

Performance-Based Planning and Programming from the MPO Perspective

A White Paper

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07/26/2022

Acknowledgements

This White Paper was requested by the Performance Based Planning and Programming (PBPP) Work Group of the Association of Metropolitan Planning Organizations (AMPO). The White Paper was developed by Caitlin Cook, the Director of Transportation Planning for AMPO in coordination with members from the work group and with the support of funding from the Federal Highway Administration (FHWA). The work was guided by the AMPO PBPP Work Group, a group of MPOs who share information and best practice on the federally required performance measures. The author extends her appreciation to Work Group members who provided input and suggestions. Additionally, thank you to the several regions who provided examples of PBPP practices that are included in this paper.

Disclaimer

This White Paper summarizes the results of several in-person workshops conducted over three years. Members of the PBPP Work Group provided input and suggestions. The contents of this white paper do not necessarily represent the views or position of any specific MPO, AMPO, or FHWA.

Contents

Introduction	1
PM1: Safety	3
Partners and Coordination	3
Data, Targets and Implementation	4
Effective Practices.....	6
PM2: Bridge and Pavement Condition	7
Partners and Coordination	7
Data, Targets and Implementation	8
Effective Practices.....	9
PM3: Performance of NHS, Freight and CMAQ.....	10
Partners and Coordination	10
Data, Targets and Implementation	11
Effective Practices.....	12
Transit Asset Management/Public Transportation Agency Safety Plan	13
Partners and Coordination	13
Data, Targets and Implementation	14
Effective Practices.....	14
Looking Ahead	15
Connected and Autonomous Vehicles (CAV)	15
Electric Vehicles (EV).....	15
Other Emerging Technologies & Increasing Availability of Data	15
Long-lasting Effects of COVID-19	15
Overarching Concepts & Concerns	16
Appendix A: Work Group Participating Agencies.....	18

Appendix B: Work Group Workshop Dates and Topic 19

Appendix C: Acronyms 20

Introduction

In response to the growing shift towards a data-driven and informed planning process, the Association of Metropolitan Planning Organizations (AMPO) applied for and was awarded funding through the Federal Highway Administration (FHWA) in 2018 to create a national Performance Based Planning and Programming (PBPP) Work Group. This PBPP Work Group consisted of thirty-two MPOs from all regions of the country and accounted for a variety of small-urbanized and Transportation Management Area (TMA) MPOs, MPOs whose thresholds who are over 200,000 to provide the best representation of the MPO community possible.

The scope of this Work Group consisted of four in-person, peer-to-peer workshops to discuss each federal performance measure in depth. In addition to these workshops, the PBPP Work Group was tasked with creating a short white paper which would highlight the current state of the practice, including challenges, effective practices, and areas of opportunity for improvement. Due to the concise nature of this white paper, it is expected that the reader will have a basic comprehension of the federal requirements and performance measures. Within this document is a brief summary of each measure, with more in-depth content pertaining to partners and coordination, data and establishing targets, implementation and communication and a one-page example of a best practice per performance measure.

The last three federal transportation bills, the Moving Ahead for Progress in the 21st Century Act (MAP-21), Fixing America's Surface Transportation (FAST) Act and the current [Infrastructure and Investment Jobs Act \(IIJA\) \(also known as the Bipartisan Infrastructure Law \(BIL\)\)](#), contain requirements for State Departments of Transportation (DOTs), Transit operators, and Metropolitan Planning Organizations (MPOs) to establish and conduct performance-based planning and programming. This includes the establishment of targets for measures as they relate to the following topics:

- Safety
- Bridge and Pavement Condition
- Performance of the National Highway System (NHS), Freight and Congestion Mitigation and Air Quality (CMAQ)
- Transit Asset Management (TAM) and Public Transportation Agency Safety Plans (PTASP)

In general, MPOs have the option to either adopt state/transit operator targets or establish their own for their respective MPO planning area; except for CMAQ Traffic Congestion measures which require unified targets with all State DOTs and MPOs in the urbanized area. In addition to establishing targets MPOs are required to monitor and track progress towards meeting these targets. More detail on the federal requirements for each measure can be found on the Federal Highway Administration's (FHWA) Transportation Performance Management [webpage](#) and the Federal Transit Administration's (FTA) performance management [webpage](#).

Note that due to the coronavirus disease 2019 (COVID-19) pandemic, the PBPP Work Group's progress was delayed and did not conclude until May 2022. While the original scope did not include an analysis of the impacts of COVID-19, references have been made where appropriate.

