incorporated in the prioritization process, the STI law requires that projects be funded based on the results of scoring and project scores cannot be altered by any political body.

SPOT led the development of prioritization frameworks for each iteration of the process, in conjunction with a working group comprised of representatives of key transportation stakeholders across the state. This working group developed both the initial P1.0 process as well as subsequent refinements to the prioritization process. The STI law dictates that no more than half of the working group can be comprised of NCDOT staff, and it is a collaborative group that makes decisions regarding the prioritization process with a focus on achieving consensus among the involved stakeholders. Each member of the working group has a two-year term, ensuring that over time many organizations and agencies across the state have an opportunity to shape the prioritization framework. The working group is comprised entirely of professional staff, MPO/RPO planners, advocates, and NCDOT staff, including the following members:

- Four metropolitan planning organizations;
- Four rural planning organizations;
- Four NCDOT Transportation Division Offices;
- The North Carolina Metropolitan Mayors Coalition;
- The North Carolina Association of County Commissioners;
- The North Carolina Regional Council of Governments;
- The North Carolina League of Municipalities;
- The North Carolina Ports Authority;
- The Governor's Office;

- The North Carolina Departments of Commerce and Agriculture;
- Legislative staff;
- The Federal Highways Administration; and
- Additional NCDOT subject matter experts.

Since the enactment of the STI law, SPOT has concluded two complete rounds of prioritization, Prioritization 3.0 (P3.0) and Prioritization 4.0 (P4.0), and the office is currently working on Prioritization 5.0 (P5.0).

In addition to the Strategic Transportation Investments prioritization process, North Carolina also had a second, separate, effort to allocate transportation funding using a scoring process, from 2010 to 2012. The Mobility Fund, established by North Carolina General Assembly's 2010 Appropriations Act, provided a new funding source for transportation projects of statewide and regional significance. The Mobility Fund established the precedent that helped lead to the development of the STI law. It distributed funding based on a project scoring framework with two metrics; a mobility benefit-cost metric (measured by estimated travel time savings divided by cost) was assigned 80 percent of the scoring weight, while a multimodal/intermodal metric (measured by whether the project provided an improvement to more than one mode) was assigned 20 percent of the weight. Only new capital projects focused on near-term delivery (with funds obligated for construction within five years) were eligible for funding through the Mobility Fund. Eligible projects also had to be identified in an adopted long-range transportation plan and consistent with local land use plans, and be in a conforming air quality plan in non-attainment or maintenance areas. The Mobility Fund project scoring and award process concluded in 2012.

3.2. Process

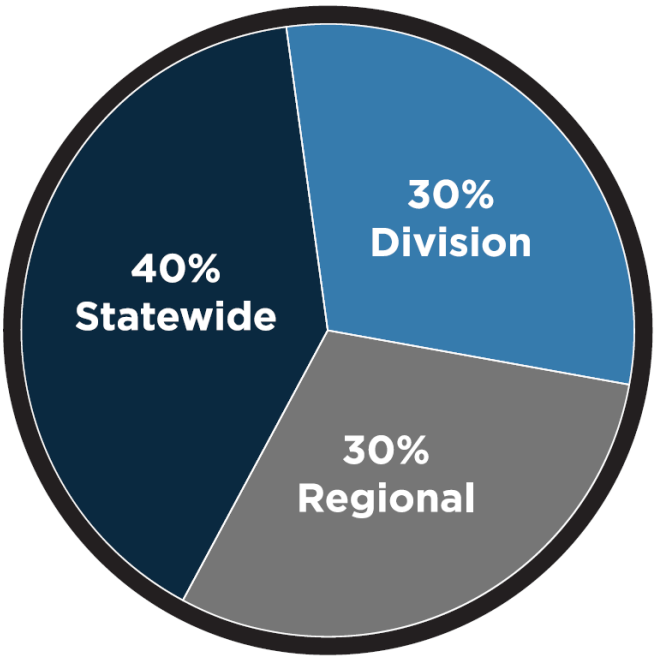
3.2.1. Eligibility and Funding

NCDOT prioritizes project applications for expansion and modernization projects from all six NCDOT modes (highway, aviation, ferry, rail, transit, and bicycle/pedestrian) through the STI process for inclusion in the State Transportation Improvement Program. Funding for projects comes from the Strategic Transportation

Investments Fund, one of North Carolina's two funds for transportation.[10] Maintenance [11]and operations projects are not eligible for funding through the Strategic Transportation Investments Fund.

Approximately 80 percent of transportation revenue in North Carolina is from state sources, while 20 percent of funding is from federal sources. The Strategic Transportation Investments fund is comprised of revenues from North Carolina's Highway Use Tax, Department of Motor Vehicle Fees, and Motor Fuels tax. An estimated $23 billion in funds were allocated in the FY2018-FY2027 STIP. In FY2017, the Strategic Transportation Investments Fund distributed a total of $2.2 billion in funds to STIP projects.

