MAP-21 Target-Setting Exercise

Background Resources

Document Overview

This document is designed to support the AASHTO SCOPM MAP-21 Target-Setting exercise. It includes material specific to the Freight performance area. It presents targeted excerpts from documents that have already been developed through previous Task Force activities. This documents also contains selected information from research conducted through NCHRP 20-24(37) Comparative Performance Measurement series. The appendix contains a brief Freight Performance Measure Factsheet produced through a previous effort of the SCOPM Task Force.

This document is organized into three sections:

1. **General Target-Setting Recommendations**
   SCOPM Task Force Findings on MAP-21 Performance Measure Target-Setting (3/13)
2. **Freight Performance Area Recommendations**
   SCOPM Task Force Findings on MAP-21 Performance Measure Target-Setting (3/13)
   SCOPM Task Force Findings on National-Level Performance Measures (11/12)
   SCOPM Task Force Workshop on National Performance Measures Background Paper (9/12)
3. **Appendix**
   Performance Measure Factsheet

Additional information is available at the Target-Setting Exercise website:
http://sites.spypondpartners.com/targetsetting/freight

1. General Target-Setting Recommendations

1.1. Target-Setting Overview

The findings of the SCOPM Task Force with regard to MAP-21 target-setting requirements included in this document are based on the following interpretation of the related MAP-21 target-setting requirements:

- A set of standard, consistent national performance measures will be established, but states will have flexibility to establish the target values of those measures. Thus, the term "consistent" applies to the performance measures, data methodologies (collection, processing and analysis), and performance reporting processes. There is no presumption that targets will be consistent across states – rather they will be specific to local conditions and needs and at set at the discretion of DOTs and MPOs.
- States must submit biennial reports on progress toward target achievement for each national measure.
- For the Highway Safety Improvement Program, states that have not made significant progress towards meeting established targets face reductions in funding flexibility and additional reporting requirements.
- For the National Highway Performance Program (NHPP), states that do not make significant progress towards meeting their established targets for asset condition or performance must report actions that they will undertake to achieve the targets.

1.2. Target-Setting Findings and Recommendations

The findings of the SCOPM Task Force with regard to target-setting center around three general findings and eleven recommendations.

1.2.1. General Findings

- **First**, State DOTs request maximum flexibility when setting performance targets. Every state and municipality faces different constraints and opportunities affecting their transportation system. Funding levels and sources vary, as do environmental conditions, population growth trends, and legislative and gubernatorial mandates and priorities. Flexibility in target-setting allows states and municipalities to face the realities of their unique situations. Furthermore, accountability should be based on what states can accomplish with their shares of federal funding.
- **Second**, consistent with the National-Level Guiding Principle #2 (see page 3), *Specificity and Simplicity*, MAP-21 rulemaking should encourage States DOTs to adopt performance targets that are attainable and realistic. These targets should be periodically reevaluated and adjusted

to reflect risks, revenue expectations, and strategic priorities. In addition, the State DOTs agree that consistent data collection and analysis methods are essential to ensure that national-level measures and reporting use comparable data.

- **Third**, in keeping with National-Level Guiding Principle #3 (see page 3), *Possession is 9/10ths of the Law*, the establishment of performance targets can provide a focal point for action and a basis for accountability. However, it is important to recognize that for several of the national-level performance measures, State DOTs have relatively limited control over outcomes. There are many externalities that could affect a State DOT attaining certain performance targets from economic to social forces. For example, the effect of background changes in traffic related to economic conditions can overwhelm any deliberate actions on the part of a state to improve safety or reduce traffic delay. Generally speaking, State DOTs have more control over achieving targets related to asset condition and less control over performance measures associated with safety and system performance.

1.2.2. Specific Recommendations

The following are specific recommendations of the SCOPM Task Force that should be considered in drafting specific rules for implementation of the target-setting provisions of MAP-21:

Provide maximum flexibility

- Regional, local, or other targets are to be established by states or MPOs as appropriate when necessary. Baseline conditions may vary significantly state-to-state and region-to-region.
- Many factors, such as population growth and environmental conditions affect performance outcomes for metrics like congestion and pavement. Therefore, maximum flexibility is required for target-setting.

