CHAPTER 3—THE PROCESS OF MEASURING MOBILITY

Chapter Summary

Mobility measures and techniques for developing mobility information are parts of several processes and activities. The key steps in identifying the best mobility measure for any particular situation include the following:

- Identify the vision and goals.
- Identify the uses and audiences.
- Consider possible solutions.
- Develop a set of mobility measures and accompanying analysis procedures.
- Collect or estimate data elements.
- Identify problem areas.
- Test solutions.

Each of these steps is summarized in this chapter.

Measuring mobility is a task performed in a variety of ways in several different types of analysis for many purposes. While the measures are often dictated by legislative or regulatory mandates, it is useful to view the selection of the measure or measures as an important task before the data are collected and the estimation or calculation procedures begin. This chapter identifies key elements necessary for a complete mobility analysis. As with any process, the continuous evaluation of the process will lead to improvement—it is important to compare the measures with the uses throughout the process and adjust the measures as necessary. It is also important to recognize that there are many processes that relate to mobility measurement. The steps outlined in this chapter are part of many of those processes. Exhibit 3-1 provides an overview of the three-stage mobility analysis process. Each stage contains one to three considerations that are described in more detail in the sections identified in this chapter. For additional information on each of the sections described in this chapter, the reader is encouraged to review *Quantifying Congestion* (*1*).

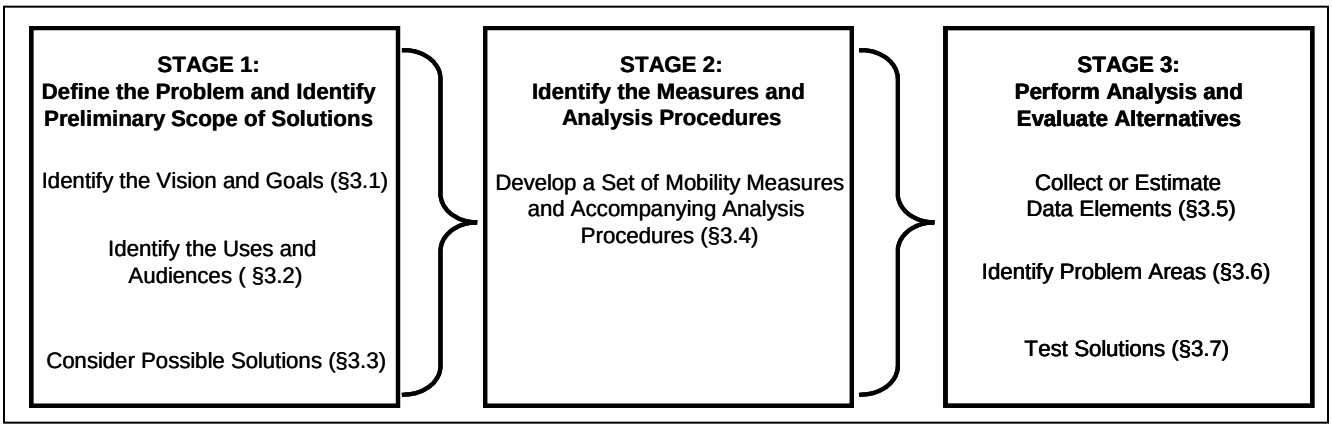
3.1 Identify the Vision and Goals

The long-range plan for an area ideally contains a description of the situation that the public wishes to create. As an important element of that plan, transportation facilities must be analyzed and improvements (if any) identified. In order for the selected programs and projects to move the area toward the vision, the measures must identify the proper type and scale of transportation improvements.

A similar line of thinking applies at the individual level (e.g., street, bus route, or demand management program). While the improvement options may not be as broad, and the financial investment may not be as great, it is always instructive to think about possible outcomes before

beginning the analysis. Not only will this ensure proper consideration of all options, it will also lead to selection of measures that can fairly evaluate the range of alternatives.

Exhibit 3-1. Illustration of Mobility Analysis Process.



It is this step where the expectations of the public and policy makers can be formulated into a set of statistics that can be used at the project or program evaluation level. The "agreed upon norms" (*1*) referred to in Chapter 2 can be used to make the link between broad outcome goals and the engineer, planner, economist, etc. who must evaluate the need for an improvement.

It is essential, therefore, that performance measures be consistent with the goals and objectives of the process in which they are being employed. Performance measures are key to controlling process outcome, whether the process is alternative selection, congestion management, growth management, or system optimization. For example, within congestion management, performance measures are used for problem identification and assessment, evaluation and comparison of alternative strategies, demonstration of effectiveness, and ongoing system monitoring.