Figure 4: Strategic Transportation Investment Funds Revenue Distribution



Within the prioritization process and the STIP, funding is distributed across three categories:

- **Statewide Mobility** (40 percent of total funding): Statewide Mobility project Projects are chosen entirely based on data. The focus of this category is addressing significant congestion and bottlenecks. Statewide Mobility funding is exclusively available to eligible highway projects and Class-1 Freight Railroads.
- **Regional Impacts** (30 percent of total funding): Regional Impacts funding is divided proportionally among regions based on population. Project scores are based on data (70 percent) and local rankings (30 percent). There are seven regions (made up of 2 NCDOT Divisions) in North Carolina and projects only compete for funding within the individual region. The focus of this category is improving connectivity within regions.
- **Division Needs** (30 percent of total funding): Division Needs funding is divided over NCDOT's 14 transportation divisions, which for the FY2018-FY2027 STIP equated to approximately $42 million per fiscal year. Projects scores are based on data (50 percent) and rankings by local planning organizations and NCDOT transportation divisions (50 percent). All divisions across NCDOT receive the same level of funding. This focus of this category is addressing local needs. Bike/Ped projects are only available for funding in this category.

Funding is distributed across these categories in a cascading fashion. Once projects are quantitatively scored, funds for the statewide mobility projects are allocated. Projects included in statewide mobility that cannot be funded with the funding available in that category are then considered alongside the regional impacts, and those projects (statewide mobility or region impacts) that are not funded in this category are considered in the scoring of the division needs. In this process, a project submitted in the statewide mobility category may be scored a total of three times across all categories. The eligibility requirement for submitting a project in a

[10] The second state fund is the Highway Fund, which is focused on highway maintenance.
[11] Graphic Source (Figure 4): North Carolina Department of Transportation, Strategic Mobility Formula: How It Works, available online at: https://www.ncdot.gov/strategictransportationinvestments/, as of January 15, 2018.

category is based entirely on the type of transportation facility (e.g., an interstate project would fall under Statewide Mobility).

While the intent of the STI law was to allocate funding across modes, the differences in the criteria and weighting for evaluating projects by mode has not allowed NCDOT to achieve cross-modal prioritization. In P3.0, a normalization process that limited the percentage of funding available for any individual mode was introduced to balance the funding allocated between highway and non-highway projects. In P5.0, for Regional Impacts and Divisions projects, a minimum of 90 percent of funding is allocated to highway projects, a minimum of 4 percent is allocated to non-highway projects, and the remaining 6 percent can be flexed either to highway or non-highway projects.

3.2.2. Project Application Period: Timeline and Process

Projects for prioritization and inclusion in the STIP can be submitted by MPOs and RPOs, as well as NCDOT's 14 local divisions. Each MPO and RPO has its own process by which it solicits projects for inclusion in the STIP, however, they are limited in the total number of projects that they can submit. In P5.0, each MPO and RPO can submit 12 projects, plus one additional project for every 50,000 in population and one additional submittal for every 500 centerline miles. Based on this formula the total number of projects an individual MPO or RPO can submit can range from less than 20 to more than 40. Every MPO and RPO has its own locally developed process for soliciting and selecting projects for scoring in the STIP process; however, it is a requirement that all projects submitted are incorporated in a long-range plan.

Each NCDOT Division can submit a total of 14 projects. These limits apply by mode, so an NCDOT Division can submit 14 highway and 14 transit projects. The project application period for P5.0 took place over a three-month period from July through September 2017, during which applicants had the ability to test, enter, and submit projects in the online application called "SPOT Online."

3.2.3. Project Scoring

Projects are submitted through a tool called "SPOT Online" to the SPOT office for scoring. The online tool captures all of the relevant project characteristics needed for scoring (e.g., how many lanes, proposed speed limits, etc.), and the tool itself then takes this underlying data to generate GIS data. The data processed through the SPOT Online tool is used to develop the actual measures. SPOT staff rely on a team of contractors, as well as NDCOT staff, to assist in the scoring process. Some of the scoring is relatively straightforward; for example, travel time savings is calculated for each project individually using a script that runs the project data from the SPOT Online tool through a script in the statewide travel demand model. Other scoring, such as project benefits (e.g., intersection improvements), are more labor intensive to produce given what needs to be modeled. Safety scores for each project are individually calculated by an NCDOT safety engineer. Depending on the level of development that a project is at when submitted, some high-level design work may be required. While some projects have verified cost estimates that are used in the scoring, all projects receive a cost estimate generated through the SPOT Online Cost Estimation tool. While this cost estimation feature in SPOT online cannot provide a sophisticated estimate that takes into account costs such as right-of-way acquisition, it does provide a baseline cost that the staff and contractors scoring the project can seek to refine and improve. During the scoring process, and prior to publishing the draft scores, all of the project scores are sent to the NCDOT Divisions, MPOs, and RPOs that submitted the projects for review. This allows the applicants to review the data in use in the scoring process and raise any data validity issues or concerns prior to the conclusion of the scoring process. The SPOT online tool is designed to capture all of the required information, and generally NCDOT doesn't have issues with data consistency or quality in the capture of information.

Each mode uses unique criteria and measures to develop the actual project score, and the actual weights used for the criteria differ by the category to which the project is submitted: Statewide Mobility, Regional Impacts, or Division Criteria. Only highway projects and Class I freight railroad projects can be submitted as statewide mobility projects, and these projects are scored without any local input. Both Division Needs and Regional Impacts projects give significant weight to local rankings developed by NCDOT Divisions, MPOs, and RPOs. However, all MPOs, RPOs, & Divisions are required to have approved methodologies for assigning local input points. In the local rankings developed at the division and regional levels, Divisions, MPOs, and RPOs receive a base of 1,000 points and an addition of 100 points for every additional 50,000-person increment in population for a maximum point value of 2,500. Each individual project can be assigned up to 100 of the local impact points. Regions and divisions have the flexibility of determining their own weighting for each category. **Table 2** through **Table 9** present the criteria, measures, and default weighting used for scoring projects for each mode.

