Evaluation

The CMP was designed to be thorough but manageable, to fully meet applicable regulations, to be relatively easy to update, and to be useful for a variety of users. While there is always more that can be done (and always a list of refinements for next time), the DVRPC CMP is an exciting advance in its field and has been recognized by FHWA repeatedly over the years as an example of a best practice. The first CMP Report was published in 2006. The 2009 and 2012 work built upon and continued to develop the original approach. Following is an overview of the methodology, highlighting changes for the 2015 effort.

An area that received attention in the 2015 update was the system performance measures. The 2012 CMP measures were modified and refined based on available data, input from the CMP Advisory Committee, and the leading measures being discussed for implementation by the MAP-21 rulemaking process, which was underway as the 2015 CMP was being developed. In general, selecting performance measures involves consideration of what conceptually is most helpful to measure, as well as what reliable data is readily available in all locations for the region. An inherent related consideration is what data will be updated on a regular basis. Extensive policy discussion, sharing of local experience, and verification of data went into the measures used for the 2015 CMP analysis. The culmination of these efforts is presented in the pages that follow as Regional Analysis. Their use is covered in Updating Corridors.

The evaluation and analysis was completed with the understanding that it is not by itself a complete answer; rather, it assists in better-informed decisions. The methodology was updated and adopted at the start of the update. It outlined a way to develop strategies by subcorridor. Very briefly, analysis provided a starting point to update corridors. These corridors were divided into subcorridors, where, at a regional planning scale, similar sets of strategies are applicable. A series of steps was used to prepare a set of strategies unique to each subcorridor.

A secondary goal was to provide toolbox or educational items for use beyond the CMP. A piece that has proven especially relevant for other studies is the Range of Strategies to Reduce Congestion. This has over 100 strategies, with a brief definition of each one.

Goals and Objectives

A basic tenet of the DVRPC philosophy for the CMP is that it advances the goals of the Long-Range Plan (“the Plan,” or “the Connections plan”). At the time the 2015 CMP was prepared, the current Plan was the Connections 2040 Plan for Greater Philadelphia (Publication #13042). The Connections plan is organized around four key principles: Manage Growth and Protect the Environment; Create Livable Communities; Build the Economy; and Establish a Modern, Multimodal Transportation System. The CMP objectives focus the Connections plan’s transportation goals to measurable objectives for congestion management. Objectives provide CMP-related detail to the goal and aid in consideration of the feasible analysis. The CMP objectives are influenced by what data is available.

<table>
<thead>
<tr>
<th>LRP Transportation Goal</th>
<th>CMP Objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduce Congestion</td>
<td>Minimize growth in recurring congestion</td>
</tr>
<tr>
<td>Increase Accessibility and Mobility</td>
<td>Improve the reliability of the transportation system as an efficient way to improve mobility</td>
</tr>
<tr>
<td></td>
<td>Provide transit where it is most needed for accessibility</td>
</tr>
<tr>
<td>Rebuild and Maintain the Region’s Transportation Infrastructure</td>
<td>Maintain existing core transportation network</td>
</tr>
</tbody>
</table>
Create a Safer Transportation System | Improve safety and reduce non-recurring congestion by reducing crashes
Maintain transportation preparedness for major events, especially ones that call for interregional movements far beyond normal; this also serves routine needs

Ensure that Transportation Investments Support Long-Range Plan Principles:
- Managing growth and protecting the environment
- Creating livable communities
- Building the economy
- Establishing a modern, multimodal transportation system

Prioritize transportation investment in less-sensitive environmental areas
Invest to support Centers first, then Infill and Redevelopment areas, then Emerging Growth areas
All CMP objectives work toward building the economy and establishing a modern, multimodal transportation system

Source: DVRPC, 2015

Regional Analysis

Performance measures to evaluate the regional transportation system were developed in an iterative process. A basic question is how to measure the performance of the transportation system in a way that is manageable and repeatable as the system moves toward achieving regional goals. This update started with an evaluation to assess whether data used in previous CMP updates had been kept current and whether useful new sources had emerged. Generally, data is only used that is available for the whole region, that will be updated regularly, and that is available for free.

The 2012 CMP update, for the first time, was able to use archived operations data available through the I-95 Corridor Coalition Vehicle Probe Project. This new data source made it possible to develop a criterion that measured duration of congestion on all freeways and select arterials in the region. In the time between the 2012 and 2015 CMP updates, this data source evolved rapidly, enabling even more robust analysis. For the 2015 update, archived operations data was used to calculate two measures on all freeways and most arterial roads in the region. The two new measures, Travel Time Index (TTI) and Planning Time Index, were selected to be consistent with what was expected to be proposed through the MAP-21 rulemaking process.

