

CRITICAL ISSUES IN STATEWIDE TRANSPORTATION PLANNING

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ABSTRACT

This paper highlights state of the art ideas and procedures that State transportation planning/programming managers should find pertinent in dealing with current problems in the statewide transportation planning process. It draws on the critical issues that emerged while preparing for and participating in a national series of State and Federal Highway Administration sponsored seminars on statewide highway planning. The issues include fiscal problems, public involvement, planning and programming relationships, multimodal planning and programming, energy, land use, and surveillance and evaluation.

The overriding issue in most States 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 tradeoffs, more extensive "education" in energy conservation, land use control to protect highway utility, early and continued public involvement, and management's accountability for implementation of the State's transportation improvement program. These activities are discussed with examples of how some States are dealing with the issues.



CRITICAL ISSUES IN STATEWIDE TRANSPORTATION PLANNING

INTRODUCTION

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 specifically. Trends, such as State legislated requirements for multimodal transportation plans; formation of State departments of transportation; focus on comprehensive planning, including land use development; energy conservation; and movement toward a national focus on statewide planning, all bear on the directions many of the States have recently taken.

This paper presents the critical issues and ideas that emerged during the preparation for, and participation in, a series of recent seminars on statewide highway planning sponsored by the Federal Highway Administration and State departments of transportation/highways. It deals with the observed trends, state of the art, and the expressed concerns and approaches suggested and used by State transportation agency planning and programming officials that participated in the seminars.

The purpose of the paper is to share these observations and significant approaches, and thus provide State transportation managers with information to help deal with problems as they occur in the planning process. The paper is not intended to take the place of more detailed studies or on-going research in Statewide transportation planning, but to provide an up-to-date report to highlight how some States are dealing with current critical issues. The critical issues that have emerged include fiscal problems, public involvement, planning and programming relationships,

multimodal planning and programing, energy, land use, and surveillance and evaluation. Each of these is discussed separately, although they all must be effectively dealt with together in managing the statewide transportation planning program. Concluding remarks reemphasize these issues for promoting good practices within statewide transportation planning.

FISCAL PROBLEMS

The problem of providing the best transportation service at the least cost has always been central to transportation management. In many of the States this problem has become more critical because of changes in the historical relationships of how funds are obtained and how they are expended.

Many States have expressed concern over the existing trends in the declining growth rate of motor fuel receipts. In a majority of the States collecting these gallonage 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 the available revenues have kept pace with costs to expand, improve, and maintain the State's highway facilities. However, the past decade has not reflected a similar ability to keep pace, and costs of necessary service have begun to exceed user-tax revenues.

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 has risen from 67 to 220 between 1950 and 1978.^{1/} Compounding this in many States is the fact that the absolute amount of fuel taxes collected is projected to begin declining. This decline is attributed to a greater fuel efficiency of new vehicles and reduced travel. See Figure 1 for an example, taken from the Iowa Transportation Improvement Program, 1978-1983.

States have reacted to this situation in several ways. Two approaches have been to reconsider the perceived need for certain transportation improvements or to look for ways to better optimize the use of available funding among alternative improvements. Others have been to seek other funding sources or increases in existing sources.

The reconsideration of the need for improvement is reflected in a number of alternative approaches to solving the problem of declining revenues.