PM1: Safety

In March 2016, the FHWA Highway Safety Improvement Program and Safety Performance Management Measures Rule (PM 1) was published. The rule requires MPOs and State Departments of Transportation (DOTs) to set annual targets for five safety-related performance measures; each based on consecutive five-year rolling averages:

- Number of fatalities
- Rate of fatalities per 100 million vehicle miles traveled (VMT)
- Number of serious injuries
- Rate of serious injuries per 100 million VMT
- Number of non-motorized fatalities and non-motorized serious injuries (combined)

Partners and Coordination

For each PM1 performance measure, the AMPO PBPP Work Group has provided a list of baseline partners that should be included in the MPO process for establishing performance targets, whether the state targets are adopted or the MPO decides to establish their own:

- State Department of Transportation (DOT)
 - DOT Engineers (especially for discussion around geometric safety issues)
- Local Partners (City, County, Parish)
- Transit Operators/Human Services Agencies
- Universities or Transportation Research Institutes
- Bike and pedestrian advocacy groups

In addition to the baseline partners, the Work Group identified additional partners that could aid in the target setting process or in achieving the adopted targets:

- Healthcare/Hospitals/Health insurance companies
- Car insurance companies
- Law enforcement – local and state (highway patrol)
- First responders
- School districts
- Universities/Behavioral scientists
- General public

The above lists are a starting point when thinking of who to coordinate with when establishing targets; each MPO will have a unique mix of partners that can aid in the development of targets. In many cases MPOs have created specific safety-focused committees or interest groups to further help advise on performance measures and planning.

One area that was highlighted in discussion, and is demonstrated in the additional list, are partners that can aid in better understanding and modifying driver behavior beyond the natural effects of physical design. Finding partners, such as researchers within universities, can provide subject matter expertise to MPOs to better understand the psychology behind human behavior and what levers may exist in planning and programming to alter it. Others that are interested in modifying behavior, such as car insurance companies, may also be productive partners in making progress towards targets.

Behavior and Crashes

This example of human behavior and its linkage to safety was most recently demonstrated in the COVID-19 pandemic where the physical infrastructure was not significantly altered, however there was a disproportionate rise in vehicle crash severities nationwide widely attributed to higher incidences of speeding.

Data, Targets and Implementation

Safety data is collected by MPOs from a variety of sources but most commonly is received from the State Department of Transportation (DOT) and the Fatality Analysis Reporting System (FARS). Depending on the state, some DOTs may scrub the data to remove personal information and conflate it to the regional roadway network before distributing, while others may provide raw data for the MPO to process. In some states, such as Texas, Missouri and New Jersey, MPOs have access to a statewide crash database or a data portal. In at least one case it was noted that MPOs may need to check with other transportation agencies, such as a turnpike commission, to ensure they are receiving all reported crashes. Despite extensive efforts to coordinate and distribute safety data there remains a lag in receiving new data, ranging from one to two years, which greatly affects a MPO's ability to establish annual targets.

A major issue with safety data that seems to span all states is locational accuracy. The location of a recorded crash is dependent on the reporting officer initially collecting the data through a crash report, and in many cases is poorly geolocated making post-processing analysis difficult. Another major gap in the data provided is the anecdotal underreporting of bicycle and pedestrian crashes that result in serious injury that do not involve a motor vehicle, but rather are reflective of roadway conditions. And while crash reporting has evolved to be more consistent from state to state, past data is provided in differing schema between states making longer trend analysis difficult.

In general, many regions have seen a streamlining of data reporting, but the granularity of that reporting is limited. Due to this, many MPOs struggle to conduct more detailed safety analysis at lower geographic areas such as corridors or intersections. Without this granularity, understanding the underlying reasons for a crash - particularly if they are behavioral - is a challenge. Without accurately understanding the underlying causes, it is difficult to apply the appropriate countermeasures.

In establishing targets, predictive tools for MPOs are lacking, leaving many MPOs to question whether their programming and planning efforts are effectively moving the needle towards

achieving established targets. Those that do establish their own targets using the data provided tend to use Microsoft Excel for trendline analysis and other statistical software packages such as the [R Project](#). While data-informed targets are ideal, many MPOs cited establishing targets based on aspirational goals or policies, most notably a growing commitment of zero roadway deaths. For most, it seems a combination of trendline analysis and a policy of zero roadway deaths form the foundation of safety targets.

