

relevant, a link has to be made between longer-range, broader planning activities, such as statewide modal plans, and specific, real-world, implementable projects.

#### Evaluation

As an agency involved in the whole gamut of highway planning, design, construction, and operational activities, the Minnesota DOT is in a better position to implement the recommendations of its planning activities in the highway mode. The primary link between planning and implementing activities is provided by the programming process. As part of the development of the Minnesota DOT Plan, the regional task forces played a prominent role in, first, developing criteria for project prioritization and, second, helping to apply the criteria by identifying their project preferences based on the criteria.

In modes where it exercises less leverage, the Department has had some successes. A study aimed at developing ways to minimize the community impact of unit coal trains moving from North Dakota through Minnesota to the Twin Cities recommended a variety of different, relatively low-cost demonstration projects, such as intersection improvements, grade-crossing predictors, and communication systems for emergency services. Implementation was achieved through funding obtained largely through the efforts of the study's Management Board and the Rail Traffic Task Force. The Task Force, made up mostly of the local communities affected, worked closely with the Management Board on the study from the beginning. This kind of broad representation encouraged a broad participation in sharing costs and implementing the project.

#### CONCLUSIONS

In this paper, an attempt has been made to describe and evaluate the Minnesota DOT statewide transportation planning program, a product of major changes in the transportation planning setting over the past 15

years or so, and to explain its recent historical development, especially the development of Minnesota's first state transportation plan, the Minnesota DOT Plan. The eight key elements of the plan, which grew out of those identified at a 1979 TRB national conference, were used as the basis for describing and evaluating the planning efforts of the Minnesota DOT. As noted at several points in this paper, the Department's statewide planning efforts have not fully met its goals as outlined in the key elements, but significant progress has been made. The key elements provide an effective framework for the future development, improvement, and evaluation of the Minnesota DOT statewide planning program. It is anticipated that the statewide transportation planning program will continue to evolve in response to changes in the setting within which planning operates.

#### REFERENCES

1. N. Gilbert and H. Specht. *Planning for Social Welfare*. Prentice-Hall, Englewood Cliffs, N.J., 1977, pp. 72-75.
2. *State Transportation Issues and Actions*. TRB, Special Rept. 189, 1980, pp. 8, 9, and 14-17.
3. *Minnesota Looks at Transportation*. Minnesota Department of Transportation, St. Paul, July 1977.
4. *Minnesota Moves Toward a State Transportation Plan*. Minnesota Department of Transportation, Jan. 1978.
5. A.B. Sosslau, A.B. Hassom, M.M. Carter, and G.V. Wickstrom. *Quick-Response Urban Travel Estimation Techniques and Transferable Parameters: User's Guide*. NCHRP, Rept. 187, 1978.
6. H.L. Westerman. *Planning for Options and Commitments: An Approach to Transport Planning in Uncertainty*. TRB, *Transportation Record* 835, 1981, pp. 15-23.

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## Statewide Transportation Planning in Uncertain Times

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An analysis of the way in which transportation planning should be carried out at the state level in conditions of uncertainty is presented. The overriding issue in most states at the moment is that expected highway revenues will not meet expected highway needs. The approaches being taken are management's response to a need for state governments to more effectively deal with available resources. The courses of action available to the states include preservation of the existing transportation system, emphasis on possible rather than desirable improvements, a focus on specific corridors for modal trade-off, more extensive education in energy conservation, land use control to protect highway utility, early and continued public involvement, and management accountability for implementation of state transportation improvement programs.

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that expected highway revenues will not meet expected highway needs. The approaches being taken are management's response to a need for state governments to more effectively deal with available resources. The courses of action available to the states include preservation of the existing transportation system, emphasis on possible rather than desirable improvements, a focus on specific corridors for modal trade-off, more extensive education in energy conservation, land use control to protect highway utility, early and continued public involvement, and management accountability for implementation of state transportation improvement programs.

Whitlock (1) has stated the following:

The principal issue of the 1980's will be a solution as to how the mobility of all segments of

the population can be maintained in the face of severely increasing transportation costs and the uncertainty of fuel supplies. A true response must be for development of a more flexible and less rigid infrastructure, and to offer greater choices and diversity of modes possible for optimum utility within people's ability to pay.

Fielding (2) adds an extra dimension:

Transportation planning is a political process. Issues, feelings and moods prevalent in the political arena influence the kind of transportation planning which is possible. And presently, there is a poor fit between the traditional systems approach to planning and the politics of transportation. The consensus of support for transportation improvement has broken down. Consequently, new approaches are needed, and it is suggested that the budgetary approach is consistent with current political reality.