FUEL TAX REVENUE FORECAST - IOWA

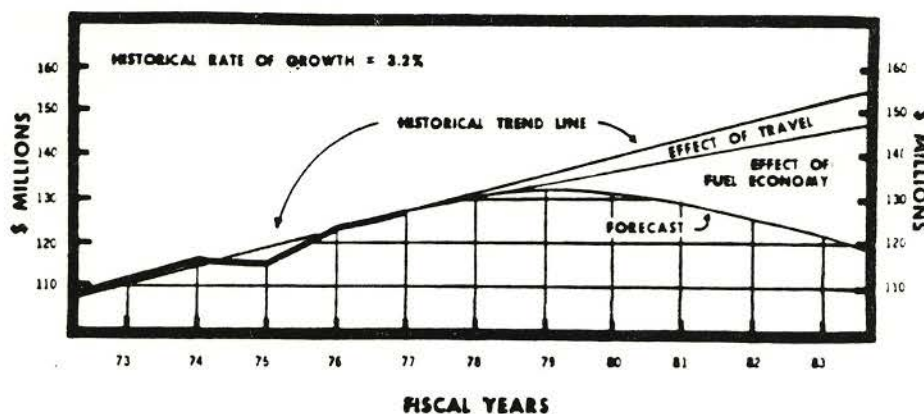


Figure 1

Texas and California chose to deal with the question of need by re-evaluating the appropriateness of existing improvement standards in terms

of the benefits that could be obtained. The result was a "system-oriented" approach.^{2/ 3/} Three guidelines are used in generating highway improvements to move a system toward a higher level of total benefits. These are:

1. Design for system balance-Projects developed should balance projected quality of service in safety and mobility (speed) 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 partially completed facilities.
3. Seek low-cost design alternatives-The broadest range of possible alternatives must include minimum cost projects. Customary design is often sacrificed--such as narrower highway medians, fewer over-passes, less than 20-year design, a combination of freeway/expressway segments, ramp metering and special bypass lanes, and modified interchange design.

In California the recommended system oriented approach was kept within the existing funding level and had very little emphasis on new funds. For Texas the system oriented approach was used along with a strong appeal and supporting analysis for additional funds.

South Dakota has taken the approach of evaluating individual routes to determine which project mix would be most cost effective for a route. Essentially, this tactic is comparable to the philosophy inherent in California and Texas. The difference is that the approach is scaled to the route level rather than applied at the system level. This subject of

financially restrained plans is discussed further in a companion paper "New Approaches in State Transportation Planning."

Jurisdictional realignments being undertaken by some States have the indirect effect of optimizing the use of available funds. The idea is that many roads have been added to the State system without actually considering whether the road serves a State level interest. Florida, for example, was required by recent State statute to functionally classify all highways to determine those that were of importance to the State. The State will take responsibility for those highways while transferring all other highways to county or city governments as might be appropriate. This activity is particularly significant when it is realized that in the last 20 years 11 States have increased their State system by over 30 percent.^{4/}

The historical tendency of transportation agencies in need of funds is to look for new sources. In the development of the Minnesota DOT Plan, the State dealt with the issue of available alternative revenue sources for transportation programs.^{5/} Seven alternative sources were investigated:

1. A sales tax on motor fuel that would be tied to price.
2. Additional general funds.
3. Increase present motor fuel tax.
4. Increase motor vehicle license fees.
5. Assign revenue from the motor vehicle sales tax to transportation purposes, instead of to the general fund, as currently done.
6. Fund the Department of Public Safety from the general fund instead of using State trunk highway funds.
7. Dedicate an increase in the general sales tax to transportation.

These alternatives were presented to regional task forces set up to comment on aspects of the plan development. It was their feeling that user charges should continue to be user-supplied. Thus policy options 1, 5, and 6 received the most support.

The State of Washington, when faced with the need to increase available funds, chose to raise the gallonage tax. The increase was not simply the addition of a fixed amount to the cost of each gallon, which had been unresponsive to the fluctuation in costs. Rather the approach is to have a variable gas tax that can fluctuate between 9 and 12 cents, depending on the average retail price of gasoline and changes in the construction cost index.

In summary, States are approaching the issue of diminishing fiscal resources through three methods. First, they are reevaluating design requirements in terms of impacts on system development. Second, the States are analyzing the character of the highways under their jurisdiction to determine if they serve the State interest and are transferring those less significant highways to other governments. Third, the States are studying methods for increasing funds by increasing taxes, tapping new revenue sources and transferring the costs of those activities not directly related to highway operations to the general fund.