Focus on what matters – the right outcome

- Target-setting should not focus on a single target value for a performance measure but on achieving improved performance over time.
- States and MPOs often have to make priority decisions based on customer and stakeholder requirements. Each state and MPO must consider these requirements – which will vary from state to state – within its target-setting process.
- The value of performance management is found in better decision-making, not target achievement. DOTs support the idea of allowing states to establish ranges of acceptable performance outcomes. Use of ranges can provide DOTs with a more nuanced way of discussing performance outcomes across multiple competing objectives.

Align targets with system ownership and funding levels

- Targets set for federal performance measures should be aligned with federal funding levels as state DOTs and local partners may or may not have multiple funding sources in addition to federal funds.
- Diverting state funds to meet federal requirements may not be an option. State funding is typically used to match federal funds and allocated to meet state obligations and priorities set by state government such as non-federal-aid eligible maintenance activities.

Base target-setting on longer term trend data

- Targets cannot be set in isolation of solid baseline and reliable, quality, multi-year trend data.
- The expansion of the NHS in MAP-21 has provided challenges as baseline and multi-year data may not be available for the full NHS system.
- Long term viewpoints and multi-year efforts should be considered in target-setting; one data point should not be used to evaluate a program.

Coordinate target-setting through a continuing, cooperative, and comprehensive process

- The development of state, MPO and transit provider targets should be coordinated through a 3C (continuing, cooperative and comprehensive) planning process. This process should result in MPO targets that are attainable given the level of investment a DOT plans to make in a metropolitan planning area (MPA) over a particular time-horizon. Whenever possible, DOTs and MPOs should use consistent (i.e. equivalent) targets to assess the condition and performance of state highways within an MPA.
- Only hold state DOTs and MPOs accountable for what they manage and control. Those who set targets should be those who manage and fund the system and are held responsible for compliance.
- Agencies should not be penalized for not meeting targets due to circumstances beyond their control.

Tell the story: performance is more than just a number

- Analysis and reporting on achieving targets should be both qualitative and quantitative
- Target-setting should reflect a good faith effort and provide qualitative and quantitative reasoning, as appropriate, to support the results of failing to meet specific targets. For example, states and MPO should be given the opportunity to explain how available resources and other factors such as population dynamics and environmental factors influenced the failure to meet specific targets.
- State DOTs are under increasing pressure and scrutiny from the public regarding investments of public funds and the quality of services provided. While defining measures, setting targets, and aligning strategies to achieve the targets can all positively affect the performance of the state DOTs, these actions will do little to increase the credibility of DOTs unless there is a

reliable, transparent, and understandable method of reporting the progress in achieving the performance targets.

Avoid unachievable targets or the "one size target fits all approach"

- Funding constraints should be factored into the process for determining what values to use for targets. DOTs and local partners work within resource constraints, and cannot be expected to perform to a uniform level (target value) on all measures.
- Targets should reflect realistic expectation about what can be achieved through transportation investments.

Allow for appropriate timelines for target achievement

- Allow for appropriate timelines for achieving targets as a measurable change or progress toward targets may take many years to be noticeable. These may vary by performance area and measure.
- In addition, time horizon (short vs. long-term) for targets should be allowed to vary depending on the measure and at the discretion of each state. For example, safety measures could use the 5 year projection of the 5-year moving average to set targets; annual reports would demonstrate progress using these projections.
- At each DOT's discretion, targets should be regularly reevaluated and adjusted to reflect evolving risks (e.g. new revenue expectations, changing strategic priorities, etc.)
- At each DOT'S discretion, targets should be reviewed and revised periodically to confirm the selected target is still suitable for achieving the required results.

Guard against unintended consequences

- Consider how targets set for one measure could have unintended consequences for the performance of another measure due to resources shifting to other priorities.
- Targets could drive a "worst first" prioritization approach, risking neglect of long-term system needs. A sustainable, efficient transportation system must place a high priority on system maintenance, preservation, and maximizing asset life while minimizing overall life cycle costs.
- Worst first prioritization can lead to unintended consequences in the system. For example, International Roughness Index (IRI) targets could lead to smooth pavements with deteriorating structural conditions. The IRI target could also prompt states to address the wrong problems, and inadvertently shorten pavement life, instead of lengthening it.