For those questioning whether they should establish their own targets or adopt the State's, below are reasons cited by work group members for why they chose to establish their own:

- If your region represents the majority of a state's population and there is a disparity between outstate and metropolitan data
- If your region's data is significantly different than the state and you wish to better understand the crashes in your region
- If your region has committed itself to aspirational targets such as zero roadway deaths

For those that chose to adopt state targets, they most commonly were small MPOs that did not have the authority to suballocate funds and make a direct impact on programming projects to effectively achieve targets. Additionally, many small MPOs see their crashes on state-owned infrastructure, further lending support to adopting state targets.

Regardless of establishing regional targets or adopting the state's, MPOs are still responsible for communicating these targets and programming projects and policies that support them. The most common way safety targets are integrated in the planning and programming process is through inclusion in the Metropolitan Transportation Plan (MTP), measuring progress towards targets through projects programmed in the Transportation Improvement Program (TIP), and through project ranking and scoring processes during suballocation of federal funds. It should be noted however, generally only TMAs have the ability to suballocate federal funds, therefore weakening small MPOs' ability to make progress towards achieving established targets. In addition to core products, some MPOs have begun integrating safety targets into other plans, such as Regional Freight plans, and dedicating planning efforts towards changing driver behavior through campaigns that discourage texting and driving or driving while under the influence.

In communicating these targets to stakeholders and the MPO Board of Directors, many MPOs struggle with explaining the disparity between the actual trend analysis and aspirational targets. It is politically unpopular to establish a target at anything less than zero, even if trendlines suggest increasing fatalities and serious injuries year over year. This is compounded by the 5-year rolling average requirement given the lag in data and the delay in seeing effective change through programming. Additionally, while targets are established annually, progress towards those targets through programming and implementation takes much longer. This makes for a difficult discussion when staff has to explain worsening data trends despite having programmed safety-related projects the year prior.

Effective Practices

While many gaps and challenges were identified, there are a few common and effective practices that were notable for MPOs to adapt for their regions:

- Create a MPO safety committee or interest group to help advise on establishing targets and communicating them to stakeholders
- Work with local and state law enforcement agencies that are collecting the data to educate and communicate the need for more accurate and complete data collection
- Use mapping to tell a story of crashes in your region, through interactive mapping or story maps via Esri's ArcGIS Online
- Integrate targets into other modal plans such as regional Bicycle and Pedestrian or Freight Plans and programs beyond the MTP and TIP
- Consider subtracting points, not just adding points, during the project evaluation and prioritization process if safety targets are not being improved

PM2: Bridge and Pavement Condition

In May 2017, the final rule for the National Performance Management Measures Assessing Pavement Condition for the National Highway Performance Program and Bridge (PM2) went into effect. Simply put, it requires State DOTs and MPOs to establish targets regarding the bridge and pavement conditions on the National Highway System (NHS) as part of the overarching state-led National Highway Performance Program (NHPP). Targets required include:

- % of Interstate pavements in good condition
- % of Interstate pavements in poor condition
- % of Non-Interstate NHS pavements in good condition
- % of Non -Interstate NHS pavements in poor condition
- % of NHS bridges by deck area classified in good condition
- % of NHS bridges by deck area classified in poor condition

Partners and Coordination

For each PM2 performance measure, the AMPO PBPP Work Group has provided a list of baseline partners that should be included in the MPO process for establishing performance targets, whether the state targets are adopted or the MPO decides to establish their own:

- State Department of Transportation (DOT)
 - DOT Engineers (especially for discussion around geometric safety issues)
- Local Partners (City, County, Parish)
 - Particularly Public Works Departments or the staff that support Capital Improvement Program (CIP) or bond project implementation
- Transit Operators/Human Services Agencies

In addition to the baseline partners, the identified additional partners that could aid in the target setting process or in achieving the adopted targets:

- Utility Companies, such as:
 - Water
 - Gas
 - Internet
- Freight Operators
 - Rail, Port, Airport, Trucking and Logistics Companies
- State Motor Carrier/Trucking Association
- Climatologists
- Chamber of Commerce/Business community
- Flood zone management agencies
- Bicycle and pedestrian advocacy groups
- Financial forecasters
- State Health Departments
- General Public

Many of the additional partners suggested, such as utility companies and the freight community, while generally not directly responsible for pavement or bridge infrastructure, can put some of the greatest stress on the structures through heavy loads or frequent utility cuts. Better coordination with both can help locals and, subsequently, MPOs forecast conditions and plan for coordinated improvements. Other stressors, such as health emergencies and natural disasters, are also a major consideration in maintaining a state of good repair, so coordinating with the agencies that map and monitor these events can provide a better understanding of the risk posed to that infrastructure and its potential improvement cycle.