Table 2: North Carolina Strategic Mobility Formula P.50 – Highway Projects[12]

Criteria	Measure	Statewide Mobility	Regional Impacts	Division Needs
Local Input	MPO/RPO Local Input	N/A	15%	25%
Local Input	Division	N/A	15%	25%
Congestion	(Volume/Capacity + Volume)	30%	20%	15%
Benefit/Cost	[(Travel Time Savings + Safety Benefits)/Cost to NCDOT]	25%	20%	15%
Safety Score	(Critical Crash Rates, Density, Severity, Safety Benefits)	10%	10%	10%
Freight	(Truck Volumes, Truck %, Future Interstate Completion Factor)	25%	10%	5%
Economic Competitiveness	(% Change in Jobs + % Change in County Economy)	10%	N/A	N/A
Accessibility/Connectivity	(County Economic Indicator, Improve Mobility)	N/A	10%	5%

Table 3: North Carolina Strategic Mobility Formula P.50 – Aviation Projects

Criteria	Measure	Statewide Mobility	Regional Impacts	Division Needs
Local Input	MPO/RPO or Division Local Input	N/A	30%	50%
North Carolina Department of Aviation Project Rating	Project Rating	40%	30%	25%

[12] While highway projects may provide alternative, self-designed criteria for use in the scoring, all involved metropolitan and rural planning organizations and the NCDOT divisions within the region must agree on the criteria.

Criteria	Measure	Statewide Mobility	Regional Impacts	Division Needs
FAA ACIP Rating	FAA Airport Capital Improvement Plan (ACIP) rating	10%	5%	10%
Non-State Contribution Index	Percent of Local Contribution vs State Contribution	30%	20%	5%
Benefit/Cost Total Economic Contribution	Cost to NCDOT	20%	15%	10%

Table 4: North Carolina Strategic Mobility Formula P.50 – Bicycle and Pedestrian Projects

Criteria	Measure	Statewide Mobility	Regional Impacts	Division Needs
Local Input	MPO/RPO or Division Local Input	N/A	N/A	50%
Safety	(Number of Crashes x 40%) + (Posted Speed Limit x 20%) + (Crash Severity x 20%) + (Project Safety Benefit x 20%)	N/A	N/A	15%
Access	(Destination Type x 50%) + (Distance to Prime Destination x 50%)	N/A	N/A	10%
Demand/Density	Number of Households and Employees per Square Mile near Facility	N/A	N/A	10%
Connectivity	Degree of Bike and Pedestrian Separation from Roadway, Connectivity to a Similar or Better Project Type, Part of/Connection to a National/State/Regional Bike Route	N/A	N/A	10%
Cost Effectiveness	(Safety + Access + Demand + Connectivity) / Cost to NCDOT	N/A	N/A	5%

Table 5: North Carolina Strategic Mobility Formula P.50 – Ferry Projects

Criteria	Measure	Statewide Mobility	Regional Impacts	Division Needs
Local Input	MPO/RPO or Division Local Input	N/A	30%	50%
Asset Condition	Asset Condition Rating	N/A	15%	15%
Benefits Number of hours (in $) saved compared to driving		N/A	10%	10%

Criteria	Measure	Statewide Mobility	Regional Impacts	Division Needs
Accessibility/ Connectivity	Number of nearby Points of Interest	N/A	10%	10%
Asset Efficiency	3-year Maintenance Cost / 3-year Replacement Cost	N/A	15%	15%
Capacity/ Congestion	Percent of Vehicles Left Behind at each Departure Compared to Total Carried by the Route	N/A	20%	N/A

Table 6: North Carolina Strategic Mobility Formula P.50 – Rail Projects

Criteria	Measure	Statewide Mobility[13]	Regional Impacts	Division Needs
Local Input	MPO/RPO or Division Local Input	N/A	30%	50%
Benefit-Cost	Benefit-Cost Score	35%	25%	10%
System Opportunities	(Accessibility/Connectivity Score x 50%) + (Multimodal Score x 50%)	15%	10%	15%
Safety	Safety Score	30%	15%	10%
Capacity and Diversion	(Volume/Capacity Score x 75%) + (Highway Diversion Score x 25%)	10%	10%	10%
Economic Competitiveness	Economic Competitiveness Score	10%	10%	5%

Table 7: North Carolina Strategic Mobility Formula P.50 – Public Transportation: Mobility[14]

Criteria	Measure	Statewide Mobility	Regional Impacts	Division Needs
Local Input	MPO/RPO or Division Local Input	N/A	30%	50%
Impact	Number of Trips Affected by Project	N/A	15%	10%
Demand/ Density	Total Trips/Service Population	N/A	20%	10%
Efficiency	Total Trips/Total Revenue Seat Hours	N/A	10%	10%
Cost Effectiveness	Additional Trips / (Cost to NCDOT/Lifespan of Project)	N/A	25%	20%

[13] Class 1 Freight Railroad projects are the only projects that can be submitted for Statewide Mobility funding. Passenger rail projects can only be submitted as Regional Impacts or Division Needs projects.

