



CHAPTER 11

Afterword - A View to the Future

Introduction

Since the earliest editions of this report were prepared, the original engineering standards perspective on transportation needs have evolved and matured along with the industries and institutions which attempt to address them. With those increasing capabilities come even greater expectations on the part of the traveling public, whether they be users of highways and transit for shopping, commuting, touring, or commercial purposes. The purpose of this chapter, in what might be considered as almost an appendage to the Conditions and Performance Report, is to raise those issues which the authors feel give an indication of the shortcomings and future advances in this endeavor to articulate for the American people the state of the Nation's highways, bridges, and transit systems.

Over time, we have continued to look at whether a more reliable, comprehensive, and useful assessment of these systems is a function of the tools that are available to assess them or the data that is collected for analysis or both. The resulting critiques have led us to new tools, refinement of tools and techniques, new questions, and new data needs. This chapter continues in that tradition to ask whether there are issues that this report should address more specifically, whether better tools should be developed to address these issues and whether additional data needs to be collected.

Some of these aspects can also be considered limitations of the current report and therefore readers are well served to understand them so that the findings can be properly applied to answer questions of concern. We understand these limitations in the context of a "work in progress" and therefore encourage constructive dialogue as to how to address the limitations of the analyses presented in the future.

The issues are presented under the strategic planning framework adopted by the U.S. Department of Transportation, with implementation responsibility related to the highway and transit networks primarily facing the Federal Highway Administration (FHWA), the Federal Transit Administration (FTA), and the Federal Motor Carrier Safety Administration (FMCSA).

The analyses results presented in this report are based on the data available to FHWA and FTA and on the analytical tools that have been developed to analyze these data. Analyses beyond the limits of the data and the capabilities of the analytical tools cannot be performed without further data collection and/or the development of more sophisticated analytical tools. This chapter addresses several issues that relate to the limitations imposed on this report by the current state of the practice in data collection and in the development of suitable tools for analysis of the data.

Safety

As the foremost goal, safety is clearly of great importance to the Department of Transportation, as it is to all of us. Safety is the first goal listed in the FHWA strategic plan, and with good reason. Fatalities and injuries on the nation's highways are not something for which we as a nation can be complacent. We are always striving to reduce injuries, including fatalities, the most serious form of injury. Safety initiatives have been developed on a number of fronts. Safer highways, safer vehicles, and safer drivers are all important achievements and all have contributed to greater safety on the highways than in the past. Fatality rates have been reduced significantly even while highway travel has increased dramatically. For example, from 1966 to 1997 the fatality rate per 100 million vehicles miles of travel has declined from 5.5 to 1.6. This occurred while travel increased from 926 billion to 2,576 billion vehicle miles.

Indicators of the safety aspects of performance are relatively easy to identify but difficult to isolate because of the many different influences on the causation. Safer vehicles (transit cars, buses, trucks, autos) are one aspect. Safer infrastructure contributes a more forgiving environment. Safer operation of the vehicles by professionals and amateurs alike yield the benefits of fewer crashes. The net effects of all of these facets are reflected in fatalities and injuries both in total numbers and rates of occurrence.

What metrics serve to help us evaluate that net result? What method of forecasting can enlighten us as to the potential safety impacts of various future situations? Since safety is imbedded in project design and program operation aspects of all transportation agencies, it is reflected in the Highway Economic Requirements System (HERS) mechanism used to evaluate various alternative investment scenarios. HERS incorporates a crash model that predicts future numbers of crashes based on the information available in the Highway Performance Monitoring System (HPMS) database and on projected highway capital improvements. This crash model has been recently upgraded to be more sensitive to changes in geometrics, such as lane width, shoulder width, and horizontal and vertical alignment. Crash costs, including the costs of injuries and fatalities, are included in the user costs estimated by HERS and are used to evaluate potential highway improvement actions.

These crash costs are evaluated along with other user costs such as the time costs of delay and vehicle operating costs. Therefore the dollar benefits of reduced crashes are included in the benefit/cost analysis by HERS when analyzing the relative benefits of alternative highway improvements. Highway improvements that would be expected to reduce the number of crashes will reduce the costs of crashes, and this reduction is part of the benefits of the improvement. If benefits exceed costs over the life of the improvement, the action is deemed beneficial.

The HPMS database on which the analysis is based includes data on roadway geometrics, travel volumes, vehicle speeds, etc., but it does not include data on the number of accidents that occur on the sample highway sections. Such data were included for several years in the 1980s, but the data were too sparse to be statistically significant. Currently the HPMS contains no data on specific roadway locations regarding number of accidents. Therefore the HERS analysis has no way to address specific high accident locations.