PUBLIC INVOLVEMENT

Public participation is an important part of transportation planning and programing. Most of this activity so far has been focused at the project level and at the urban scale. There is relatively little experience concerning public involvement as a part of the statewide planning process.

Recently, however, States have begun to look toward effective ways of incorporating public views at all stages of statewide transportation planning in an effort to gain support of resulting plans and programs. In many instances, States view the need for public involvement in the early planning stages as critical so that a base of support can be established for (1) discussions with the legislators on financing programs and (2) discussions with the public on project development activities (e.g., EIS, design, project hearings).

By far the most commonly used method to gain public input has been through public meetings. These have usually been at a sub-State level and normally take the form of a workshop or a more formal hearing. For example, critical transportation issues and suggested policy changes were identified by eight (now ten) regional citizen advisory councils in a statewide program established in Iowa. A continuing involvement is achieved through monthly council meetings, mailbacks, response sheets and newsletters. The councils are open to all interested persons.

In the development of the Minnesota DOT transportation plan regional public meetings have been used as a forum to help identify and deal with issues and problem areas the plan is to address. Additional input was obtained through response to letters and brochures to legislators, other elected representatives, interest groups, and the general public. It is anticipated that continuing involvement will be through agreements with regional development commissions assisting DOT with periodic revisions of the transportation plan.

As an initial element in developing a regional transportation plan for Southeast Alaska, the State Department of Transportation and Public Facilities held public workshops in 17 communities. Participants identified transportation services in their communities, listed their likes and dislikes in regard to these services, and recommended transportation improvements with priorities. Based on this input, several principal transportation system options were considered at another series of public workshops, leading eventually to a preferred transportation plan.

Arizona has held 19 public forums throughout the State to obtain inputs on the future direction of transportation. Attendance ranged from 16 to 150, averaging about 40 participants. Background information on the status of the systems had been provided in a previously circulated report, which was briefly summarized at the meetings. The participants then responded through small workshop groups. Continuing involvement is through a monthly newsletter that covers progress on the plan development and invites response from readers.

Louisiana holds hearings on the State's proposed short-range program. These hearings are conducted annually by the Joint Legislative Committee on Highways and Public Works and receive public testimony. The State Department of Transportation provides staff to address technical issues at these hearings. The Minnesota, Arizona and Louisiana participatory processes are discussed further in the paper "New Approaches to State Transportation Planning."

Two common characteristics in the above examples that are among the apparent contributors to their success are the early involvement of the public and provisions for keeping the public involved and informed on a continuing basis.

Advisory committees are often used in the plan development process, with a variety in the type of memberships and structure. For example, Michigan has established modal committees, including modal carrier representation, for the State's multimodal needs study. Also, Wisconsin uses a broad-based State Transportation Plan Advisory Committee to aid in developing statewide plan alternatives; and Alabama has a citizen group, "Alabama Citizens for Transportation," that developed a long-range plan with financing packages for legislative use by working closely with the Alabama State Highway Department. No two States have approached the use of committees in the same way, and each committee has been tailored to specific objectives of each State's transportation planning program.

Several States have used special surveys to gain public opinion. For example, Washington has used transportation surveys and TV-callback programs to obtain representative public input. Colorado used a modified questionnaire technique for gathering information from the public on transportation issues, goals, and alternative State development futures. A 30 percent response rate was obtained.

In nearly all of the above examples, some form of written communication has been provided to the public, such as reports, minutes of meetings, or newsletters.

The approaches used by States to obtain public involvement in the state-wide planning process include one or more of the following: (1) Public meetings, including presentations, workshops, or hearings; (2) citizen advisory or interest groups; and (3) communication through informal channels, the media, surveys or written reports. Early involvement is critical to gaining support for proposed programs and for project development activities.

PLANNING/PROGRAMING

Where does planning end and programing begin? The viewpoint taken during the seminar series was that the development of the program is a primary product of planning. Planning and programing were recognized as different aspects of the same activity, i.e., management.