[14] The "Public Transportation: Mobility" category includes Route-specific vehicles (for new or expanded service), Fixed guideway (Light Rail, Commuter Rail), Bus Rapid Transit (BRT), and Bus-on-shoulder-system (BOSS)/Busway projects only.

Table 8: North Carolina Strategic Mobility Formula P.50 – Public Transportation: Demand Response (Vehicles Only)

Criteria	Measure	Statewide Mobility	Regional Impacts	Division Needs
Local Input	MPO/RPO or Division Local Input	N/A	30%	50%
Impact	Number of Trips Affected by Project	N/A	10%	10%
Demand/ Density	Total Hours with the Project in Place/Service Population	N/A	20%	15%
Efficiency	Vehicle Utilization Ratio	N/A	15%	10%
Cost Effectiveness	Additional Trips/(Cost to NCDOT/Lifespan of Project)	N/A	25%	15%

Table 9: North Carolina Strategic Mobility Formula P.50 – Public Transportation: Facilities[15]

Criteria	Measure	Statewide Mobility	Regional Impacts	Division Needs
Local Input	MPO/RPO or Division Local Input	N/A	30%	50%
Impact	Number of Trips Affected by Project	N/A	20%	15%
Demand/ Density	Ridership Growth Trend for the Previous 5 Years	N/A	10%	10%
Efficiency	Efficiency Score	N/A	15%	10%
Cost Effectiveness	Additional Trips / (Cost to NCDOT/Lifespan of Project)	N/A	25%	15%

3.2.4. STIP Development Process

The development of the STIP is a two-year process; as one STIP concludes its development, the development of the next STIP has already begun. STIP development takes place in three distinct phases: prioritization, programming and scheduling, and review and approval. The 2018-2027 STIP process began in the Fall of 2015 with an initial call for projects and prioritization, with the scoring for the statewide, regional, and division projects subsequently released individually over the course of 2016. A total of 1,929 applications were scored during the development of the 2018-2027 STIP. An initial round of public comment was held after each release of project scores, and these comments were incorporated into the Draft Final STIP released in January 2017. Once scored, successful applications are programmed and scheduled, taking into account not only their ranking in the scoring process but other factors such as funding restrictions and where the application is at in the project development process (i.e., the completion of environmental and engineering documentation). Projects are typically programmed in the order of their prioritization; as 80 percent of the NCDOT's projects are locally funded, the impact of restrictions on the use of federal funds by project type has a relatively minor impact on programming. The only time a project may not be funded in order of its prioritization is a constraint

[15] Public Transportation: Facilities projects can include passenger stations, stops/shelters, park and ride lots, and administrative and maintenance buildings.

in the STI law that prevents projects on a specific corridor from being funded (called the Corridor Cap, as written in the STI Law).

A draft STIP was released on June 29th, 2017, followed by a public comment period that ended on July 12, and the adoption of the STIP by the NCDOT Board of Transportation on August 3rd, 2017. In the 2018-2027 STIP, a total investment of $13.2 billion was planned for 1,929 P4.0 projects across North Carolina.

The Working Group developing the process for P5.0 first met for five months in early 2017, with the NCDOT Board of Transportation approving the P5.0 criteria, measures, and weights for use in the 2020-2029 STIP on June 29, 2017, the same day that the 2018-2027 STIP was approved by the Board. The Working Group met a total of 18 times between October 2016 and May 2017 to develop recommendations for the P5.0 schedule and process, including highway and non-highway scoring measures and changes in the use of local input points and the normalization process.

Changes made in the process from one STIP to the next can be minor; as there is a desire to keep improving the process and not to make significant changes every two years. As the STIP is a 10-year document, there is a need to ensure that the projects incorporated in the STIP keep moving forward during that period. NCDOT has committed funding for the first five years of each STIP (with the five years starting in the first year of expenditure). Projects included in years six through 10 of the STIP are reconsidered and rescored with each cycle of prioritization. The first five years are therefore known as the "Delivery STIP," while the second five years are known as the "Development STIP." Projects that are incorporated in the Development STIP are automatically carried over into the next STIP's prioritization process, as well as any additional projects that are considered a "sibling" of a programmed project or have development of National Environmental Protection Act (NEPA) documentation. This approach provides both stability for projects that have scored well in the previous rounds of prioritization, while also allowing any improvements in the process to impact project scoring within the later years of the STIP.

3.3. Key Lessons Learned

Since the STI process began in 2009, NCDOT has been able to achieve broad-based buy-in from stakeholders at all levels of the transportation planning process through an inclusive, transparent, data-driven framework for project prioritization. Part of being able to achieve this has been a focus on carefully considering changes and enhancements in the in the process between cycles, with a focus on incremental change and improvement rather than re-thinking the process each time. P1.0 focused only on highways and used three criteria, and stakeholders had a chance to review the data and process and provide input that was acted upon. This collaborative approach to project prioritization has been extremely successful, and the process has many champions both internal and external to NCDOT.

4. MASSACHUSETTS' PROJECT SELECTION ADVISORY COUNCIL AND CAPITAL INVESTMENT PLAN

4.1. Background

In 2013, the Massachusetts Legislature established a Project Selection Advisory Council (the Council or PSAC) to develop uniform criteria and a transparent, data-driven prioritization process for use by the Massachusetts Department of Transportation (MassDOT) in the preparation of the 5-year Comprehensive Transportation Plan, known as the Capital Investment Plan (CIP).