And finally, one additional partner many may overlook in bridge and pavement target coordination are bicycle advocacy groups. As physical improvements are made to bridges and pavement, it can be an optimal time to include additional bicycle facilities and expand multi-modal access, as appropriate. Involving bicycle advocacy groups in this way can not only provide a more holistic approach to establishing targets but can also galvanize local and political support for improvements that will positively impact targets.

Data, Targets and Implementation

For these performance measures, the State DOT is the primary data provider. While locals may be collecting data and creating their own asset management plans or programs, the majority of MPOs obtain their data from the state. For many it has taken close coordination with their State DOT to receive the needed data on time to make target-setting decisions. In some cases, MPOs that have the capacity are working with local governments to help acquire bridge and pavement data for off-system roadways to augment the NHS data and provide a more complete picture of asset management region wide.

Primary issues with data are the volatility year to year when not tracking and reporting on fair condition infrastructure. For example, having one large bridge on the cusp of declining into a poor condition can greatly affect the overall state total once it deteriorates, making the numbers seemingly bounce year to year when the fair category isn't accounted for.

Similar to safety data, and nearly all performance measures, predictive tools are limited at the MPO level. While many states have access to tools to better predict the deterioration rate of infrastructure, most MPOs do not. This is most likely due to the fact that MPOs generally are not directly responsible for physical infrastructure and asset management. Some MPOs have attempted to create spreadsheet-based tools using deterioration rates to analyze and estimate pavement and bridge conditions based on the amount of funding invested, but the outputs have proven to be fairly unreliable. Climate impacts on materials and how they hold up over time as well as a myriad of other variables, such as utility cuts by private companies, all affect condition and deterioration; much of this data is not easily accessible to MPOs making predictive analysis and target setting difficult. GIS has been another tool for those understanding these measures.

Making the pavement dataset HPMS-based has made it easy for some state DOTs to provide it in a format that makes it easier for MPOs to join additional data to it.

MPO adoption of state targets was most common for these measures, with Work members citing that the state DOT owns the vast majority of the system that the targets are being applied to. In more rare cases MPOs have established their own targets, usually for the non-interstate NHS roadways or NHS bridges in instances where regional assets were significantly different from state averages or when the MPO was driven by policy versus data. In some cases, there are regional nuances to establishing your own targets; in one example a region's DOT was using a coarse aggregate in resurfacing which increased its roughness, but its actual condition was good.

Similar to safety performance measures, these are most commonly implemented in core products like the MTP and TIP and used for project prioritization in suballocating federal funds. However, because the DOT tends to own the vast majority of roadway miles for these measures, most MPOs have limited impact on the actual improvement of the conditions. In tracking progress towards these measures, MPOs also struggle when DOTs group preventative maintenance projects into one categorical project in the TIP instead of individual line-item projects that can be directly tied to target improvement.

Despite adopting state targets, many MPOs struggle to communicate these measures. The process for measuring asset condition is very technical and relies on several factors. This does not always translate well to the general public or stakeholders without an engineering background. For those places with few bridges, improvements can have a great impact on the condition rating but at the same time performance can appear to decline faster than other areas with a larger number of bridges. Other parts of the measures can cause confusion as well, such as bridge deck condition versus bridge deck area. Because of this many MPOs rely on their state DOT engineers or district planners to present to the Board of Directors or stakeholders. In addition to its technical nature, many stakeholders and Boards fail to see the connection between what MPOs do and these measures as direct improvement is limited. And for those that do see the connection and want to have a conversation about asset condition at a smaller granularity than the regional level, may find themselves restricted by state law, as some states only allow the distribution of data in the aggregate making it impossible to discuss specific corridors.

Effective Practices

While many MPOs defer to their state DOTs for these measures, there were examples provided by the Work Group where the MPO worked closely with the DOT to help communicate the state of the system to the public and raise overall awareness around asset management. In one case, a MPO plotted deficient bridges along with planned improvements to nearby corridors to identify areas of low investment. This, combined with the growing desire to look at historical and planned investment in relation to environmental justice (EJ) areas, are ways that MPOs can add to the regional dialogue of pavement and bridge condition.