Based on events that have occurred since Fielding made his presentation, it can be suggested that the budgetary approach is now the only transportation planning methodology that makes sense.

The basic question that must be answered is how far transportation planning can go to meet some of the alternatives specified in the foregoing paragraph. In this paper, these various possibilities are examined and some objective criteria are established that will allow state transportation planners to follow some consistent format as they put together statewide transportation plans. In the development of this paper, considerable use was made of the statewide transportation planning completed in the state of Washington. In addition, reference is made to other states where this is relevant in order to broaden the knowledge of the information developed in Washington. Therefore, this paper represents a fairly broad approach to the subject and should be valuable to a large number of professionals dealing with this difficult problem.

#### TRANSPORTATION PLANNING REGULATIONS AND REQUIREMENTS

New developments in statewide transportation planning have resulted from a rapidly expanding set of demands being placed on existing state transportation systems in general and on highway programs in particular. Trends such as state-legislated requirements for multimodal transportation plans focus on comprehensive planning, including land use developments, energy conservation, and movement toward a national focus on statewide planning, all of which bear on the direction many of the states have recently taken.

It has been mandatory for the states to adhere to certain federal requirements in undertaking statewide transportation planning. A significant number of regulations and requirements have been established, but there are indications now that these are being modified. It appears likely that there will be a further modification as FHWA and UMTA decide that many of the requirements that were formerly mandatory can now be met in a more optional framework.

Irrespective of all of this, the role of statewide transportation planning will continue to be important. Without such planning it is extremely difficult to move ahead in a consistent and concrete way. It seems unlikely that any ad hoc substitute will take the place of carefully formulated transportation planning.

A legitimate question that can be asked is

whether the states would have been as involved in transportation planning as they are today without federal support. The answer possibly is no. Therefore, the promulgation of the new transportation planning regulations should be followed with interest because the states may have to assume greater leadership if federal plans are implemented.

In a recent speech, Robertson of FHWA (3) said

Let's go into the status of the urban transportation planning regulations and legislation on it. Legislation is going to be looked at in Section 8, which is the planning part of the UMTA program, and Section 134, Title 23 of the federal program. We're going to submit legislation in 1983 if there's any way under heaven and earth that I can bring it about. We're going to start the process this summer, and I am totally committed to raising the mandatory threshold level for the urban transportation planning process to 200,000. We are going to continue the funding to states on the basis of 50,000 population and up. That's the big point; I guess I'm open to any other suggestions that states care to make on what we should see in the way of legislative changes in 134 and Section 8. We are moving toward an optional process, non-mandatory for groups below 200,000. We believe the process is desirable below 200,000, but we do not believe that the federal government should mandate. We don't think that there is that strong an interest in it.

If these transportation planning needs are to be met--specifically the needs of small urban areas--then it appears that the states must meet them.

Having made that point, however, it should be noted that the requirements for transportation planning must also be modified in the light of the economic and financial conditions facing the nation. The economy is not in a buoyant state, which suggests that many of the activities that formerly could have been undertaken must now be shelved. This must have an impact on transportation planning irrespective of the degree to which the regulations are administered by the various authorities.

#### TRANSPORTATION NEEDS AND THEIR IDENTIFICATION AND CLASSIFICATION

This might be a good point at which to spell out the transportation needs that fall under the planning process. It is time to define exactly what falls within the scope of statewide transportation planning.

First it is necessary to determine exactly what the needs are that must be met. This obviously includes the physical needs, which in turn must be balanced by financial needs. This presupposes that some form of measurable benefit is generated.

Obviously, a systems orientation must be applied to any transportation needs development. Three guidelines can be used in generating highway improvements to move a system toward a higher level of total benefits:

1. Design for system balance--Projects developed should balance projected quality of service and safety and mobility throughout the transportation network.
2. Provide for system continuity--Projects should close gaps in the existing transportation system. One completed facility is likely to offer more benefits than two partly completed facilities.
3. Seek low-cost design alternatives--The broadest range of possible alternatives must include

minimum-cost projects. Customary design is often sacrificed, as in the use of narrower highway medians, fewer overpasses, less than 20-year design, a combination of freeway-expressway segments, ramp metering and special bypass lanes, and modified interchange design.

By undertaking this systems type of approach and looking at the needs in this context, it should be possible to come up with a series of priority projects that will deal with the needs and do so effectively. This can be extended from one mode to the others and thus ensure that the systems concept is formulated. In taking this approach, planners must remember that they are trying to develop tools to be used by decision makers.