Another consideration in developing measures is looking ahead at the ability of the resulting analysis to suggest strategies and specific projects as a means of implementing the region’s goals. This step was implemented with the 2009 CMP and was further refined with the 2012 and 2015 updates. A table was developed that lists:
- Each goal;
- Its objectives;
- The performance measure used to evaluate the objectives; and
- A guide to advance from objectives and measures to strategies.

Note that the guide to advance from objectives and measures to strategies is only one of several steps used to develop strategies for each subcorridor. More information about that process is included under Advancing from Objectives and Criteria to Strategies. The table described above was used throughout the development of the CMP.

CMP System Performance Measures

A natural and required step in updating the CMP is analysis of the performance of the regional transportation system. The goals and objectives flow into specific measures used for this analysis in an iterative process with evaluating available data sources. The following table is a general description of
the measures that were analyzed in the 2015 update. They help answer the question, “Where should we invest in appropriate multimodal strategies to achieve regional goals?”

**Table 2: CMP Objectives and Performance Measures**

<table>
<thead>
<tr>
<th>CMP Objective</th>
<th>Criteria (short version)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimize growth in recurring congestion</td>
<td>- Travel Time Index (TTI) to understand usual recurring congestion*&lt;br&gt;- High current peak-hour volume/capacity ( (V/C) ) ratios&lt;br&gt;- High anticipated growth in ( V/C ) in the peak-period 2040 travel model future scenario, reflecting board adopted forecasts of population and employment&lt;br&gt;- Provide transit where it is most needed for accessibility&lt;br&gt;- Improve the reliability of the transportation system as an efficient way to improve mobility&lt;br&gt;- Transit score and rail stations to understand where transit could reasonably help increase accessibility&lt;br&gt;- Planning Time Index (PTI) to understand non-recurring congestion*</td>
</tr>
<tr>
<td>Maintain existing core transportation network</td>
<td>- Enhanced National Highway System (NHS)&lt;br&gt;- Existing passenger transit&lt;br&gt;- Existing freight rail&lt;br&gt;- Major freight facilities&lt;br&gt;- Philadelphia International Airport&lt;br&gt;- Roads with substantial bus or trolley service, which are essential infrastructure for transit riders&lt;br&gt;- Areas where the density of people makes evacuation a regional concern&lt;br&gt;- Most heavily used bridges and passenger transit stations&lt;br&gt;- Nuclear power plant evacuation zones&lt;br&gt;- General location of largest military bases in the region&lt;br&gt;Note: Infrastructure measures are also considered in security planning.</td>
</tr>
<tr>
<td>Improve safety and reduce nonrecurring congestion by reducing crashes</td>
<td>High crash rate compared to the rate for that functional class of road in the counties of that state in the Delaware Valley</td>
</tr>
<tr>
<td>Maintain transportation preparedness for major events, especially ones that call for interregional movements far beyond normal; this also serves routine needs</td>
<td>- Areas where the density of people makes evacuation a regional concern&lt;br&gt;- Most heavily used bridges and passenger transit stations&lt;br&gt;- Nuclear power plant evacuation zones&lt;br&gt;- General location of largest military bases in the region&lt;br&gt;- Prioritize transportation investment in less-sensitive environmental areas&lt;br&gt;- Invest to support Centers first, then Infill and Redevelopment areas, then Emerging Growth areas&lt;br&gt;- All CMP objectives work toward building the economy and establishing a modern, multimodal transportation system&lt;br&gt;- Low Green Infrastructure Screening Tool (GIST) score (less harm to environment)&lt;br&gt;- Centers, Infill and Redevelopment areas, Emerging Growth areas</td>
</tr>
</tbody>
</table>

*: TTI and PTI were chosen as likely MAP-21 measures based on the best information available at the time.
Source: DVRPC, 2015
Summarizing Results of Performance Measures Analysis

The transportation system of the Delaware Valley was evaluated using the CMP measures. The performance measures analysis was performed with Geographic Information System (GIS) software. GIS allows for spatial analysis and establishes the capacity for relatively easy and efficient updates. A file structure was set up to allow consideration of any one measure or multiple measures together. A system was developed that summarizes how many measures are in effect for a given roadway section. This system allows clicking on any one road section in GIS to know what measures relate to it and also to map how many measures are in effect. While the evaluation is multimodal, a representation of the road network was used to gather and summarize the data for drafting and revising corridors.

The system to summarize how many measures relate to any location uses points (or portions of points) for measures that relate to a location represented by a road segment. In this multimodal analysis, buffers were used to incorporate measures, such as where there is a parallel train line. A road segment may have a maximum of eight points. This was kept consistent with prior analyses. Swaths of segments with many points indicate corridors where investment in appropriate strategies would likely be especially beneficial to reducing congestion and moving toward the region’s goals.