The composition of the Council was determined by the legislation that established the PSAC, with the aim of providing representation for a diverse array of transportation interests around the state. The Council includes the MassDOT Secretary & CEO and a representative of the Massachusetts Municipal Association, with three additional members appointed by the Governor, one by the Senate Majority Leader, one by the Senate Minority Leader, and one member of an advocacy organization designated by the Speaker of the House. The Governor appointed the Acting General Manager of the Massachusetts Bay Transit Authority, Executive Director of MassDOT Planning, and the Executive Director of the Franklin Regional Council of Governments to serve on the Council, while the Senate Minority Leader appointed a representative of the Construction Industries of Massachusetts trade association and the Senate President appointed a representative of a law firm. The advocacy organization appointed by the House Minority Leader was a representative of a government relationships consulting firm. The legislation stipulated that a public hearing on the criteria and prioritization process be held in each of the six MassDOT Highway Districts. In addition to these six public hearings, the Project Selection Advisory Council held 12 additional public meetings to inform the prioritization process.

The Council met regularly during the development of the criteria for the prioritization framework that became the Project Priority Formula. The work of the Council was initially focused on highway,Massachusetts Bay Transit Authority (MBTA), and Regional Transit Authority (RTA), projects, but at implementation it was expanded to include all modes and all MassDOT division capital cost categories. MassDOT planning staff in coordination with staff at MassDOT divisions and other MassDOT technical staff conducted background research and developed actual scoring metrics to be associated with the criteria to inform the work of the Council.

In July 2015, the Council issued its preliminary recommendations on the criteria to be used in the prioritization process for the 2017-2021 CIP. The Council continued to meet periodically through January 2016 when the criteria and goals for the 2017-2021 CIP (**Figure 5**) were finalized. The PSAC reconvened in late 2016 to hear about lessons learned and recommendations from staff on how to update the scoring approach for the 2018-2022 CIP cycle.

Figure 5: Criteria/Goals for the Priority Funding Formula[16]

System Preservation	• Projects should contribute to a state of good repair on the transportation system.
Mobility	• Projects should provide modal options efficiently and effectively.
Cost Effectiveness	• Projects should result in benefits commensurate with costa nd should be aimed at maximizing the return on the public's investment.
Economic Impact	• Projects should support strategic economic growth in the Commonwealth.
Safety	• Projects should contribute to the safety and security of people and goods in transit.
Social Equity and Fairness	• Projects should equitably distribute both benefits and burdens of investment among all communities.
Environmental and Health Effects	• Projects should maximize the potential positive health and environmental aspects of the transportation system.
Policy Support	• Projects should get credit if they support local or regional policies or plans; or state policies not addressed through the other criteria.

4.2. Process

4.2.1. Eligibility and Funding

Projects are scored and prioritized within existing funding programs for highways, MBTA, RTAs, rail, aeronautics, information technology, and the Registry of Motor Vehicles. MassDOT annually conducts a separate quantitative exercise to determine the size of the funding programs that takes into account historical spending, internal needs estimates, fiscal constraints, board guidance, performance projections and MassDOT priorities.

Two types of projects are eligible for inclusion in the project selection process:

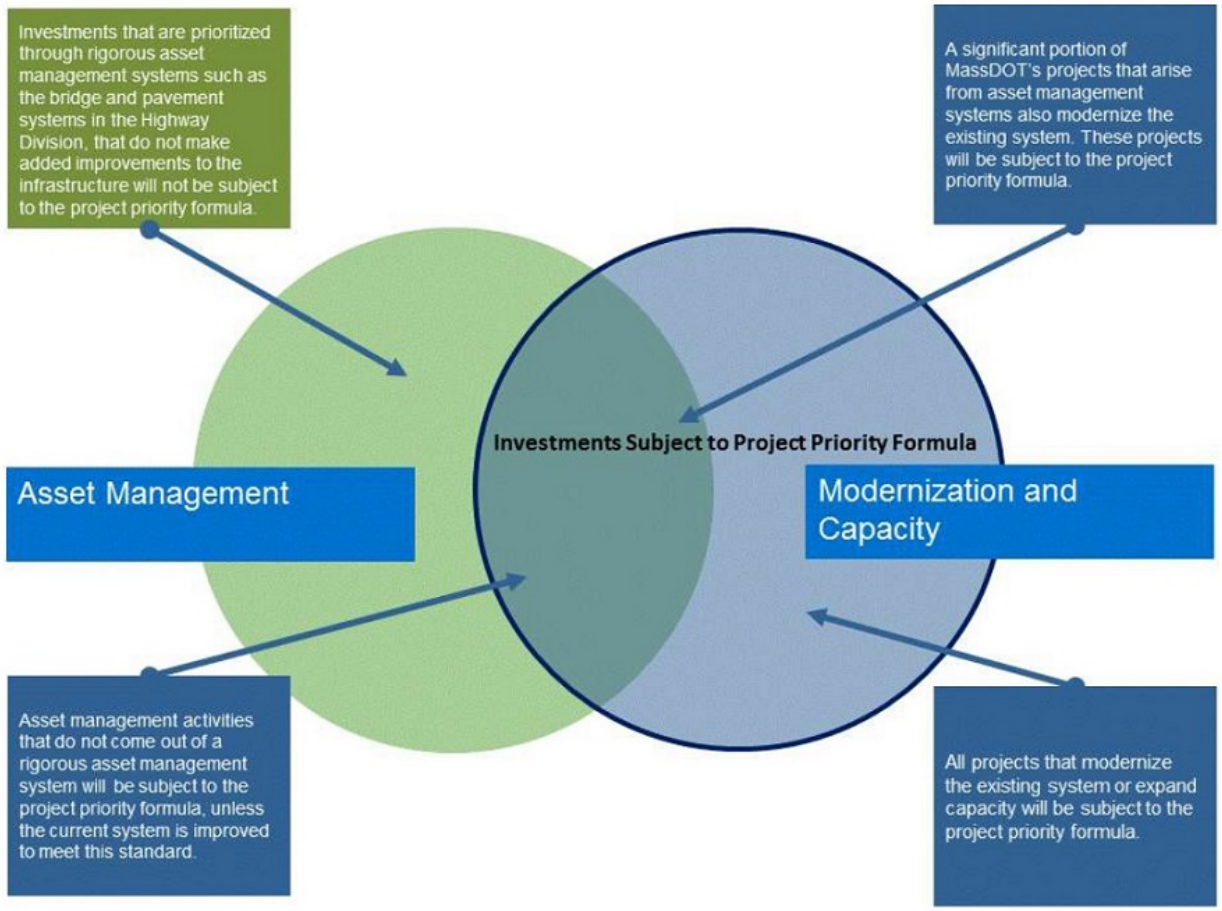
1. Modernization projects that replace or rehabilitate existing transportation assets.