Planning and decision making are part of the same process, and the value of planning can be measured by its relevance and usefulness for decision makers in a given institutional and political context. In most situations this means a rather short-term planning horizon and greater emphasis on meeting the needs of today than possible needs at some future time. The value of planning is not limited to today's decision making, but it is also determined by the opportunities it creates for future decision makers acting in a different context. This longer-term horizon is particularly important when there are strong and divergent community or political views on matters that have a long-term impact, such as the introduction of new technology or energy constraints.

It is not at all clear that the transportation planners of the past two decades were aware of this need; if they were, they failed to put together a consistent approach that would allow implementation of effective transportation systems. The result has been a serious deterioration in the capability of the current system.

One of the greatest distortions in public programs has been the relentless pursuit of new development at the expense of the existing infrastructure. While a massive effort was mounted to undertake the largest public works project ever conceived by man--the Interstate Highway System--public transit, rail, and even the existing highway system have reached a point of severe deterioration. Based on present federal appropriation levels, it will be necessary to spend nearly \$5.0 billion/year in hopes of reviving mass transit, \$2.0 billion to subsidize intercity rail passenger and rail freight services, and a rehabilitation investment for highways that, according to the National Transportation Policy Study Commission, could reach \$900 billion by the year 2000.

Perhaps a systems approach that concentrated on the items listed previously might have helped, perhaps not. Responsibility for the errors that were made is fairly widespread. According to Haack (4),

It is only too tempting to blame the planners of the 60's for taking transportation in a direction that does not fit at all well with today's world of spiraling inflation, declining revenues, and scarce energy. Regardless of who should receive the credit or the blame, neither the planners nor the decision-makers of the 60's are free of blame. While the life style of most Americans in the 60's and 70's has been of unparalleled quality, the fact remains that when planners and decision-makers took aim in the 60's, they missed the mark of the 80's. Now that the future is here, we have a new set of issues and a world changing faster than our ability to respond. We find ourselves entering the 80's in a situation where both planning and decision-making must

adapt immediately if we are to survive as a leader among nations.

In the state of Washington planners and decision makers are attempting to meet the three criteria mentioned earlier--i.e., designing for system balance, providing for system continuity, and seeking low-cost design alternatives--by seeking ways to work together to move state transportation needs through the planning and programming phases to implementation.

#### IMPORTANCE OF THE HIGHWAY SYSTEM

In undertaking transportation planning in uncertain times (and for that matter in any conditions), the importance of the highway system must be continually emphasized. Highways, streets, and roads form the basic transportation network of the state and will continue to do so in the future. An adequate system of roadways is essential for use by automobiles, intercity buses, local transit vehicles, trucks, and bicycles. The movement of people and goods by air, rail, and water also involves the use of state roads and streets.

Although, for administrative purposes, the highway network falls under state, county, or city jurisdiction, it must be considered as an integrated state highway transportation system for planning purposes. Problems are similar at each level of administration. Population growth and the increasing number of motor vehicles will result in increased congestion, and this in turn will lead to a higher number of accidents, faster deterioration of road surfaces, and inconvenience and increased costs to travelers and businesses. As population increases, so does the demand for transportation services and facilities. Providing adequate facilities has become increasingly difficult due to limited funds, and it seems likely that this trend will continue. It is thus extremely important that, in developing transportation planning activities in times of uncertainty, full attention be paid to these difficulties and attempts be made wherever possible to develop those priority items that are essential for the success of the total system. This is a detailed task that requires considerable understanding of the overall needs of the state and of the process by which priorities will be determined, but it is a task that cannot be avoided because of its obvious importance to the success of the process.

Here too, however, the transportation planning and programming process comes up against funding and resource allocation problems. There are also problems of concept and control, all of which are listed in a recent NCHRP publication (5). The major problems are the following:

1. The major construction programming decisions at the state level are determined predominantly by federal categorical grants because a major objective of state and local government has been to make full use of all available federal funds. This has meant that some issues have received attention at the expense of others, most notably highway pavement and bridge maintenance.

2. Increasing transportation needs for all modes and the decreasing value of available dollars due to inflation and declining levels of funds have caused a growing gap between critical needs and available funds. This has led to serious competition for transportation funds (within and between modes) and general revenue funds (for transportation versus other state and local needs).

3. Different priorities frequently exist among and within the legislative and executive branches and among various levels of government.

4. Often a great deal of time is needed to prepare a new construction project for implementation because the process of project development is so complicated. Criteria and priorities, therefore, may change between planning and implementation. The long time delay may also mean that a project requires additional funds because of the impact of inflation.