The question asked here is whether the current form of analysis is sufficient to address safety concerns at the national level. HERS can be adjusted to assign a higher value to crash costs than to other user costs. Crash costs could, for example, be doubled with respect to other user costs. This would give crash costs more weight in the benefit/cost analysis than other costs. But such a

procedure, it can be argued, would invalidate the premise of basing the analysis results on values that are assigned as fairly as possible for all costs. If different weights are arbitrarily assigned to different components of user costs, that could be construed as predetermining the results of the analysis. If we wish to claim that a dollar in crash costs is worth more than a dollar of delay, sensitivity analysis can be done to determine how much change in investment strategy would result.

How can transit safety be related to the overall analysis? The safety of bus transit may be related to overall highway safety, but to what degree? The safety of rail transit, whether light or heavy rail, would typically be a separate issue from highway safety.

There is no intent implied here for FHWA to develop a specific program of highway safety projects for the States. Instead the concern is whether safety is adequately addressed in the national level analysis for this report. In other words, does the analysis that we perform for this report adequately address concerns about highway crashes? If more attention were paid to highway improvements that enhance safety more than capacity or pavement condition, what would the scenario look like? Would it be very different from what HERS now recommends? Should more attention be paid to facilities that are substandard from a safety standpoint—width, alignment, shoulders, etc?

The national investment analysis that we now perform is not intended to dictate what highway improvements the States will accomplish. The analyses are rather intended to demonstrate what can be accomplished with given investment levels, with user costs and agency costs being minimized for each scenario. Safety is one of the major inputs to each scenario, and this may be the way to continue.

Mobility

By most measures the United States is the most mobile nation on earth. Most of us have the opportunity to be selective of the location where we work, where we live (even at some distance from our job), and where we shop, yet there are sectors of the population which have less than the average mobility. Traffic congestion is a problem that faces almost everyone who lives in the larger cities in this nation, and to some degree in smaller cities as well. Do we really know how much congestion exists and what it is costing us? Is there a better way to analyze the need for highway improvements that are intended to reduce congestion and to determine which improvements are best?

Personal Mobility

According to Chapter 1 of this report, certain population groups are not accommodated as well as the average person by our transportation systems, both highways and transit. The major factor affecting the use of our transportation systems is economic. For example, if one cannot afford to buy and operate a car, one's opportunity to travel becomes limited to other modes. Population groups categorized by age, gender, or ethnic origin may also be at a disadvantage. Part of this is because these groups have a lower income than average. But even those within the group who receive an average income may not receive average service. This may be because of reduced personal mobility, as with the elderly, or it may have a geographic component, as may be the case with ethnic groups. Working mothers may need to go by the grocery store and the day care center on the way home from work. People that need to do trip chaining may find the use of a car a necessity and for them the use of transit may not be practicable.

Why are some groups or subgroups at a disadvantage in the transportation system even when they are not economically disadvantaged? Is it geography? Do they live in an area not well served by transportation systems? Does transit provide the service they need? Does it provide a reasonable service

between where they live and where they could work, shop, or participate in other activities? Are these questions relevant at the national level, or are these matters best left to the local level?

Congestion

Everyone claims to know what traffic congestion is but a precise quantification is difficult. Measures of the operational performance of our nation's streets and highways can be difficult to obtain or define. Congestion in one city is not necessarily perceived the same as in another. In some cities commuters struggle with an hour of congestion in morning and again in the afternoon. In other cities, congestion occurs for 8 or 10 hours a day.

In some cities transit plays a significant role in travel, and therefore reduces highway congestion compared to what it would be without transit. We can hardly imagine New York City without its subway system. An analysis of the trade-offs between transit and automobile travel would include the role of transit in reducing highway travel and therefore highway congestion. While this type of analysis may be done at the local level to establish the need for new or expanded transit systems, how can this impact be addressed at the national level?

The Volume/Capacity (V/C) ratio has long been used in this report as a measure of congestion, but it has weaknesses. It only addresses the peak hour, which may be the only congested time or may be only one of many congested hours of the typical day. Also, a V/C ratio of less than 1.0 (say 0.9) may describe a facility approaching capacity (Level of Service E) or a facility that has been reduced below capacity by congestion (LOS F). Delay as a measure of congestion has recently come into some prominence; however, it has been difficult to measure and apply.

Chapter 4 of this report cites two sources of calculated delay. One is delay based directly on HPMS data, and calculated from recently formulated travel speed equations. This delay includes delay at traffic signals and stop signs. The other measure reported by the Texas Transportation Institute is based less directly on HPMS data and uses travel per lane as a surrogate for congestion. Their procedures are based on rather simple assumptions, but do include an estimate of delay caused by roadway incidents, such as accidents. Two other measures that have been proposed are travel speed and reliability. The average traveler, whether commuter or shopper, would like to travel at a speed not slowed by congestion or frequent "red" traffic signals. Industries which depend on transportation need a reliable system that can guarantee a given level of performance, providing for "just in time" deliveries. A trip that takes one hour one day and one and a half hours the next day does not provide that service.