Complement flexibility in target-setting with transparency and accountability

- Setting targets should be accompanied by a rationale for selecting the specific target value.
- When states and MPOs do not meet performance targets, they should describe what they have done to improve performance, how those actions impacted the performance, and why they have not met the target.

Allow flexibility for DOTs and MPOs to use a risk based target-setting approach

- Risk-based targets do not reflect optimal outcomes within a particular investment area; rather, risk-based targets represent strategic objectives within a plan to manage agency risks.
- Risk-based targets are meaningful in that they can be realistically achieved under existing revenue expectations. Unlike aspirational targets, risk-based targets can be managed.
- Risk-based targets are derived from risk assessments and revenue expectations at a point in time; Targets should be continuously reevaluated as risks and revenue expectations evolve.

2. Freight — Performance Area Recommendations

2.1. Measures

- **Annual Hours of Truck Delay (AHTD)**—Travel time above the congestion threshold in units of vehicle-hours for Trucks on the Interstate Highway System.
- **Truck Reliability Index (RI_{80})**—The RI is defined as the ratio of the total truck travel time needed to ensure on-time arrival to the agency-determined threshold travel time (e.g., observed travel time or preferred travel time).

2.2. Targets

2.2.1. Delay

- AASHTO supports state flexibility in the setting of targets; as provided in MAP-21. To that end, the AHTD target would be set by individual state DOTs and MPOs expressed in terms of the continuous variable of Annual Hours of Truck Delay. This continuous variable will not be represented through categorical variables of good-fair-poor or similar. Targets could have a negative or positive direction. For example "AHTD should not increase more than 5 percent per year".
- In addition to urban and rural interstates, other geographic constructs are critical for longer distance freight movements. For example, targets could be set for truck trips on multi-state corridors between major city pairs, and at major international border crossings, using cooperative target-setting between adjacent jurisdictions.

2.2.2. Reliability

- AASHTO supports state flexibility in the setting of targets; as provided in MAP-21. To that end, the targets would be set by individual State DOTs and MPOs expressed in terms of the Reliability Index. Targets may vary by facility, by corridor, by region, by rural or urban, by freight versus commute route or other factors such as investment levels, available transit options, remaining capacity and levels of recurrent versus non recurrent congestion levels.
- In addition to urban and rural interstates, other geographic constructs are critical for longer distance freight movements. For example, targets could be set for truck trips on multi-state corridors between major city pairs, and at major international border crossings, using cooperative target-setting between adjacent jurisdictions.

2.3. Thresholds

2.3.1. Delay

- Agencies have used a variety of congestion thresholds to meet the analysis and communication needs. For example, California uses 35 mph on freeways as a threshold to identify serious congestion problems. Washington State uses a maximum productivity-based threshold where a value of 85% of the free-flow speed (51 mph) is used to define the point where the maximum vehicle volume per hour per lane occurs; the freeway is not as productive at moving people at speeds above this level. Rural areas, or areas with less congestion, may use the speed limit or free-flow speeds as the basis to identify the size of the congestion problem.
- Delay: An Agency-specified Threshold Setting for truck speed thresholds could be similar to passenger vehicle values, or could be different for purposes of calculating the AHTD measure

2.3.2. Reliability

- This measure uses the Agency-specified Speed Threshold determined by the State DOTs and MPOs to define the comparison standard. The Agency-specified Speed Threshold speed could be based on several factors that the state considers appropriate such as (among others): corridors' characteristics; local conditions; community opinion about the desirability of additional capacity in a corridor; freight movement goals; rural/urban routes; capacity assumptions and/or level of potential investment required to achieve performance levels. Using one condition, the Agency-specified Speed Threshold, for both the reliability and delay measure simplifies the communication of the freight performance measure results (particularly with non-technical audiences) and supports the expectations of the local community as expressed in the threshold.

2.4. Methodology

2.4.1. Delay

Input data

- Corridor Segments— Definition of Interstate Corridors being analyzed for trucks consisting of an origin and destination. At a minimum, the Corridor Segments defined by the states would need to reflect congestion at freight bottlenecks and those corridors identified in the National Freight Strategic Plan located within the state.
- Time Period—Daily.
- Freight Vehicle Miles Traveled (VMT)—VMT needs to be available in appropriate units depending on the measurement being analyzed. For AHTD, the truck volume times the corridor length is the appropriate measure. Hourly values would be estimated for trucks for each of the 24 hours during each of the seven days of the average week.
- Travel Speed—Average speed of the trucks during the time period on the corridor segments. An hourly value would be calculated for each hour of the day and each Corridor Segment.