5. Continuing change and uncertainty in the nation and the world regarding energy, inflation, and the economy make it extremely difficult to plan far into the future. This makes it necessary to remain flexible and be ready for the unexpected. Consequently, short-term planning is becoming a critical need and long-term capital planning is becoming less useful. All of this means that it is difficult to make programming decisions in a systematic way and in accordance with reproducible procedures; this is why there is now a period of crisis programming.

6. Some states use extensive technical procedures in the priority-setting process; others do not. For example, some states believe that a numbered ranking system is useful in setting priorities; others do not. Some states have great confidence in such procedures as sufficiency ratings and pavement serviceability indexes; others believe that such procedures are not useful. Both positions may be correct, depending on specific circumstances. The question is to what degree those procedures do or should affect the establishment of priorities.

7. Many states have a substantial backlog of deferred maintenance. The full consequences of deferred maintenance of pavements and bridges are not known, but it will probably mean much greater reconstruction costs and perhaps substantially higher user costs. These factors must be considered much more carefully than they have been in the past, and future federal and state funding priorities must take them into account.

8. The criteria considered in establishing priorities are different in various parts of the nation. For example, in the Northeast there is major investment in a physical infrastructure that is old and rapidly deteriorating. The Sun Belt states are experiencing rapid increases in population and economic development and are therefore concerned with system expansion. Federal transportation policies, then, should provide for an equitable distribution of funds in a manner that recognizes that different states may have significantly different needs.

9. Many state officials have been urging the federal government to reduce significantly the number of categorical programs. Emerging federal policies are moving in that direction and toward a reduction of federal funding support. If that happens, states must be prepared to establish their own priorities and justify the need for additional revenue.

10. The criteria used in setting priorities for projects are often different for different types of systems (e.g., Interstate, primary, and urban). This may be satisfactory from a technical point of view, but it may also create unnecessary confusion for the public and the legislature. The merging of programs or projects often requires trade-offs among them, which may cause further confusion in the decision-making process.

11. Past commitments to projects may have led to the advanced acquisition of right-of-way. If the programming process calls for selling some of that right-of-way, the problem then becomes one of withdrawing projects that had been committed, which may call for criteria completely different from those considered in the past.

12. Most states have a trust fund for highway

purposes, but in some states (e.g., Delaware, New Jersey, and New York) the highway agency must compete for funds.

13. Changes in design and maintenance standards will probably be necessary to reduce the expense of individual projects and thus allow for the programming of more projects. Careful consideration must be given to the effect of such changes on safety.

14. Some states have traditionally allocated funds to geographic regions by using a rigid distribution formula, often one established by the legislature. Many technical and program managers feel that such an approach is inefficient and sometimes counterproductive, but they should be sensitive to the political process. A balance should be established between the two positions.

These points are evaluated further in the NCHRP report (5). It is sufficient to point out here that the highway system is the key transportation network in most states. To ensure its importance through optimum funding and resource allocation in times of uncertainty may not be easy.

#### ROLE OF OTHER TRANSPORTATION MODES

The preceding comments about the highway system apply in some degree to public transportation operations throughout the United States and in the state of Washington in particular. One area of operation, local transit, is experiencing difficulties in covering costs and meeting technical and operational challenges. This is creating considerable problems for many operators and for the passengers that depend on these systems. Local funding sources may not be sufficient to meet the needs of expanding services, and this can create problems. Thus, a detailed evaluation of public transportation needs is essential if the full role of such operations is to be considered in a systems-oriented approach. This is true of local transit but it applies equally to paratransit services and also to the supplementary type of operations, including intercity bus, passenger railroad, local air services, and other public transportation operations that make up the total transportation network.

In addition to developing some type of priority, it is necessary to determine whether the funds being made available for the other modes are adequate and whether they complement the role of the highway system rather than compete with it. That is why high-occupancy-vehicle lanes and park-and-ride lots are relevant to statewide transportation planning and should be pursued as far as possible to modify the impacts of reductions in the funds that are available for these key areas.

In this area the state must work closely with local transit systems to ensure optimum systems planning and the development of a balanced transportation system. In this context, a recent article by Forkenbrock (6) suggests how this might be accomplished through improvements to the transit development planning process. In his perceptive treatment of this subject, Forkenbrock states that a review of transit development planning guidelines and the documents associated with them shows several common shortcomings. The major ones are

1. Overemphasis on descriptive presentations,
2. Failure to arrive at a real statement of purpose for transit,
3. Limited involvement by citizens, and
4. Lack of clear choices for decision makers.

Forkenbrock suggests instead what he calls a budget-constraint approach to transit development

planning. In this context, the planner must act both as a technical expert and as a facilitator who strives to ensure that local preferences, needs, and desires are reflected in the service ultimately provided. During periods of fiscal scarcity, in particular, the planner, must be capable of providing clear choices for decision makers--i.e., the incremental benefits and costs of moving from some baseline operation to higher levels.