The problem that the planning or program manager must solve is how to determine whether his decisions are reasonable. The response to this problem in numerous States has been the development of long-range plans. Such plans, based on adopted goals and objectives, give guidance as to how the physical system should be developed to serve a future way of life, presuming, of course, that the plan is fiscally realistic. In the absence of a long-range plan, it is necessary for management to specify objectives (e.g., safety, efficiency, etc.) 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, reduction in traveltime, reduced vehicle emissions, improved sufficiency ratings, etc. These characteristics then should be monitored by specifying levels of achievement against which success can be measured.

Part of the separation that exists between planning and programing can be attributed to organizational structures. Planning and programing officials often report to different individuals and both functions may be carried out independently. Similarly, State highway agencies may centralize planning, while the initial development of the programing is done at the district level. The central office control may be only to the extent that it ensures total dollar amounts will not be exceeded. The problem with these organizational structures can be characterized by the lack of a unifying agent. This agent can be a person, a plan, or a process.

When the agent is a person, it usually means the chief engineer or commissioner who has a clear vision of the agency's mission. Projects may be chosen in a largely intuitive way, but they are consistent with the agency mission. When the unifying agent is a plan, the program can be developed by comparing project mix with the facilities and policy embodied in the plan. The plan helps to focus efforts on those activities that help bring the plan to fruition.

Good management is achieved when the unifying agent is the process by which decisions are made. While individuals and issues may change over time and assumptions made during plan development may no longer hold, effective planning management must be sensitive enough to adjust and respond accordingly.

California's response to a statutory requirement for a quadrennial needs study is an example of this adjustment. Between the 1974 and 1977 studies, management recognized a need for low-capital intensive improvements and for a shift away from dependence on the private auto.^{6/}

The difference in needs between 1974 and 1977 are summarized in Table 1. There are two major differences between the two programs. First, in 1974, deficiencies in the system were proposed to be eliminated by constructing new facilities or reconstructing existing facilities to full modern standards. The 1977 needs estimate contains more proposed improvements but fewer proposals for new facilities. The current estimate includes 480 new highway proposals whereas the 1,500 "projects" in 1974 were almost all new highway proposals. Second, the 1974 needs were directed almost entirely at capacity problems. Underlying structural, safety, or operational problems added priority to new highway construction, but were not usually problems for correction in themselves. The 1977 needs report was much more comprehensive and included various operational, environmental, and multimodal improvements.

TABLE 1

CONSTRUCTION
NEEDS BY PROGRAM ELEMENT

<u>Program Element</u>	<u>\$ Millions</u>	
	<u>1974</u>	<u>1977</u>
Maintenance Lands and Buildings	-	30
Bridge Reconstruction	22	161
Roadway Reconstruction	53	315
Highway Planting Restoration	-	34
Safety Roadside Rest Area Restoration	-	2
Resurfacing	-	73
Protective Betterments	6	43
Safety Improvement	22	397
Noise Attenuation	-	381
Highway Planting	-	74
Roadside Rests	5	45
Vista Points and Roadside Enhancement	-	16
Traffic Operational Improvements	132	621
High Occupancy Vehicle Facilities	11	724
Bicycle Facilities	-	24
New Highway Construction	8,295	3,698
Miscellaneous	2	9
TOTAL	8,548	6,647

Source: Reference 6

There are two trends in planning and programing. First, States are developing a system planning process that will allow management to better evaluate the success in fulfilling the agency's mission. Second, managers are recognizing the need for stronger coordination between planning and programing so that data developed by planning will be responsive to the needs of programing.

MULTIMODAL PLANNING AND PROGRAMING

A primary reason State DOT's are created, according to statutory material, is to provide intermodal coordination. The next step would be the development of a multimodal program. That is, a statement of work that recognizes the abilities of each mode to satisfy travel demand and the optimization of these abilities. This sort of program development rarely occurs at the State level. The reason is the difficulty in assessing the comparative advantages of each mode.