- Agency-specified Threshold Speed—This is the agency-specified threshold speed for the analysis time period from which AHTD would be calculated. The threshold speed should account for the different aspects of slowing trucks on the Interstate including weather conditions, enforcement, work zones, and congestion. For example, the Threshold Speed could be free-flow (65mph), posted speed (55mph), maximum throughput speed (50mph), severe congested speed (35mph) or some other speed. Regardless, this is specified by the transportation agency.[1]

Freight – Delay Data

Variable	Type	Source	Availability
Corridor Segments	Inventory	State DOT	Informed by the USDOT/FHWA national framework and identified by each State DOT.
Agency-specified Threshold Speed	Determined and used in calculations	State DOT	Determined by each State DOT for each Corridor Segment. The Agency-specified Threshold Speed may change over time for individual corridors.
Freight VMT for each Corridor Segment	Measured	FHWA HPMS	Freight VMT would have to be calculated using the FHWA HPMS Average Annual Daily Truck Traffic (AADTT) and modified by both a daily and hourly truck factor determined by the State DOT.
Travel Speed	Measured	FHWA National Travel Data Set (Could be separate data sets for passenger vehicle and truck speeds).	Annually

Procedure

- Establish Corridor Segments.
- For each Corridor Segment, determine the Agency-specified Threshold Speed.
- For each day and Corridor Segment, calculate the Daily Truck-Hours of Delay:

$$Daily\ Truck\ Hours\ of\ Delay = \frac{Freight\ VMT}{Travel\ Speed} - \frac{Freight\ VMT}{Agency{-}specified\ Threshold\ Speed}$$

- Sum the Daily Truck-Hours of Delay for each Day → Weekly Truck-Hours of Delay per Corridor Segment.
- Multiply Weekly Hours of Delay per Corridor Segment by 52 → Annual Truck-Hours of Delay per Corridor Segment.
- Sum the Annual Hours of Delay per Corridor Segment → Annual Truck-Hours of Delay.

[1] Freight and passenger cars could have different Agency-specified Threshold Speed.

Output Data

- AHTD per Corridor Segment
- AHTD Statewide for all Corridor Segments

2.4.2. Reliability

Input Data

- Corridor Segments—Definition of Interstate Corridors being analyzed for trucks consisting of an origin and destination. At a minimum, the Corridor Segments defined by the state would need to reflect congestion at freight bottlenecks and those corridors identified in the National Freight Strategic Plan located within the state.
- Time Intervals—The day is divided into 288 five-minute intervals (24 hours x (60/5) = 288).
- Travel Time—Corridor Segment length (miles) divided by Average Speed (mph).
- Agency-specified Threshold Speed— This is the agency-specified threshold speed for the analysis time period. The threshold speed should account for the different aspects of slowing trucks on the Interstate including weather conditions, enforcement, work zones, and congestion. For example, the Threshold Speed could be free-flow (65mph), posted speed (55mph), maximum throughput speed (50mph), severe congested speed (35mph) or some other speed. Regardless, this is specified by the transportation agency.[2]

Freight – Reliability Data

Variable	Type	Source	Availability
Corridor Segments	Inventory	State DOT	Informed by the USDOT/FHWA national framework and identified by State DOTs.
Agency-specified Threshold Speed	Determined and used in calculations	State DOT	Determined by each State DOT for each Corridor Segment. The Agency-specified Threshold Speed may change over time for individual corridors.
5-Minute Corridor Speeds	Measured	FHWA National Travel Data Set (Could be separate data sets for passenger vehicle and truck speeds).	Annually

Procedure[3]

- Establish Corridor Segments and repeat Steps 2 through 6 for each.
- Determine the Agency-specified Threshold Speed for Corridor Segment and calculate the Agency Travel Time.