Forkenbrock describes the desired approach as follows (6, p. 364):

The process begins with a survey of the area's citizenry. Results of the survey are presented at a public meeting, where those in attendance may express their views. Out of these contacts with the public, and the inputs from the advisory committee if one exists, the planner formulates and ranks objectives to which transit should contribute. The objectives constitute a basis for a technical analysis to generate developmental alternatives. In formulating these alternatives, demand for service, current service capabilities, and the area's fiscal position are considered. A key feature of this approach is that the alternatives are all geared toward attaining the same objectives, but they vary in scale and, hence, cost. Decision-makers are thus able to assess the incremental net benefits of moving from smaller to larger, more costly alternatives. Only after a choice, and thus a commitment, has been made is the planning document finalized.

All of this work is geared toward the development of alternatives. This is the most significant innovation in the whole process--i.e., the budget-constrained approach to alternative generation and selection (6, p. 367).

For each alternative, a five-year developmental path is laid out. Detailed budgets are provided for the first two years, including (1) anticipated revenues from contracts and fares, the amounts of funds to be requested from state and federal sources, and the local share, and (2) the costs associated with each service element and needed capital projects. Only a sketch plan is prepared for the remaining three years, highlighting developmental benchmarks and providing a capital improvement timetable to assist the state in programming its capital assistance.

The framing of alternatives is not new in transit planning, but in this case it is done in conformity with budget constraints. This is the approach presented by Fielding several years ago, which is now part of the Reagan Administration's transit philosophy. In the process of meeting these constraints, planners give decision makers an opportunity to examine incremental source benefits and their costs and make an informed choice. Under current conditions, this seems to be the only course to follow, even if it means that many projects will not be implemented.

#### FUNDING AVAILABILITY AS THE ULTIMATE CONSTRAINT

It is worth repeating that the availability of funds is critical to the development of transportation planning in uncertain times. The problem of providing the best transportation service at the least cost has always been central to transportation management. In many states this problem has become more critical because of changes in the historical

relationship between how funds are obtained and how they are spent.

Many states have expressed concern about the declining growth rate of motor fuel receipts. In the majority of the states that collect per-gallon taxes on motor fuel, the funds are dedicated by statute or by constitutional amendment to be used only for highway or other transportation purposes. During most of the time that these funds have been in existence, available revenue has kept pace with costs to expand, improve, and maintain state highway facilities. However, over the past decade the cost of necessary services has begun to exceed user tax revenue.

A great deal of this problem can be related to the large increases in construction costs since the beginning of this decade. The national construction index rose from 67 to 250 between 1950 and 1980. This is compounded in many states because the absolute amount of fuel taxes collected is beginning to decline. This decline is attributed to greater fuel efficiency of new vehicles and reduced travel.

This is obviously a problem, and the historical tendency of transportation agencies in need of funds is to look for new sources. These sources have been listed in the development of various plans and are considered in the following paragraphs. It is worth pointing out that there is an upward limit to the amount of tax that can be generated, from both economic and political viewpoints. Consequently, although it is possible to pursue new methods of financing and funding, it should be recognized that these can only go so far and will eventually prove to be the ultimate constraint on transportation planning. This has always been true, but in today's political and economic climate it is even more true. It is the major factor that has contributed to the state of uncertainty.

There are problems in this area, but there are possible solutions as well if decision makers have the courage to develop those solutions, as the following summary show.

#### Elements of the Financial Crisis

The following elements have contributed to the financial crisis:

1. Motor fuel consumption, and thus fuel tax receipts, no longer increase annually.
2. Highway construction, maintenance, and operating costs have increased at a pace double the general inflation rates.
3. County and local governments have commanded a large share of state and federal highway user revenues.
4. Maintenance and administrative expenses are continuing to consume a large proportion of the national transportation budget.
5. Depressed bond markets make it more difficult to raise government's outside income.

#### Solutions

Some options available to transportation policy-makers to improve a deteriorating situation are

1. Restructuring the fuel tax (i.e., percentage of sale or percentage of volume purchases);
2. Adding a tax on vehicle ownership;
3. Rethinking existing transportation funding mechanisms;
4. Developing additional marketing strategies for transportation finance;
5. Educating legislators to allocate more funds for transportation system development and operations;

6. Carefully formulating the proper justification for transportation needs; and

7. Involving the public so that there is the proper support for the necessary funding.

Whitlock appears to have said it about as well as it can be said (1, pp. 330-331):

The funding program is not a matter of unavailability of revenue potential or inadequacy of particular sources; it is more a matter of political acceptance of justifiable expenditure programs. What has really changed are the political facts of life. With the fiscal restraints now in place, the relevant comparisons will more often involve unrelated public programs (for example, highways versus education) and less often rational consideration of public versus private expenditure (for example, more for public highways to lessen private motor vehicle operating costs).