Updating Corridors

In each iteration of the CMP, the intent has been to keep the number of corridors manageable for regional analysis, while covering key movements. The 2015 CMP revised the 2012 corridors based on the following considerations:

- **CMP Analysis Points:** Patterns where there are many measures in effect have proven reliable representations of major movements of people and goods. Corridors were reviewed for correspondence to links with greater than four measures in effect, as well as the other considerations in this list.

- **Transportation Refinement Layers:** Review of highway interchanges, rail stations, emergency detour routes, Intelligent Transportation Systems (ITS) infrastructure, and previously adopted TIP and Plan projects.

- **Community Refinement Layers:** Concentrations of transportation-disadvantaged populations, brownfield properties where redevelopment opportunities could require transportation improvements, merged parcels of permanently protected open space totaling 20 or more acres, and existing and proposed bicycle and pedestrian multiuse trails.

The draft corridors were then further refined based on documented input from the CMP Advisory Committee. The results were again similar to previous iterations of the CMP. Of the 30 congested corridors, one large corridor was divided into three subcorridors and another was refined to go from three to four subcorridors. All other changes to the corridors and subcorridors were minor refinements.

Advancing from Objectives and Measures to Strategies

A final column in the measures spreadsheet provides guidelines for how analysis of the specific measures identifies potentially appropriate strategies. Where a measure was extremely significant (for example, V/C ratios that imply not just congestion but gridlock during peak hours), strategies widely recommended to address that type of situation were considered in prioritized order reflecting the adopted approach described in the document titled “DVRPC’s Perspective on Transportation Planning” available on the CMP website. Levels were set high, in part to keep this exercise manageable and meaningful. In general, the level was adjusted to not apply to more than about twenty percent of subcorridors. The strategies can also be considered when conditions are less extreme, but more careful analysis and discussion is needed.
For example, subcorridors with high existing transit use (bus and/or rail) would suggest strategies including enhancing safe access to stops for transit riders, improvements to transit amenities, ITS improvements for transit, and additional shuttle service, among other strategies for that subcorridor. The table also suggests consideration of certain strategies where two or more related measures were extremely significant. For example, where current peak-hour congestion and existing transit use were both high, the final column in the measures spreadsheet suggests reviewing the appropriateness of strategies to add transit capacity or new intermodal facilities.

The table below summarizes how the measures lead to analysis-based strategy guidance.

**Table 3: Sample of Analysis-based Strategy Guidance**

<table>
<thead>
<tr>
<th>Sample of Performance Measures*</th>
<th>Sample of Guidance on Advancing to Strategies†</th>
</tr>
</thead>
<tbody>
<tr>
<td>High TTI or V/C ratio at peak hour</td>
<td>Review of operations strategies for road and transit, including Transit Signal Priority (TSP) and other signal improvements, ITS improvements for road and transit, modifications to existing transit services, and transit infrastructure improvements</td>
</tr>
<tr>
<td>High TTI and High V/C and High PTI</td>
<td>Where there are multiple measures of high current congestion, start looking at strategies such as Bus Rapid Transit (BRT), new passenger rail investments, or general purpose lanes in addition to strategies listed above</td>
</tr>
<tr>
<td>High existing transit use, defined as three or more runs of bus routes in urban areas or two or more runs in suburban areas during peak periods, or train stations with 500 or more daily boardings</td>
<td>Review transit infrastructure improvements, ITS improvements for transit, TSP, transit-oriented development (TOD), and modifications to existing transit routes or services</td>
</tr>
<tr>
<td>High crash rate compared to that functional class of road</td>
<td>Emphasize safety improvements and programs, and incident management for interstate routes</td>
</tr>
<tr>
<td>LRP Centers, Infill and Redevelopment and Emerging Growth land use categories</td>
<td>Where transit is also present, review transit infrastructure improvements, TSP, and TOD</td>
</tr>
</tbody>
</table>

* Note that there are several measures for each objective. These examples presented here are simplifications.
† Where measures are strongly present, the listed strategies are reviewed (note that just a few examples are listed here).
Source: DVRPC, 2015

**Steps to Advance Toward Strategies**

The steps used in drafting strategies for the 2015 CMP were as follows:

1. Strategies developed in previous iterations of the CMP provided a starting point, as they had been heavily informed by analysis and input from the CMP Advisory Committee;
2. Performance measures analysis was used to tailor strategies to local conditions for each subcorridor;
3. Dozens of corridor and CMS studies† were used to revise strategies and were included as references;
4. Existing major SOV capacity-adding TIP projects and the Connections plan’s Major Regional Projects were reviewed to be sure that they remained consistent; and
5. Input from the CMP Advisory Committee was incorporated throughout strategy development.

† Only those corridor studies performed or commissioned by DVRPC or its member agencies were considered. Recommendations from corridor studies must be consistent with the DVRPC Long-Range Plan to be included in the CMP.