Applying the Performance Measures

A system of congestion measures should be decided only after an examination of the uses, users, and audiences to be served, and after full considerations of program goals and objectives and the nature of likely solutions. A national congestion measure, therefore, should work at the local, state and national level for a range of purposes and provide information for several different types of audiences. The procedures described here are useful for roadway systems, as well as other person and freight movement modes, and transportation improvement strategies and programs. Although a number of analyses may not benefit from such a broad focus, consideration of the context in which the measures are used will allow the analyst to identify the right set of congestion measures.

Congestion measures are applied in different geographic settings, in different time frames, at differing levels of detail, at different scales, and under existing, changed, and future conditions. They must accurately describe present conditions and be capable of being forecast. There is a need for measures that can be applied across all passenger modes of urban travel individually and simultaneously and using units of vehicles, persons, tons or dollars depending on the data and uses.

Applying Analysis Methods

Experience clearly shows the need to separate the issues of data collection from the measures that are used in technical analyses and presentations. The measures that are needed to evaluate the transportation system or the effect of improvements are the most important consideration. There are several alternatives for data collection, measurement and estimation procedures. They are important elements of a congestion monitoring program, but they should not be the key consideration in deciding which measures are used.

While direct measurement of travel time and speed is desirable, and much more achievable with current systems, it is not always practical. When future conditions or new alternatives are analyzed, the travel time data are obviously not available. Travel time and speed estimating procedures are needed for situations like this and are thus an important part of the congestion measurement process. Overall, there are several ways to accomplish measurement and estimation of congestion information depending on the use and the available data.

Procedures

The travel time and speed estimating procedures that are needed include relatively simple procedures that use easily obtained roadway inventory data, procedures that can be used by agencies responsible for system operations with access to real-time data and archived travel time and speed data, and procedures that work well with travel demand models and future land use scenarios.

- **Purpose**—For most types of general policy, programming, or planning purposes, estimation procedures can provide useful results with a minimum of extra data collection. More specific design changes and operational improvement projects will require more precision; direct measures of travel time or travel speed will usually be required in these cases.
- **Analysis period**—Most techniques and a variety of datasets can produce useful information for existing conditions, but future conditions will require some estimation procedures (e.g., travel time estimates or *Highway Capacity Manual type procedures*). Estimates will also be required for existing conditions where future scenarios will be analyzed. This approach will provide uniformity of results, avoiding inconsistencies caused by differences in analysis procedures.
- **Analysis scope and scale**— The same type of congestion measures can be used for all areas of analysis. Smaller areas are more likely to benefit from metrics like seconds of delay per vehicle (such as identified in the *Highway Capacity Manual).* The analysis procedures used for most site or intersection analyses may produce a variety of values, but travel delay measures can be derived and used in presentation of results. Directly collected travel time measures will be more useful for corridors, regions and states, although some sampling processes might be useful to limit data collection requirements.

Before-After Evaluations and Improvement Comparisons

New projects, programs, or strategies are frequently selected and implemented at the corridor level. Corridors also serve as a good model for regional or state analyses. Travel time and speed statistics are very useful for single-mode and multimodal comparisons at this level of analysis. The corridor measures that are most useful will vary according to the types of improvements that are examined.

- Persons or vehicles? -- Strategies that do not significantly change average vehicle occupancy can be conducted without person-travel measures. However, it may be desirable to use a general average vehicle occupancy factor to present the information in person terms if the audience is used to seeing values in that way. Persons may also be a useful quantity if the presenter is trying to educate the audience on those types of measurement techniques.
- Total or per person? – The overall effect of a treatment is an important aspect of benefit-cost analyses, but thousands or millions of hours of delay are a difficult value to connect with an individual's experience. The difficulty in applying 'per person' measures, however, is that it is difficult to determine which persons to include and how much of their trip is included. For a typical corridor there may be many people who travel only a few miles in or through the area being analyzed. Any measure of the treatment effect on these people will be small.
- Hours, minutes or indexes? – Depending on the time frame of use, any of these quantities are useful. Minutes of expected travel time are very useful in real-time applications for websites or messaging systems. Indexes are most applicable for communicating system trends or the effect of improvements where several system elements are included. And hours work well for the overall effect measures needed to evaluate the societal and economic effects.

- What is demand? – Analyses of corridor facilities frequently identify different amounts of person travel on the various alternatives. This may be due to new (or induced) demand, but in some cases travel is transferred from other streets, freeways or transit routes that are not a part of the original analysis. It is easier to examine the effect of congestion reducing strategies if similar system elements and demand levels are included in each scenario, or if some normalizing element is provided (e.g., per commuter, an index measure).
- Accessibility measures? – Most of the congestion measures focus on facilities or modes or provide a framework to combine modes or facilities. This is a representation but not a perfect replication of how most travelers make their choices. Door-to-door travel time is closer to the primary measure used by travelers and is best expressed in accessibility measures. Unfortunately, it is difficult to translate an accessibility measure like "population within a 30-minute travel time of a major activity center" into a procedure to evaluate minor operational improvements. It is also difficult to create an annual update of the statistics with the transportation and land use planning model required to calculate accessibility. The method to connect the concerns addressed in accessibility measures is to use target congestion values.
- What time periods? – Measures can be used with a variety of time periods, but two three-hour peak periods are a common time for congestion/mobility overview measures. The same procedures can be used for off-peak periods or daily analyses. The process used to combine routes, modes, time periods or regions to calculate averages and totals for different modes and sections of roadway can use person-volume or freight volume or travel value as weighting factors. Longer time periods (beyond peak-hour calculations) are important. Post-project evaluations may show no improvement in peak hour performance, but there may be a reduction in the length of the peak period that is affected by congestion and improvement in the delay per commuter statistics.