To look on the issue as merely one of finding additional sources of revenues to maintain the existing transportation system is to avoid coming to grips with all these factors that are at work and that must be addressed. The funding issue is only part of the vast problem.

The most successful states in financing transportation investments have done so most often through candor and by means of a well publicized program for construction and maintenance. They have strategically planned the marketing of the program and funding package and have mounted a massive information drive well in advance of the legislative session. They have been willing to accept more public scrutiny than many, and to accept amendment to the existing funding mechanisms rather than introduce more proposals of hidden taxation.

The presence of the most efficient transportation system should be ensured with a high and safe level of service at all costs. The solution to the critical issue of transportation finance is more than finding a few additional dollars. It is a new philosophy of thought and responding to the public's needs.

#### FALLACY OF LONG-RANGE TRANSPORTATION PLANNING

It appears fairly clear that transportation planning in the past concentrated on long-range planning at the expense of the short-range plan. It is believed that this must now change so that a more realistic series of answers can be provided to top management, concerned as they are with the development of effective plans that can be used now.

In this context, a question is usually raised as to where planning ends and programming begins. Generally, the answer lies in the fact that the development of the program is a primary product of planning. Planning and programming are thus different aspects of the same activity--i.e., transportation management.

The problem for the planning or program manager is how to determine whether his decisions are reasonable. The response to this problem in many states has been the development of the long-range plan. Such a plan, based on adopted goals and objectives, gives guidance as to how the physical system should be developed to serve a future way of life (assuming, of course, that the plan is fiscally realistic). In the absence of a long-range plan it is necessary for management to specify objectives through continual dialogue with other affected agencies and the public. Objectives are then translated into specific criteria to be met, such as

desired changes in the accident rate and reductions in travel time and vehicle emissions. These characteristics then should be monitored by specifying a level of achievement against which success can be measured. This has been done rather effectively in most states in that the basic long-range plans have already been repeated on more than one occasion. It does not seem necessary to repeat the obvious, because long-range changes are perhaps not going to be as drastic as was originally thought, so the concentration should now be on the short-range plan.

In the transportation planning profession this is probably a minority view. It is well to remember what Keynes said: "In the short run all decisions are political; in the long run we are all dead!" Yet there is sufficient evidence (or at least conjecture) that long-range planning may have a role to play. One of the best examples of this is an article by Schofer and Stopher (7).

Perhaps there is room for a new approach to both short- and long-range planning that will allow these key areas to be given the amount of appropriate emphasis in these times of uncertainty. This point is emphasized by Schofer and Stopher. They suggest that, although it is entirely appropriate to question the usefulness of long-range planning as it has been practiced recently, the transportation planning profession may well be faced with the possibility of acting too hastily and rashly should long-range planning be discarded. More specifically, much of the criticism and many of the failures of long-range planning may be attributable more to the techniques and practices used than to the concept of long-range planning itself.

Long-range urban transportation planning is assumed here to mean examining the urban system and its transportation component 15 years or more into the future and developing plans for changing the supply, demand, and/or operation of the transportation subsystem. Thus, an important element of long-range planning is forecasting the demand for travel under various conditions of urban development and relating it to transportation supply for the purpose of identifying a desirable and achievable supply-demand situation for some future period. With this in mind, the specific roles of long-range planning can be identified.

Some areas have developed successful long-range scenarios for transportation planning. In Wisconsin a seven-step procedure has been developed:

1. Key external variables that are likely to be important in the transportation planning process are selected. These may include energy supply and price, the state of technology (in terms of energy efficiency), the state of the economy, and the availability of federal funding for local actions. A derivative and more locally specific variable of concern is household life-style.

2. Extreme values of external variables are estimated (qualitatively) by using past studies and judgment.

3. Plausible bundles of the extreme values of external variables are defined by using combinatorial analysis and logical analysis of the relationships between variables to ensure plausible and internally consistent scenarios.

4. Selected regional attributes (internal variables) that are directly applicable to the transportation planning effort are defined. These may include regional population levels, alternative land use patterns, and key travel behavior parameters. The values of these attributes are estimated qualitatively for each tentative scenario defined in step 3.

5. The set of working scenarios is reduced to

feasible size by eliminating those scenarios that result in essentially similar regional attributes because differences in those attributes alone will lead to scenario-unique planning outcomes.