PM3: Performance of NHS, Freight and CMAQ

In May 2017, the final rule for the National Performance Management Measures Assessing Performance of the National Highway System, Freight Movement on the Interstate System, and Congestion Mitigation and Air Quality Improvement Program went into effect. These measures are commonly divided into four categories:

Travel Time Reliability (TTR)

- Percent of Person-miles Traveled (PMT) on the Interstate System that are Reliable
- Percent of PMT on the Non-Interstate NHS that are Reliable

Freight Reliability

- Interstate System Truck TTR (TTTR) Index

Traffic Congestion

- Annual Hours of Peak-Hour Excessive Delay (PHED) per Capita
- Percent of Non-Single Occupancy Vehicle (SOV) Travel

Emission Reduction

- On-Road Mobile Source Emissions Reduction for CMAQ-funded Projects

Partners and Coordination

For each PM3 performance measure the AMPO PBPP Work Group has provided a list of baseline partners that should be included in the MPO process for establishing performance targets, whether the state targets are adopted or the MPO decides to establish their own:

- State Department of Transportation (DOT)
- Local Partners (City, County, Parish)
- State Environmental Protection Agencies (EPA)/State Environmental Divisions
- Freight Operators
 - Rail, Ports, Airports, Trucking Companies, Logistics Companies
- State Motor Carrier/Trucking Association
- Transit Operators/Human Services Agencies
- Universities and Transportation Research Centers
- Bicycle and pedestrian advocacy groups

In addition to the baseline partners, the Work Group identified additional partners that could aid in the target setting process or in achieving the adopted targets:

- Autonomous Vehicle (AV) companies
- Economic development/chambers of commerce/Elected officials
- Police and motor carrier enforcement
- Army Corps of Engineers
- Homeland security/hazardous materials
- Data providers (e.g., Streetlight)
- Community/neighborhood groups

- Environmental Justice (EJ)/Equity focused groups
- Environmental Groups (e.g., Sierra Club, Clean Cities Coalition)
- Truck stops (e.g., Love's)
- Toll road authorities
- Land use developers
- Energy providers
- Department of Defense (DOD)
- Mexican or Canadian Border Control (when appropriate)

Data, Targets and Implementation

MPOs receive the data for these measures through a variety of sources, including their state DOTs. For reliability measures most access the required travel time data in the National Performance Management Research Data Set (NPMRDS) via the Regional Integrated Transportation Information System (RITIS). RITIS is an analytical platform that interfaces with a variety of transportation datasets. For performance measure analysis RITIS has developed a dashboard tool that allows quick access to performance measure summaries for each region. State and other transportation agencies can access and use the basics of the NPMRDS for free through an account with RITIS after agreeing to the necessary license agreement.

Some DOTs and MPOs have opted to purchase access to an add-on tool developed by RITIS that provides more detailed access to the NPMRDS called the Probe Data Analytics Suite. PDA Suite hosts a variety of tools that evaluate a region's performance metrics and trends using NPMRDS data.

Depending on the state contract, some MPOs only have access to the bare minimum data needed to establish targets while others have full access to the RITIS tool including more granular data and analysis. Additionally, MPOs use FHWA's User Profile and Access Control System (UPACS) for the on-road mobile source emission targets and the U.S. Census Bureau for non-SOV targets.

Some of those MPOs that have access to the RITIS tool have conducted deeper analyses. For example, one MPO compiled a list of regionally significant projects that would impact congestion and used RITIS to look at these projects at a more granular project level. Other MPOs and state DOTs have been seeking consultants to build software to better fit their needs using machine learning models to develop forecasts for target setting.

Level of Travel Time Reliability (LOTTR) and TTTR are binary metrics, either a roadway segment is reliable or it's not. Thus, a roadway segment that is 'barely good' today could end up being 'bad' during the target year with just a very minor change in condition. Additionally, TTTR is very sensitive to temporary conditions such as a preventative maintenance project. Coordination is important with maintenance schedules in order to anticipate an unreliable condition.

For the some of MPOs establishing CMAQ emission reduction targets, they lead the state in establishing targets, particularly if they are the only TMA in the state such as St. Louis in Missouri and Chicago in Illinois and in the entire state of Texas. Others tend to follow the states lead and coordinate to establish targets. For the Non-SOV measure, we have some concerns about data quality of the 2020 5-Year Estimates considering the Census Bureau’s difficulties with data collection during that time, although 5-year estimates do mute some of the variation.