[2] Freight and passenger cars could have different Agency-specified Threshold Speed.
[3] Given a fixed travel distance between the origin and destination of a trip, speed and travel time are inversely related. Meaning, higher travel speeds result in lower travel times for a given commute distance and vice versa. Hence the RI can be calculated using the speed input as well.

- Calculate the Travel Time for each Time Interval for each day of the calendar year (365).
- For each Time Interval, array the Travel Time.
  - From these 365 calendar days, travel times are arranged in ascending order.
  - From this list, the 80th percent worst travel time is selected.
  - This will be the Annual Average 80th Percentile Travel Time for that 5-minute interval across all days.
  - Repeat the same process for the other 287 five-minute intervals.
- From Step 4, array the 288 Annual Average 80th Percentile Travel Time values.
  - Arrange them in ascending order.
  - From the list, the 80th percent worst travel time is selected.
  - This will be the 80th Percentile Travel Time.
- Calculate the Freight Reliability Index:

$$Freight\ RI_{80} = \frac{80th\ Percentile\ Travel\ Time}{Agency\ Travel\ Time}$$ Type equation here.

- The individual corridor RI values will be weighted by the number of truck-miles traveled in each corridor and a statewide average RI value is calculated. This step requires volume data (truck vehicle miles traveled data) in addition to speed data and should be provided in the same manner as volume data is provided in the delay measure proposal.

Output Data

- Truck RI_{80} per Corridor Segment

2.5. MAP-21 Performance Measurement Requirements

- Performance Measures for States to Assess Freight Movement on the Interstate System [§1203; 23 USC 150(c)(6)] The Secretary will establish performance measures for States to use to assess Interstate System freight movement.
- States to Set Performance Targets [§1203; 23 USC 150(d)] States have 12 months from final rulemaking to set targets reflecting the established measures, with the option of setting different targets for rural and urbanized areas.
- States to Submit Biennial Performance Reports [§1203; 23 USC 150(e)] States have four years from the enactment of MAP–21 to submit a first biennial performance report addressing progress in achieving performance targets.
- Priority Freight Projects Must Contribute to Achievement of Established Performance Targets [§1116] Priority freight projects are eligible for increased federal funding share if included in a state freight plan and contribute to achievement of established freight performance targets. [§1116; 23 USC

3. Appendix

Performance Measure Factsheet
Freight

AASHTO SCOPM Communications Workshop

Why it's Important

- Efficient movement of freight along the nation's highways boosts economic productivity and helps preserve or create jobs.
- Fewer truck delays are an indicator of more efficient freight movement, which reduces businesses' transportation costs.
- Businesses also place high value on the predictability of travel time, meaning they want to be able to accurately predict how long a trip is likely to take.
- Congestion is a fact of life in many urban areas, but unexpected congestion that creates wide variations in travel times on key corridors from day-today is most problematic.

Measure #1: Hours of Truck Delay

What FHWA May Measure

Simply put: The time trucks spend delayed on the interstate system.

Technically speaking: Travel time above the congestion threshold in vehicle-hours for trucks on the interstate system

Language of the Measure

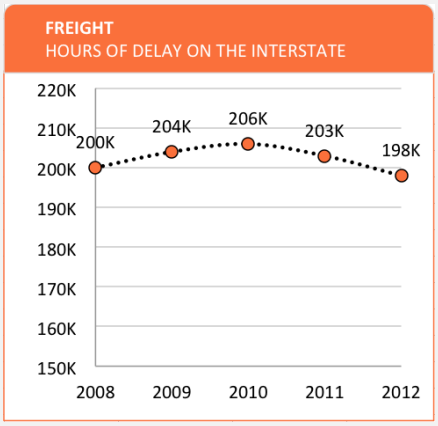
Communicating at the right level. The measure can be expressed in a variety of ways. At the highest level, all of the delay can be rolled up into one large aggregated number. For example:

- "Trucks experienced 200,000 hours of delay on our state's interstates last year"

If this large aggregated number is too hard to put in perspective, it can be expressed in other ways. Some examples include:

- By corridor – "Trucks experienced 10,000 hours of delay on I-70 between City and City B last year"
- By truck or truck trip – "The average truck trip experienced 7 minutes of delay on our state's interstates last year"
- By day – "Every day trucks experience over 50,000 hours of delay on our interstates"
- By mile – "Trucks experienced an average of 7 seconds of delay per mile on our interstates last year"