6. Quantitative estimates of the regional attributes are prepared for use in analytic planning models. This is the translation process referred to previously.

7. Scenario-specific plans are developed through parallel sketch-planning efforts, and an attempt is made to define a robust investment program, one that functions well across the range of plausible futures.

These or similar procedures can be useful in developing the long-range transportation planning process. If some systematic approach can be developed that addresses the three major objectives listed at the beginning of this paper, long-range planning may be less of a fallacy than if that course is not followed.

#### ESSENTIAL NATURE OF SHORT-RANGE TRANSPORTATION PLANNING

It is suggested in this paper that transportation planning in uncertain times dictates the need to concentrate on short-range planning requirements. This is so because, as mentioned previously, the long-range plans have been fairly well established and it is fairly clear that long-range changes are less traumatic than short-range changes. In addition, it appears likely that many of the long-range parameters are somewhat fixed, and there is probably less uncertainty about a 20-year term than there is about the next 2 years. For that reason it is strongly suggested that transportation planners concentrate on the short-range aspects and try to come up with some strong priorities that can be implemented by organizations quickly. A whole series of possibilities should be evaluated, but the basic priority determination factors should be used. If this is done, then it is believed that the plans will provide direct guidance for the people responsible for implementing them and will in fact serve the public interest rather than some vested interest. In this process, the need for a multimodal transportation plan should become apparent and it should be possible to implement the plan without any great delay.

In this context, however, Schofer and Stopher (7) have pointed out certain factors that should be considered. To them, short-term planning is really part of the long-range planning process:

First, the short-term actions (which have taken an increasingly important position in national, state and local programs) have long-term impacts. On the one hand, investment in short-term TSM strategies and the like diverts funds from the provision of new transportation facilities. On the other hand, short-term actions such as reserved bus lanes, carpooling programs, etc., have long-term impacts on travel patterns, residential and work-place locations, auto ownership, and so forth.

Thus, short-term actions can (and should) have a significant impact on the future demand for and supply of transportation. Failure to assess these long-range impacts may lead to the adoption of short-run strategies that seem appropriate now, but which may generate new and more serious problems in the future.

Second, short-range actions are rarely isolated and independent events; rather, each short-range action contributes to the development of the urban transportation system. Furthermore,

such actions may foreclose other, future actions, and therefore may have associated with them important opportunity costs subject only to long-range assessment. Long-range planning provides the framework to gain appropriate perspective and control over the extended system-development trajectory. For example, long-range planning can determine whether there will be an appropriate population in the long term to support the system that is likely to develop from certain short-term actions. Thus, a generally-defined long-range framework can provide a basis for short-term planning and evaluation, with the possibility that both long- and short-term plans will be influenced by such evaluation.

Third, short-range actions are usually designed to tackle existing problems. Long-range planning permits the planner or decision-maker to identify potential future problems and prepare for them in advance. An alternative viewpoint might be to say that short-range planning tends to be reactive, while long-range planning provides the opportunity for normative actions.

Fourth, long-range planning allows the exploration of major policy or facility options so as to identify the most promising; it provides a much clearer perspective for assessing trade-offs between significant transportation actions, as well as between transportation and actions in other, interacting sectors (e.g., land-use, environment, economy). This is not possible if only short-range planning is undertaken. In this sense, short-range planning alone threatens to lead to the kind of piecemeal transportation actions taken prior to the 1960's, which tackled symptoms of problems rather than the problems themselves.

Fifth, there has been a clear association between the period of the planning and the type and size of investments that form the recommendations. Short-term planning has generally produced recommendations for management and operational change, particularly low-capital activities such as purchasing buses, etc. On the other hand, long-term planning has usually generated recommendations for new transportation infrastructure, such as rail facilities, new highways and freeways, etc. One of the problems in the past has been the concentration on long-term planning only, with its attendant capital-intensive recommendations. More recently, an opposite bias has arisen from the swing in emphasis to short-run planning and low-capital only. A balance between the two is called for, so that both low- and high-capital options can be considered. Such balance may be achieved not only through maintaining a reasonable mix of short- and long-term planning, but also by revising approaches to both types of planning so as to uncouple them from specific types of actions.

It might be suggested that this discussion about long- and short-range planning is itself a further example of uncertainty.

#### CONCLUSIONS

In summary, if planning is to contribute toward better decisions, planner products must provide information useful to decision makers. Because so much of decision making revolves around the budget process, planners must pay special attention to limited resources, cash flows, and project phasing. Because problems transcend all levels of government as well as both public and private interests, a process is required that integrates all priorities

into a common information flow. Through this information flow decisions must be anticipated, communication with decision makers effected, and, most important, illusions of certainty avoided. In times of uncertainty it is appropriate to acknowledge the limitations of the process.