MPOs are using a variety of ways to establish targets, including considering the lowest emission reduction benefit recovered over a 4-year baseline and applying a multiplier, using the average emission reduction with a multiplier, or by considering how much CMAQ funding was obligated each fiscal year and calculating the average emission reduction and using the funding allocation forecasts to establish targets. However, these targets tend to reflect the cumulative effects rather than a traditional target. In some cases, MPOs have leveraged state or local university resources to help provide recommendations on what a good target would be.

COVID-19 and Commuting
Many MPOs have noticed that while traffic volume has returned to pre-COVID levels, the AM and PM peaks while still present seem to have leveled out. More time will be needed to determine if this will be a permanent effect of COVID-19 or if the peaks and their related effects on congestion and reliability will return.

Overall, these measures were decidedly the most difficult to communicate, particularly the difference between congestion and reliability as stakeholders often confuse the two. Compounding this discussion is the fact that many MPOs do not view congestion as inherently bad, recognizing it can prompt desirable changes in travel behaviors such as carpooling or taking public transit. In addition to this, the air quality measures tend to be the most complicated to explain to stakeholders given their complex nature and the fact that it is a measure that is harder for the public to personally experience, when compared to measures such as pavement condition.

Effective Practices

MPOs that had the most success in communicating these measures were the ones that avoided the technical calculations used and instead focused on graphics such as arrows to indicate whether a region was getting better or worse in making progress towards achieving a target. Being able to provide visualizations, particularly through interactive mapping, as well as comparing the region to other peer regions helped provide a clearer context for the measures.

Transit Asset Management/Public Transportation Agency Safety Plan

In October 2016, the Transit Asset Transportation Performance Management ruling required MPOs to establish their own targets or adopt the transit operators targets for the following measures:

- % of revenue vehicles exceeding Useful Life Benchmark (ULB)
- % of non-revenue service vehicles exceeding ULB
- % of facilities rated under 3.0 on the Transit Economic Requirements Mode (TERM) scale
- % of track segments under performance restriction

Beginning July 2019, The Public Transportation Agency Safety Plan (PTASP) required covered public transportation providers and state DOTs to establish safety performance targets to address the safety performance measures identified in the National Public Transportation Safety Plan. MPOs are required to establish performance targets for each performance measure after the transit agency establishes their performance targets for the following:

- Total number of fatalities reported to National Transit Database (NTD)
- Rate per total Vehicle Revenue Miles (VRM) by mode
- Total number of injuries reported to NTD
- Rate per total VRM by mode
- Total number of safety events reported to NTD
- Rate per total VRM by mode
- Mean distance between major mechanical failures by mode

Partners and Coordination

For each transit-related performance measure, the AMPO PBPP Work Group has provided a list of baseline partners that should be included in the MPO process for establishing performance targets, whether the transit operator's targets are adopted or the MPO decides to establish their own:

- State Department of Transportation (DOT)
- Local Partners (City, County, Parish)
- Transit agencies\Human Services Agencies
- Stakeholders that represent transit-dependent populations
- Universities
- Public school systems
- Veterans Affairs
- Asset owners (City/County/Parish/Private)

In addition to the baseline partners, the Work Group identified additional partners that could aid in the target setting process or in achieving the adopted targets:

- Businesses/Major employers
- Hospitals
- Law enforcement
- Advocacy groups
- Transportation Network Companies (TNCs)

Data, Targets and Implementation

Data is provided by the transit agencies for these measures, although as noted by the Work Group timeliness of the data remains a challenge. While some may use the National Transit Database (NTD) because it offers consistent, quality data for assessing performance and setting targets, they also noted a significant delay. Of all of the federally required performance measures, transit-related measures tend to require the most amount of time for coordination despite generally being adopted by the MPO. While transit agencies provide the data and their own target to MPOs, for those regions that have multiple transit agencies MPOs may have to aggregate individual targets to create a regional target, generally based upon the least common denominator. In some cases, MPOs created separate targets for small and large providers. Further compounding this coordination is the requirement to adopt targets within the 180-day timeframe. Additionally, the flexibility allowed for including security events or grouping facilities can make it difficult to combine individual targets into a regional target.

While these measures seem to be the most hands-off process for MPOs, as most elected to adopt the targets provided by their transit agencies, there were several gaps the MPO community expressed interest in measuring. MPOs identified quality of service and equity as two main focus areas that are not currently addressed in the federal performance measures. Every metropolitan region has people who for reasons such as age, disability or income cannot travel using a personal vehicle and are reliant on public transit. To date, none of the federal measures are representing whether or not the system is meeting their mobility needs.