Visualizing it



National Reporting Issues and Key Concepts

Congestion is relative. What people consider a congested roadway in a large urban area can be very different from how congestion is defined in a less populated part of the country. To account for this, DOTs may have the flexibility to define what constitutes delay in their state and those definitions are likely to vary greatly. Some examples of how states might define delay might be:

- Urban State X: When speeds drop below 35 mph on the Interstate
- Rural State Y: When speeds drop below the posted speed limit
- Other State Z: When speeds drop below 85% of the free-flow speed

Because the definition of delay is likely to vary greatly from state to state (or even within a state), comparisons may be difficult and subject to misinterpretation.

Measure #2: Truck Reliability Index

What FHWA May Measure

Simply put: The predictability of truck trip times

Technically speaking: The ratio of the total travel time needed to ensure on-time arrival to the agency-determined travel time

Language of the Measure

Businesses want travel time reliability. In many parts of the U.S., drivers are used to everyday congestion. Although congestion is not welcomed, most travelers are less tolerant of unexpected delays than they are of everyday congestion they can plan around and prepare for.

The reliability index represents how much total time a traveler should allow to ensure on-time arrival. For example:

Time a trip is expected to take in normal conditions: 10 minutes
Total time needed to ensure on-time arrival: 12 minutes
Reliability index: 12/10 = 1.2

Apple-to-apples comparisons. One benefit of the reliability index is that it provides a common denominator for comparison of congestion impacting trucks across corridors or collections of corridors across urban areas.

Overcoming the abstract. A downside of indexes is that they are not well understood by the general public. Few people would understand how to interpret the following statement:

- "The truck reliability index was 1.20 in 2013"

To combat the abstract nature of the measure, a clear explanation is needed. Some examples:

- "Our truck reliability index is 1.2, meaning if a driver allows 12 minutes to complete a trip that should normally take 10 minutes, they will arrive at their destination on time 8 days out of 10.
- "The truck reliability index is the ratio of how long a truck trip is likely to actually take vs. how long it would take in normal conditions."

Some have found these types of explanations to cumbersome and have instead converted their reliability index into a strict on-time performance metric, such as:

- "Truck trips in our state arrive on-time 87% of the time"

Visualizing it

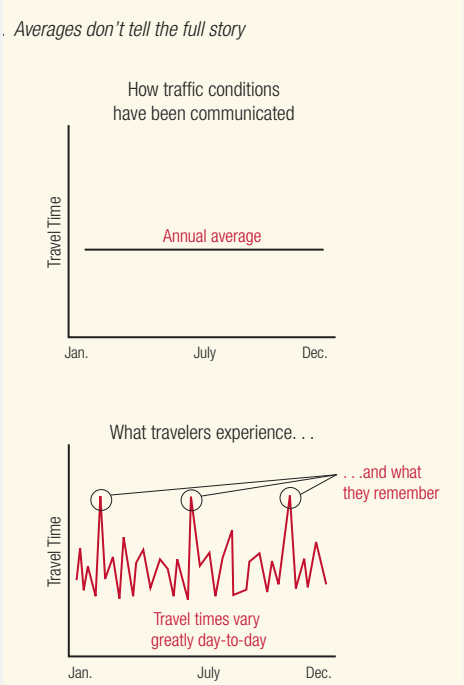


Figure from USDOT *Travel Time Reliability* brochure

National Reporting Issues and Key Concepts

It is possible that states will be allowed some flexibility in how they define the "time a trip is expected to take in normal conditions." Permitting agencies to define the threshold of what is considered normal would allow for apples-to-apples comparisons and aggregation of reliability based on what is 'normal' in each state. There are potential pitfalls though - this method could conceivably allow for some states to set unusually low standards for 'normal', which would make it more difficult to use the measure for comparison across states.

Freight Performance Communication Issues

Freight performance comes with its own set of communication challenges and issues, such as:

- The reasons why freight performance is important may not be inherently clear to some.
- Some of the language and measures for freight performance may require education of the audience – which will likely include truckers, shippers and logistics companies.
- Improvement to freight congestion can sometimes be driven more by economic trends than by specific DOT policies or decisions.