On the receiving end, decision makers must understand the planning process. By direct participation in planning activities, decision makers can provide the strong leadership necessary to shape planning so as to make it more relevant to decision making while at the same time learning from planning and gaining a better sense of uncertainty.

The key is a hand-in-glove relationship between planning and decision making. It is suggested that such a relationship can be accomplished through an integrated planning/political/decision-making process and that this may well be the answer to increased planning efficiency in the 1980s.

#### REFERENCES

1. E.M. Whitlock. Current Issues Facing Transportation Policy Makers. Traffic Quarterly, July 1981.
2. G.J. Fielding. Presentation to Joint Conference, Board of Directors and Board of Consultants, Enc Foundation, Westport, Conn., Oct. 1978.
3. R. Robertson. Changes in Transportation Planning. Presented at meeting of AASHTO Standing Committee on Planning, Scottsdale, Ariz., May 27, 1982.
4. H. Haack. Transportation Planning for the 80's: A Case Study in Pennsylvania. Pennsylvania Department of Transportation, Harrisburg, Sept. 1980.
5. Evaluation Criteria and Priority Setting for State Highway Programs. NCHRP, Rept. 84, Nov. 1981.
6. D.J. Forkenbrock. Improving the Transit Development Planning Process. Traffic Quarterly, July 1981.
7. J.L. Schofer and P. Stopher. Specification for a New Long-Range Urban Transportation Planning Process. Transportation, Sept. 1979.

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## Revenue Versus Needs: An Analytic Approach

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To examine the difficult choices created by growing transportation needs and decreasing revenue, the Michigan Department of Transportation developed a comprehensive State Transportation Plan. Within the plan, matching transportation needs in order of priority with available revenue was accomplished by using a planning process called the Transportation Revenue Investment Plan (TRIP). TRIP begins with the need that has the highest priority and continues retiring needs until all allocated revenue is spent or all needs are met. Accurate costs for the needs are determined by inflating the base-year cost to the year of revenue that is attempting to retire it. TRIP contains decision rules by transportation mode that regulate the way in which needs are retired and needs not met. TRIP output can be summarized in reports by transportation mode, year, and various other factors. Its highest utility can be seen when these summaries are displayed by means of bar charts, CALFORM maps, or network plotting. The ease with which the graphic display and summarized output of TRIP can be analyzed is beneficial in the State Transportation Plan and within the strategic planning process. In both cases, TRIP can help in evaluating the effects of alternative revenue levels and spending patterns.

Growing transportation needs in Michigan have been evident for some time. A 1977-1989 needs study reported Michigan's needs to be \$30 billion. Decreasing transportation revenues in Michigan have become a reality the past few years. This combination of growing needs and decreasing revenues has made difficult choices for the people trying to provide the best transportation system possible in Michigan. To examine these choices, the Michigan Department of Transportation (DOT) developed a comprehensive State Transportation Plan (see Figure 1). Within the plan, available revenue is generated by using a fiscal forecasting model. The fiscal model uses current issues when generating revenue at the state, city, and county levels. An inventory of deficiencies is stored by transportation mode.

Matching available revenue with needs was accomplished within the plan by using a planning process called the Transportation Revenue Investment Plan

(TRIP). TRIP has a twofold purpose within the Michigan DOT. TRIP was first used in the State Transportation Plan to match available revenues with needs. The process is also useful as an early warning system within the strategic planning process. In daily strategic planning analysis, it can help decision makers to evaluate the effects of alternative revenue levels and spending patterns. Describing TRIP is the purpose of this paper.

#### SYSTEM OPERATION

The workings of TRIP are summarized in Figure 2. The major driving force of the program is the revenues available and the needs identified. Computer files for each were created, and both are categorized by mode and program element. The modes are aviation, highway, intercity bus, intercity rail passenger, local transit, marine, nonmotorized, and rail freight. The program elements are service continuation, service relocation, service improvement, new service, mobility disadvantaged, economic development, safety, and energy conservation.

Revenue is assigned to the year in which it will become available. In a similar manner, the needs are identified by the year in which they will become deficient. Deficiencies are also assigned a priority within each mode and program element based on highest need. These files are taken into TRIP and matched by mode and program element. Beginning with the highest priority for a given mode and program element, needs are retired or "bought" until either all the allocated revenue is spent or all the needs are met. If no state revenue remains for a given year, TRIP will not attempt to buy any more needs that year.