It is common for MPOs to invite their transit agencies to speak to their stakeholders or Board of Directors when presenting and explaining targets. Anecdotally most of the conversation revolves around safety or age of assets. In many situations, MPOs struggle with the narrative that old busses are unsafe busses, which is not always the case.

Effective Practices

The most noted struggle in these performance measures were the coordination between MPO and transit agency(s). Those that were most successful worked with their transit agencies early and often. Many followed an agreed upon process for establishing targets and then rolled them up to the regional level, which allowed the MPO to better anticipate when targets would be received and coordinate the multiple providers to ensure they stayed within the 180-day timeframe.

Looking Ahead

As demonstrated through the continuation of performance-based planning and programming requirements in the last three federal transportation bills, the desire for data-driven and informed decision making in transportation investments has continued to grow. The PBPP Work Group has identified several potential disruptions that will likely impact the federal performances measures, both in achieving progress towards targets as well as monitoring that progress. The top four are identified and will require additional research and time to fully understand how they will impact the federal performance measures.

Connected and Autonomous Vehicles (CAV)

Various components of connected and autonomous vehicles have already penetrated the market, particularly in the freight sector and trucking industries. With the continued deployment of CAV technology, the Work Group has hypothesized that the transportation community could see progress towards multiple performance measures. With a more widespread integration, crashes could be reduced, and congestion, reliability, and air quality could improve. Conversely though increased reliance on CAV technology would stress improved pavement and bridge condition since portions of the technology rely on the physical infrastructure.

Electric Vehicles (EV)

Electrification of the fleet has long been underway and has been given additional emphasis under the current federal administration. With increasing electric vehicle infrastructure and competitive pricing models many consumers are turning to electric vehicles, with a greater shift predicted in the coming years. This most heavily impacted the conversations around CMAQ and the potential benefits to reduced mobile-source emissions while also acknowledging the tradeoffs associated with an increased demand on utility companies and the potential increase in emissions from generating the necessary electricity.

Other Emerging Technologies & Increasing Availability of Data

While CAV and EV were the two emergent technologies most discussed, there are other technologies that may not be as mature or widespread but are likely to enter or expand in the market in the coming years. Examples, such as drones, small parcel delivery vehicles, synthetic modeling, block chaining, and increased access and ability to analyze big data, were all mentioned in the peer-to-peer discussions as potentially affecting the performance management process. In other cases, some MPOs are looking at how to use existing technologies, such as lidar, in new ways to plug existing gaps in data. As technologies continue to enter the transportation market it will be important to monitor their effects on the federal performance measures and leverage them, when possible, to drive progress towards achieving targets.

Long-lasting Effects of COVID-19

The COVID-19 Pandemic had widespread effects across the transportation sector. In some cases, MPOs witnessed positive impacts on performance measures such as congestion and reliability due to the decrease of SOVs on the roadways and reduction of VMT. While the safety

performance measures saw a decrease in overall crashes but an increase in severity, with preliminary data indicating that while there were fewer SOVs on the road, there seemed to be an increase in speeding and poor driving behaviors. While many travel habits have begun returning to pre-COVID behaviors, there remains uncertainty regarding how much of the workforce will remain working remote.

MPOs, State DOTs and Transit Agencies also saw significant staff turnover during the pandemic, a struggle that has remained more than two years after the pandemic began. This made tracking performance and setting new targets more challenging as we all lost a lot of institutional knowledge. Supply chain and labor issues also delayed projects, delayed procurement of buses, parts, and equipment, and increased overall expenses. More time and research will be needed to fully understand the long-term effects of COVID-19 on the transportation system and the federal performance measures.