[16] Graphic information source: Massachusetts Department of Transportation, 2017-2021 Capital Investment Plan, available online at: https://www.massdot.state.ma.us/Portals/0/docs/infoCenter/docs_materials/CapitalInvestmentPlan2017-2021.pdf, as of January 15, 2018.

2. Capacity projects that expand capacity or transportation connections.

Basic state of good repair and asset management projects were not included in the Project Priority Formula, as existing rigorous processes that prioritize these projects existed prior to the establishment of this CIP prioritization process. This decision was made based on the current understanding MassDOT has of the impact of state of good repair projects on system performance. Any asset management activity that is not already a part of an established prioritization process, or projects that modernize the system and represent material improvements in infrastructure or assets (i.e., not one-for-one replacements) could be prioritized using the Project Priority Formula. **Figure 6** illustrates the types of projects that are eligible for inclusion in the Project Priority Formula.

Figure 6: MassDOT Purpose of Investment and Inclusion in Project Priority Formula[17]



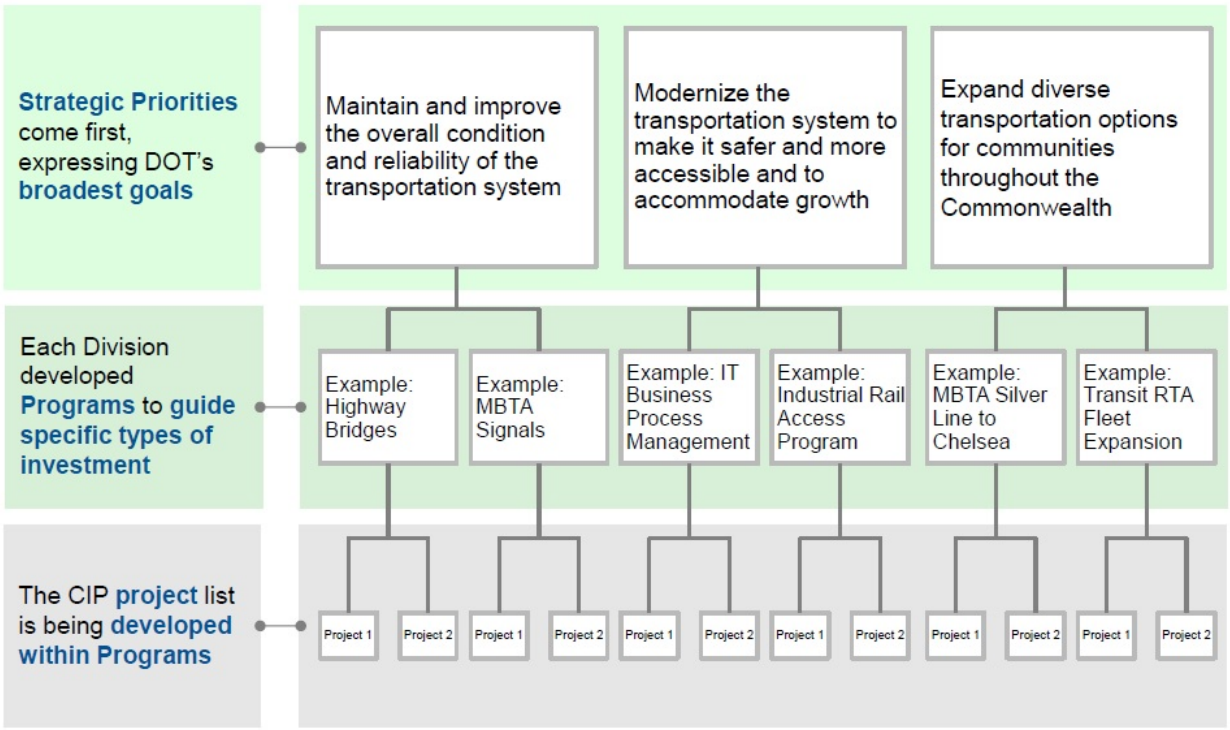
[17] Graphic Source: Federal Highway Administration, Performance-Based Programming, available online at: https://www.tpmtools.org/guidebook/chapter-04/chapter-04-steps/#programmingacrossperformanceareas, as of July 27, 2017.