All modes have characteristics that can be defined and measured in similar terms, but these characteristics often are not the significant ones used in making modal tradeoffs. For example, speed, frequency of service, capacity, and operating costs can be measured for all modes but do not necessarily indicate why a particular modal choice is made. However, all modes also have unique characteristics that can be defined and measured (in not necessarily similar terms), and these characteristics are significant in making modal tradeoffs. Examples are the rates that can be charged for service, minimum size of shipment, union operating rules, and the degree to which modal choice is influenced by regulation (although the latter may have less impact in the future than in the past).

For example, in Table 2 comparisons are made between intercity freight modes. In terms of weight, all modes have similar shares of ton miles except for air. When the comparison between modes is made in terms of revenue, the picture changes considerably. Rail and trucking hold the dominant shares of freight revenue, with air having the highest ratio of revenue to ton miles. What causes such differences?

TABLE 2.--INTERCITY FREIGHT MODAL USAGE

Mode	Ton miles*	Revenue**
Rail	34%	30%
Water	25%	4%
Pipeline	22%	3%
Truck	19%	61%
Air	<u>1/2%</u>	<u>2%</u>
	100%	100%

Source:

*National Transportation Trends and Choices, U.S. DOT 1975

**1972 National Transportation Study, U.S. DOT

Nondirect transportation costs can have a significant effect on modal choice. For example, the following tabulation depicts the types of economic considerations related to inventory costs that a private corporation must make in freight shipment.^{7/} These considerations include annual volume, warehouse cost, the minimum shipment size for

various modes, freight rates, and transit time. As the example shows, direct transportation costs favor rail; however, the associated inventory costs that arise due to frequency and size of shipment tip the economic scale to favor trucking.

INVENTORY COST EXAMPLE

Condition of case study

Annual volume through warehouse 360,000 lb.

Value of inventory \$4/lb.

Base inventory: rail 171,000 lb.

truck 63,000 lb.

Rail rate: \$1.50 on 60,000 lb. minimum,

transit time 7 days

Truck rate: \$2.25 on 30,000 lb. minimum,

transit time 2 days

Results of case study

<u>Annual costs</u>	<u>Truck</u>	<u>Rail</u>
Transportation	\$ 81,000	\$ 54,000
Inventory investment @ 10%	<u>25,200</u>	<u>68,400</u>
Total distribution cost	\$106,200	\$122,400
More expensive option		\$ 16,200

From freight statistics (Table 2), the relative share of freight in terms of ton miles by mode would suggest that random sampling of freight shipments should provide a picture of modal activity. The problem is that many freight carriers will not release information for fear it will aid their competitors, or they will release information

only if they are reimbursed for it. The response to this situation has led to a number of alternative approaches. In Texas manufacturers were contacted to obtain the type of goods shipped and modal information. The State achieved a 64 percent response rate.

Arizona has attempted to obtain freight information from shippers and receivers, rather than from transportation companies. Oregon has indicated that an attempt will be made to obtain information only on those commodities that are particularly significant to the State's economy and thus reduce data collection costs.

Recognizing the often subtle issues in the weighing of modal tradeoffs, how is the planner to evaluate questions, such as; What are comparative advantages to intercity bus service relative to auto service? How large a public investment should be made in supporting such bus service? Would publicly supported rail adversely affect bus service within the same corridor? The most effective approach would emphasize modal specific and corridor specific issues, where modes would complement each other, and avoid complex simulations of competing modal systems.

For example, the Arizona DOT performed an extensive analysis of national airline rates as they might affect business and tourism in the State. The analysis led to a persuasive presentation to the Civil Aeronautics Board and to the inclusion of Arizona in the special West Coast air fare rate structure. Iowa depends heavily on a transportation network that can efficiently move grain during harvest. The State was

instrumental in developing a combination rail/barge tariff for corn and soybeans shipped to the Gulf of Mexico for export.^{8/} This tariff eliminates the daily fluctuations common to barge rates and offers the shippers an annually contracted rate.