Today, the variety of congestion measures creates uncertainty and confusion about how much congestion exists and whether it is getting worse, better, or is about the same as last year. When a measure of congestion is tied to the agency performance measure or goal, a defensible and reliable measure is needed. We need accepted, easily understood measures for which data can be readily collected.

Life Cycle Cost Analysis

The FHWA encourages the States to use Life Cycle Cost Analysis (LCCA) in their determination of pavement types and designs. This type of analysis can be used to evaluate a total stream of costs and benefits over a significant period of time, say 40 years, to compare alternative highway improvement actions. It can include the cost of delay to the user of pavement actions, maintenance and capital improvements. It can be a useful tool to evaluate alternative pavement investment strategies.

If FHWA is to promote the use of LCCA to the States, should FHWA also use LCCA in its own analyses of current and future highway capital investment requirements? The HERS process currently does look ahead at costs and benefits of potential highway capital investment actions. However, HERS does not compare resurfacing with reconstruction on a fully implemented LCCA basis. It does not consider the cost of delay to the user of improvement actions proposed, now or in the future. It does not compare a 20-year pavement design with a 40-year design. Should these elements be considered at the national level? If so, would the national analysis be making a false assumption about what the States will do in their stewardship of the highway systems? Would such analytical capabilities be useful and informative at the national level?

Productivity

It is the conventional wisdom, at least among highway advocates, that improvements in the highway systems positively affect the productivity and economy of the nation. A healthy transportation system is important to the manufacturing and service industries of the nation, as well as to personal users. It is not trivial to measure the effects of the highway systems, or improvements to the system, on the economy. It is not trivial to determine the effect of highway improvements on the economy of the nation. Do currently available tools, such as HERS, adequately consider the costs of industrial users of highways? HERS does consider user costs in its decision process, but is it skewed toward the private automobile user? While the value of time for trucks is calculated differently from passenger cars, is that sufficient to adequately address the full costs and benefits to the industrial user? How can recent or future research improve the analysis to better address the effects on industry and the economy?

A number of highway routes in this country are considered trade corridors, because of their importance to international trade. Many of them connect to international borders or to major ports. If we as a nation wish to give prominence to international trade, we need to know whether these corridors are adequate to accommodate this trade. Do we know the conditions of highways that accommodate border trade flows? What is the strength of the pavement on these facilities? What is the capacity of these facilities, and are they adequate to accommodate the expected loads travel? Are we providing adequate service at our international border crossings to facilitate trade? Should we evaluate these corridors separately from the rest of the highway system to determine the condition of these facilities relative to the condition of similar facilities nationwide?

Human and Natural Environment

The environment is important to all of us, indeed to life on this planet. Improvements to transportation systems must acknowledge this importance and tread softly where environmental concerns are high. But how can the environmental concerns be addressed in a national level analysis of highway conditions and performance, and capital investment? While it is routine for an assessment to be made of pavement conditions nationwide, how is it possible to make a similar assessment of the effects of highways or highway construction on the environment? For example, can wetland mitigation be addressed? Most environmental concerns are addressed at the local level. A highway project may be altered or canceled to address environmental concerns. Increased use of transit may reduce the negative impact of highways on the environment. How can these types of actions be subsumed in a national analysis of highway investment strategies? Can a national analytical process be used to address these environmental costs or trade-offs?

The HERS does have the capability to recognize vehicle emissions and to estimate at the national level the costs to the populace of these emissions. Since this is a nationwide analysis, it does not

delve into the local situation, but makes general assumptions and applies them nationwide, segmented only by rural/urban location and by highway type. Is there any reason to attempt to develop a more local approach for national analysis?

National Security

This report does not attempt to address conditions, performance, or investment requirements separately for those highways of particular importance to the military, such as the strategic highway network (STRAHNET). Since all public roads eligible for Federal-aid highway funds are represented in the report, such highways are covered in their respective functional system analysis. Is this coverage sufficient, or can the FHWA better address national security in our national analysis of the highway systems? STRAHNET routes are identified in the HPMS database, but the sampling for this database does not use STRAHNET as basis for sampling. There is a FHWA/Military Traffic Management Command (MTMC) working group that meets periodically to address military interest in the highway system. Is there a national analysis that would better serve the goals of this group? Are the pavement and bridge data adequate for DOD purposes? Does the C&P report need to have a specific focus on military requirements?

Conclusion

The purpose of this chapter is to raise certain issues regarding the analysis of our highway and transit systems, and the results of these analyses as reported in the biennial Conditions and Performance Report. If sufficient importance is attached to further analyses, beyond the scope supported by available data and the capabilities of the current models, additional resources would need to be applied. This chapter does not promise a resolution to these issues, either now or in the future. Some of these issues may be faced for a number of years, as efforts are made toward obtaining more comprehensive data and more capable analytical tools. If raising these issues results in a broader discussion of the problems, with a view toward eventual improved analysis and reporting, the purpose will have been achieved.