3.2 Identify the Uses and Audiences

The analyses and potential targets of the measurement process must be determined before the proper mobility measures can be selected. The set of measures must be technically capable of illustrating the problems and the effect of the potential improvements. They must also be able to be composed into statistics that are useful for the variety of potential audiences. Increasing the flexibility of the measures may also improve the ability to use the information beyond the particular analysis. Corridor statistics may also satisfy annual reporting requirements, for example.

3.3 Consider Possible Solutions

Before measure selection and data collection begins, it is useful to reflect on the problem areas and consider possible solutions. Possible solutions include potential projects, operational programs, and policies. Understanding the possible solutions will help ensure that key considerations are vetted and understood as the measures and procedures are established in the next step. Can all the improvement types be included in the typical measures? Will the

measures be able to illustrate the effect of the improvements? Are there aspects of the projects, programs, or policies that will not be covered by the measures? Are the measures understandable to all the audiences? Are the uses of the measures appropriate, and will the procedures yield reliable information? These questions should start to be considered at this stage and should be fully evaluated with prototype results of the analysis.

3.4 Develop a Set of Mobility Measures and Accompanying Analysis Procedures

Many analyses, especially multimodal alternatives or regional summaries, require more than one measure to describe the problem. Analyses of corridor improvements might require travel time and speed measures to be expressed in person and freight movement terms. Some analyses are relatively simple, and it may be appropriate to use only one measure. Analyses of traffic signal timing where carpool and bus treatments are not part of the improvement options might not require person movement statistics—vehicle volume and delay information may be sufficient.

Poor selection of measures has a high probability of leading to poor outcomes (*1*). In contrast, goals and objectives that are measured appropriately can guide transportation professionals to the best project, program, or strategy and can then check (using evaluation results) that the goals and objectives are best served by the solutions offered (*2*).

3.5 Collect or Estimate Data Elements

Data collection can proceed after an analysis of potential sources of information. The level of precision and statistical reliability must be consistent with the uses of the information and with the data collection sources. Estimates or modeling processes may be appropriate additions to traffic count, travel time, and speed data collection efforts. Statistical sampling procedures may be useful for wide area analyses, as well as for validating models and adapting them to local conditions. Direct data collection may be used from a variety of sources including specific corridor studies, real-time data collection, and annual surveys of travel time routes.

An areawide travel monitoring program will consist of both travel speed data collection and estimated speed information obtained from equations or models. The directly collected data may be more expensive to obtain; statistical sampling techniques will decrease the cost and improve the reliability of the information. It may be possible to focus the data collection on a relatively small percentage of the roadway system that is responsible for a large percentage of the travel delay. Such a program would be supplemented with travel time studies on a few other sections of road and estimation procedures on the remainder of the system.

3.6 Identify Problem Areas

The collected data and estimates can be used to develop measures that will illustrate the problem areas or situations. These should be compared to observations about the system to make a reasonableness check—the measures should identify well-known problem areas. The data will provide information about the relative size of the mobility problems so that an initial prioritization for treatment can be made.

3.7 Test Solutions

Testing the potential solutions against the mobility measures during the data collection process may improve the data collection effort and the ultimate results. After data collection and estimation are complete, testing the solutions for effect will be another chance to determine the need to modify mobility measures. Even after the analysis is complete, the measures should be evaluated before similar projects are performed. Inconsistencies or irregularities in results are sometimes a signal that different procedures or data are required to produce the needed products.

3.8 Summary of Implementing Mobility Measures

The use of a set of mobility measures may mean more computer-based analyses, which might be perceived as a move away from direct measurement for some levels of analysis. This does not mean that travel time data will be less useful or less cost-effective to collect. On the contrary, direct measurement of travel time can be used to not only quantify existing conditions, but also to calibrate wide-scale models of traffic and transportation system operation and to perform corridor and facility analyses. Incorporating the important process elements into a sequence of events leading up to a public discussion of alternative improvement plans might result in a series of steps like the following:

- Existing traffic and route condition data are collected directly.
- Measures are calculated.
- Results are compared to target conditions that are determined from public comments during long-range plan discussion.
- Trip patterns, areas, and modes that need improvement are identified.
- Solutions are proposed. Areawide strategies should guide the selection of the type and magnitude of specific solutions.
- A range of the amount and type of improvements is tested.
- Mobility measures are estimated for each strategy or alternative.
- Measures are compared to corridor, sub-area, and regional goals.
- Individual mode or facility improvements that fit with the areawide strategy are identified for possible inclusion in the plan, subject to financial analyses.

3.9 References

1. *NCHRP Report 398*. Quantifying Congestion—Final Report and User's Guide. National Cooperative Highway Research Program Project 7-13, National Research Council, 1997.

2. Deen, T.B., and Pratt, R. "Evaluating Rapid Transit." In *Public Transportation* by editors George E. Gray and Lester A. Hoel, Second Edition, Prentice Hall, Englewood Cliffs, New Jersey, 1991.