Multimodal inter- and intrastate studies of passenger movement have focused on bus and air modes. Michigan and Oregon have conducted bus studies that include such items as the number of operating companies, routes, schedules, frequency of service, financial statistics, user profiles from on-board surveys, and trip purpose.

In summary, the direction of multimodal studies has been away from complex simulations of competing modal systems and toward specific issues and corridors. General approaches to multimodal planning are based on modes complimenting each other as opposed to competing with each other. Either/or questions are not being asked as much as are questions of appropriateness of a particular modal service, either as the solution to a capacity problem within a corridor or as the response to the transportation needs of a particular segment of the public.

ENERGY

In statewide transportation planning today the energy issue has become a most important consideration and has some of the most profound long-term ramifications. The transportation sector accounts for about 40 percent of total gross energy consumed when indirect uses are included and over 50 percent of all petroleum consumed. Moreover, the automobile

accounts for half the Nation's transportation energy consumption.^{9/} Thus, the transportation sector, and particularly the automobile, is obviously the choice area in which to implement energy conservation measures. There are a multitude of options open to the transportation planner, and literature regarding their implementation and effectiveness is voluminous, yet even reliable sources differ on fundamental considerations. In addition, a lack of consensus on the extent or even existence of an energy problem requires that extensive public education be an integral part of most conservation measures.

Statewide energy conservation measures may seem ineffectual when compared both to the enormity of the energy problem and to the energy savings produced by a national policy such as the mandating of greater fuel-efficiency in newly constructed vehicles. However, State planners should recognize that conservation measures sometimes produce a fiscal savings that can offset decreasing gasoline tax revenues. It is important to recognize, also, that government agencies have been slow in responding to the energy situation, possibly because many conservation proposals do not fit within their traditional framework of responsibilities. Yet their response is necessary. Energy conservation is not a short-term policy. As an increasingly important fact of life, it demands the attention of those whose decisions will determine future energy use.

Transportation System Management (TSM) strategies offer urbanized areas options for increasing the efficiency of their transportation systems.

This increased efficiency, in many cases, means decreased energy consumption. TSM strategies in use can be stratified into two principal categories:

- Promoting the use of high Occupancy vehicles (HOV)
 - increase auto occupancy
 - shift to transit
- Improving traffic flow.

Increased auto occupancy has the potential of saving up to 5 percent of the total direct transportation energy (TDTE).^{9/} The most feasible area of savings improvement is the work trip, since average vehicle occupancy is about 1.2. Unfortunately behavioral changes (with respect to personal travel) are quite difficult to effect, and although it is easier to get people to carpool to work than for other purposes, success still has been limited because of desire for privacy and convenience. Even during the adverse conditions of the 1973-1974 oil crisis, carpooling increased only 5 to 10 percent.^{10/}

Incentives that are being provided to increase auto occupancy include:

- Reserved lanes and roadways for car-and vanpools
- Preferential parking policies
- Differential tolls

Another HOV strategy with varying degrees of success is to shift travel from auto to transit by:

- Reducing transit fares
- Improving service
- Making transit capital improvements
- Auto disincentives

The overall efficiency of the transportation system is the prime concern, not just the efficiency of an individual mode. A major consideration in determining system energy is the source of the new transit patronage. Gains in transit ridership from those that previously walked or were in carpools may even be counter productive. The maximum estimated impacts on transit ridership for any strategy would be a 60-80 percent increase (only half of which would be diverted from autos); and this would be due to universal free transit.^{11/}

However, even this would have relatively minor impact on the TDTE consumed. Combining drastic fare reductions with extended route coverage and reduced headways would also produce negligible results because of lower load factors and also due to the use of the auto to gain access to the transit facility. Because transit accounts for such a small fraction of total urban passenger travel (2.5 percent in 1973), its short-term contribution to energy conservation would be slight. It is estimated that doubling the share of travel carried by transit in 1980 would only have 1/12 the impact of increasing new car fuel economy by 40 percent.^{12/} Even though the benefits of transit might be small, there is a definite need for transit capacity as a backup system to the auto.