Overarching Concepts & Concerns

Many MPOs were already tracking and monitoring aspects of system performance prior to the federal requirements. The federal process did, however, introduce the transportation planning process to a broader community of subject matter experts whose previous involvement may have been limited (e.g., state DOT bridge and pavement experts) and has helped to standardize the process and ensure the availability of consistent data. Despite this history of performance-based planning, there remains several overarching challenges that affect the federal performance measures:

- Differing timelines for each target is difficult to track and keep up with, as the 180-day clock begins at different times each cycle
- The timeline for project development or implementation is often much longer than the timing for performance targets, sometimes taking up to a decade to be built. As a result, a lot of hard work to program projects that will affect the measures on the part of MPOs, state DOTs and transit agencies is often not reflected in the more immediate data and targets.
- MPOs are just beginning to understand the extent to which the various performance targets may work at cross purposes to each other. For example, if an agency establishes targets to improve pavement condition, those improvements may require lane closures which in turn could affect safety and reliability.
- Predictive tools for many, if not all, of these metrics and measures are currently rudimentary and do not yet consider changes in traffic, speeds, weights, weather conditions, etc. The result is that it is often difficult to determine a reasonable target beyond an analysis of the current trendline.
- Challenges with connecting targets to project programming, particularly as non-TMA MPOs have limited or no access to suballocated funding
- Many MPOs and state DOTs group certain projects within a categorical project in the TIPs rather than a line-item listing of projects. This is especially true for preventative

maintenance and rehabilitation projects but also can be true for certain safety projects and transit asset procurements. As a result, it can be difficult to directly connect MTP or TIP investments to achieving PM1, PM2 or transit asset targets.

Appendix A: Work Group Participating Agencies

Atlanta Regional Commission
Baltimore Metropolitan Council
Boston Region Metropolitan Planning Organization
Capital District Transportation Committee
Charlotte Regional Transportation Planning Organization
Chattanooga-Hamilton County Regional Planning Agency
Chicago Metropolitan Agency for Planning
Denver Regional Council of Governments
Farmington Metropolitan Planning Organization
Greater Nashville Regional Council
KYOVA Interstate Planning Commission
Lexington Area Metropolitan Planning Organization
Maricopa Association of Governments
Memphis Metropolitan Planning Organization
MetroPlan Orlando
Metropolitan Area Planning Agency
Metropolitan Council
Metropolitan Transportation Commission
Metropolitan Washington Council of Governments
Mid-America Regional Council
North Central Texas Council of Governments
North Jersey Transportation Planning Organization
Northeast Ohio Areawide Coordinating Agency
Puget Sound Regional Council
Regional Planning Commission of Greater Birmingham
Regional Transportation Commission of Southern Nevada
South Jersey Transportation Planning Organization
Southeast Michigan Council of Governments
Valdosta-Lowndes Metropolitan Planning Organization
Wasatch Front Regional Council
Wichita Area Metropolitan Planning Organization
Wilmington Area Planning Council

Appendix B: Work Group Workshop Dates and Topic

Workshop 1: Kick-Off

Atlanta Regional Commission

December 12-13th, 2018

Workshop 2: PM1

Association of Metropolitan Planning Organizations

June 11th, 2019

Workshop 3: PM2

Denver Regional Council of Governments

October 1-2nd, 2019

Workshop 4: PM3 and Transit

New Orleans Regional Planning Commission

April 20th-22nd, 2022

Appendix C: Acronyms

AMPO – Association of Metropolitan Planning Organizations
BIL – Bipartisan Infrastructure Law
CAV – Connected & Autonomous Vehicles
CMAQ – Congestion Management & Air Quality
DOT – Department of Transportation
EJ – Environmental Justice
EPA – Environmental Protection Agency
EV – Electric Vehicles
FARS – Fatality Analysis Reporting System
FAST – Fixing America’s Surface Transportation Act
FHWA – Federal Highway Administration
FTA – Federal Transit Administration
IIJA – Infrastructure Investment & Jobs Act
LOTTR – Level of Travel Time Reliability
MAP-21 – Moving Ahead for Progress in the 21st Century Act
MPO – Metropolitan Planning Organization
MTP – Metropolitan Transportation Plan
NHPP – National Highway Performance Plan
NHS – National Highway System
NPMRDS – National Performance Management Research Data Set
NTD – National Transit Database
PBPP – Performance-based Planning & Programming
PHED – Peak-Hour Excessive Delay
PM – Performance Measure(s)
PMT – Person-miles Traveled
PTASP – Public Transportation Agency Safety Plan
RITIS – Regional Integrated Transportation Information System
SOV – Single-occupancy Vehicle
TAM – Transit Asset Management
TERM – Transit Economic Requirements Mode
TIP – Transportation Improvement Plan
TMA – Transportation Management Area
TNC – Transportation Network Company
TTR – Travel Time Reliability
TTTR – Truck Travel Time Reliability
ULB – Useful Life Benchmark
UPACS – User Profile Access & Control System
VMT – Vehicle Miles Traveled
VRM – Vehicle Revenue Miles