4.2.2. Project Application Period

Applications for submission to the CIP are submitted by a range of different offices across all modes. Staff at the MassDOT divisions for Aeronautics, Rail, and the Registry of Motor Vehicles submit projects, while transit projects are submitted by asset managers at the RTAs and the MBTA. Highway projects are submitted by asset managers and municipalities via MassDOT's regional districts. All highway projects submitted must be consistent with local plans and needs.

The projects submitted for scoring are allocated to a program within a component division, and prioritized based on their purpose and need (**Figure 7**). The 2017-2021 CIP was the first CIP to consolidate the CIPs of all MassDOT divisions into a single, integrated document.

Figure 7: Strategic Framework for CIP Development[18]



4.2.3. Scoring

Scoring is conducted by technical staff in the MassDOT modal divisions. **Table 10** through **Table 13** present the metrics and weighting associated with the criteria established by the Council for use in scoring projects for the CIP for highways, MBTA, Regional Transit Authority, and rail projects.

Table 10: CIP Scoring – Highway Criteria

Criteria	Weight	Measure/Explanation
Condition	15	Looks at both preservation and fixing assets in poor condition

[18] Graphic Source: Project Selection Advisory Council, Stakeholder Advisory Committee Joint Meeting, Presentation, May 5, 2016.

Criteria	Weight	Measure/Explanation
Mobility	20	Looks at improvements to all modes
Safety	15	HSIP eligibility, safety for users of vehicles and other modes
Economic impact	10	Anticipated impact to city/village center, priority development areas, local economic considerations
Environment	10	GHG reduction, positive impacts to the environment, resiliency
Social equity	10	EJ and Title VI benefits, municipalities who don't often propose projects
Policy support	10	FHWA risk criteria, state, regional and local policies/plan consistency
Cost effectiveness	10	Cost per user per lane mile

Table 11: CIP Scoring – MBTA Criteria

Criteria	Weight	Measure/Explanation
Condition	15	SGR database rating, lifecycle management, reduce system vulnerabilities
Mobility/Customer Experience	25	Improvement to accessibility, service quality, person throughput
Safety	10	Improved safety for operators and the public
Economic impact	15	Connectivity improvements to job centers, capacity increases to address demand, Supporting transit oriented land use
Environment	10	Mode shift potential Consumption of natural resources/GHG
Cost effectiveness	10	Impact on operating costs/revenue Operational sustainability
Social equity	10	Net benefit to >50% low-income, minority census tracts
Policy support	5	Consistency with MBTA initiatives and plans

Table 12: CIP Scoring – Regional Transit Authorities Criteria

Criteria	Weight	Measure/Explanation
Condition	15	Consistency with asset management needs
Mobility/Customer Experience	25	Improvement to accessibility, service quality, person throughput
Safety	10	Improved safety for operators and the public
Economic impact	15	Consistency with economic development plans
Environment	10	Mode shift Consumption of natural resources/GHG
Cost effectiveness	10	Impact on operating costs/revenue Potential future capital cost savings
Social equity	10	EJ, Title VI benefits
Policy support	5	Supports local, regional, state policies

Table 13: CIP Scoring – Rail Criteria

Criteria	Weight	Measure/Explanation
Condition	10	Consistency with asset management practices
Mobility	15	Faster service, more service, new service
Safety	20	Improved safety for operators and the public
Economic impact	15	Job creation, tax revenue, improved freight movement, added capacity
Environment	10	GHG reduction/Consumption of natural resources
Cost effectiveness	10	Impact on operating costs/revenue Ability to leverage funding
Social equity	10	EJ, Title VI benefits
Policy support	10	Consistency with Rail initiatives and plans

In the MassDOT districts, each project was first scored by the District's Project Development staff. Projects were subsequently peer reviewed by a committee comprised of representatives from each District throughout the Commonwealth and MassDOT's Pavement Management and Environmental staff prior to the finalization of the score. The MassDOT districts typically have a single engineer working with an individual applicant to ensure that projects submitted have the prospect of scoring well and align to the CIP's funding priorities. Robust documentation, such as project need and initiation forms, plan submittals, and GIS information was used to reduce subjectivity in the scoring process.

At the MBTA, individual questions are all scored by the same Subject Matter Expert on staff, minimizing differences in scoring approaches. Information about projects needed for scoring was obtained through Capital Funding Request (CFR) forms completed for all projects. The CFR included a series of targeted questions correlated to the Project Priority Formula to allow for scoring.

RTA projects were scored by first by the RTAs and then by MassDOT staff. For each project, RTAs completed a background information document that incorporated the information required for scoring. For RTA projects, only those that were greater than $500,000 in value were scored.

MassDOT also conducted an analysis of the initial set of projects scored to ensure that projects were being scored in a consistent manner. A map-based electronic application tool that will automate much of the scoring process is currently under development.

Projects are scored three times per year to ensure that all projects are scored before the annual CIP deadline. An individual project may be scored twice, once at initiation and once at 25 percent design, and they are only scored again after that point if the cost has increased beyond a given threshold. All project scores are published and publicly available on MassDOT's website. For the 2018-2022 CIP, a total of 472 projects were scored using the Project Priority Formula.

4.2.4. CIP Development

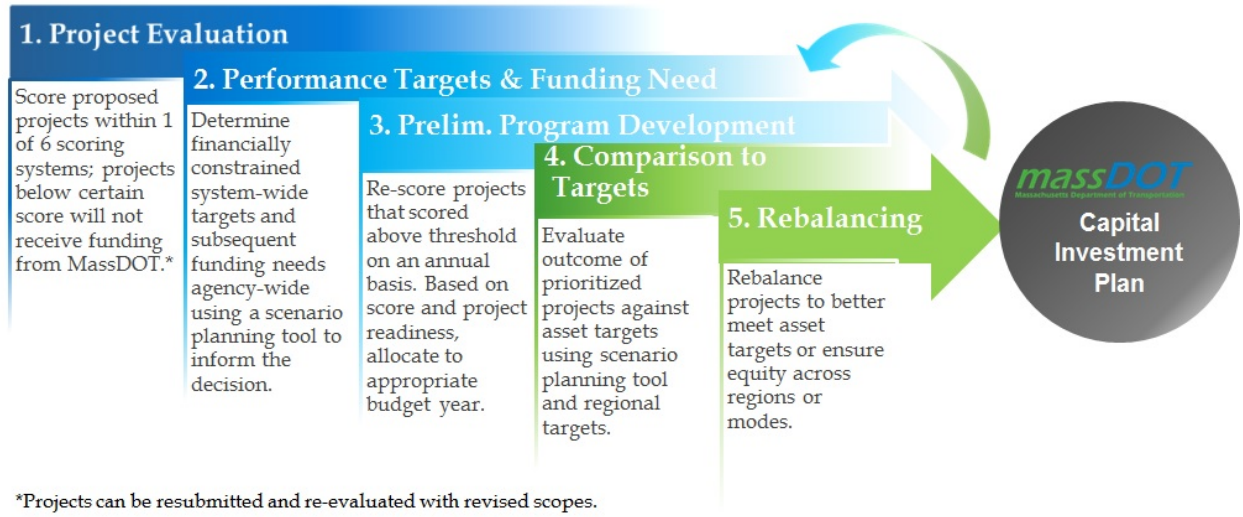
The Project Priority Formula informed the incorporation of projects in the MassDOT CIP as the first step in the overall CIP development process. The Project Priority Formula scores were used with other CIP priority factors (e.g., underway vs. proposed project, project inclusion in other existing plans) to determine which projects were

funded. In each MassDOT division, there were some differences in how the scoring ultimately informed the incorporation of projects in the CIP:

- Highway Projects: As the vast majority of projects included are Federal Aid projects, which are identified and programmed by Metropolitan Planning Organizations (MPOs), an analysis was conducted to compare MPO programming and the results of the Project Priority Formula. This analysis found that the results of the formula aligned relatively well with the MPOs, and coordination between the Project Priority Formula and MPO programming in the future is anticipated.
- MBTA Projects: Scoring was used as one of the criteria in determining which projects should be included in the draft CIP, however, several projects or programs were exempted from scoring due to pressing safety needs (e.g., positive train control).
- Regional Transit Authority Projects: A cut-off score was also used by the RTAs to exclude low-scoring projects.

In addition to these nuances that dictate how the scoring is ultimately used in the CIP, once the preliminary CIP is developed it is evaluated based on the outcome of prioritized projects against targets for asset and regional outcomes, and selected projects may be rebalanced to ensure that outcome targets as well as modal and regional equity goals are met (Figure 8). The 2017-2021 CIP included a total of $14.8 billion in projects, of which $1.7 billion was scored using the Project Priority Formula. The vast majority of the projects that were not scored were state of good repair projects.

Figure 8: MassDOT Capital Investment Plan Development Process[19]



4.3. Lessons Learned

The first implementation of the project prioritization process for the CIP took place in 2016, and MassDOT views the deployment of some aspects of the scoring framework as a work in progress. For example, scoring thresholds for projects by mode were not used in the initial prioritization, with the exception of Regional Transit Authority projects. This process resulted in some lower scoring process remaining in the CIP and with mean

[19] Graphic Source: PSAC Meeting Presentation, December 14, 2016.

scores that varied widely by program. Projects with advocates for the inclusion in the CIP also tended to score well.

MassDOT staff have also received feedback regarding the results of the scoring from municipalities and from each of the divisions conducting the scoring. Recommended changes to the scoring included developing a simpler scoring system for more transparency, bringing more clarity for scoring "non-traditional" criteria, providing scoring information on the MassDOT website, and improving the process to capture data needed for scoring. Changes to the scoring for the 2018-2022 CIP cycle were developed based on this feedback and subsequently approved by the Council. In the first year of the process, the modernization and capacity projects were scored separately, however, in the current CIP cycle the two categories of projects were scored together.

Other improvements MassDOT is developing include providing more documentation to staff conducting the scoring on the data projects need to be scored, and implementing the map-based project application portal that will be designed to capture all of the required data. Once this portal is available, municipalities will be able to use it to have a preliminary idea of how their project will score based on the automated scoring aspects built into its capabilities.

Strong leadership support from the Secretary of Transportation for Massachusetts for the process and the establishment of clear guiding criteria and a transparent methodology for the scoring were among the reasons cited by MassDOT staff for the success of the first year of the use of the CIP scoring process.

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