The alternative to providing incentives to increase auto occupancy would be to make single occupant auto travel less attractive through disincentives. For example, parking could be made more expensive and/or less convenient for single occupant drivers. Another effective way of promoting increased auto occupancy would be to decrease the availability or increase the price of fuel.

Two different approaches have been used to examine the effectiveness of disincentives. One study used the responses to a questionnaire survey of three major cities to evaluate impacts on regional VMT.^{13/} The most effective strategies identified in the study are those that 1) cause significant (20 percent) increases in drive-alone times with similar concurrent decreases in carpool times, 2) restrict gasoline availability, and 3) significantly increase gasoline price. Each of these strategies is estimated to reduce regional VMT by more than 4 percent (estimated petroleum savings would be somewhat less, about 3.4 percent due to circuitry of routing and increased weight in the cars). A second study used a set of behavioral travel models to analyze various policies.^{14/} Gasoline availability emerges from the study as most effective because it reduces nonwork as well as work travel. It is estimated that one-quarter to one-third of the work VMT reduction caused by other policies is offset by increases in nonwork travel with automobiles left at home.

The other principal TSM strategy is to improve the flow of traffic including right turn on red, one-way streets, improved signalization and better maintenance. While the return in terms of systemwide energy savings is not great, these strategies require no major expenditures of funds. Since much travel is over highways that were developed using an engineering economy in which capital cost and traffic volumes were considered, the major portion of the existing system is probably as efficient as can be expected. Any significant improvements would require considerable capital resources that do not appear to be available.

State energy conservation plans (SECP) have been developed in every State in response to the Energy Policy Conservation Act of 1975 (EPCA). This act makes conservation efforts eligible for Federal assistance if certain minimum standards are met. The standards include a variety of transportation-related measures, most of which are designed to increase modal efficiency or to encourage a shift to more efficient modes.

Wide scale behavioral changes in travel could result in significant energy savings with a minimum level of investment. Unfortunately, these changes often involve perceived inconveniences and are consequently very difficult to realize. Therefore, a greater emphasis must be placed on informing the public about energy problems, the need for conservation, and the attractiveness and workability of energy efficient practices. For example, a New York research report has suggested that an energy audit program be set up to assist citizens in energy use.^{10/} Citizens would voluntarily ask that their energy usage be audited and request suggestions on how to save energy for their particular situation.

Successful implementation of carpool/vanpool and public transit programs is also dependent on a public education process that emphasizes fuel and monetary savings while emphasizing other personal savings and convenience. Additional incentives and promotions that are to be offered by State governments, according to their SECP's, will encourage employers and employees to initiate carpool/vanpool programs.

Many discretionary trips are made for private and business purposes. Proper planning to combine recreational trips and other private use trips can reduce waste. Many short trips, such as shopping and commuting, can be made by bicycle where proper facilities exist. Montana and Oregon, for example, have set aside a fixed percentage of their highway construction funds for bicycle facilities (bike paths, locked storage facilities, intersection crossing lights, etc.). This mode offers potential energy savings only if facility safety is upgraded significantly.

Effective strategies in urban land use planning and control offer potential energy savings. This subject was discussed only briefly in the SECP's since its effectiveness is long range. Police powers, taxing policies, and public works investment policies affect land patterns. The resulting location of shopping districts, residential areas, and high density employment centers can help reduce future demand for travel. Tax breaks are also being considered for industries that locate in urban areas, thus, discouraging suburban sprawl.

The purpose of the 55 m.p.h. speed limit is to restrict vehicles to a more fuel-efficient operating range. In fact, the 1978 Surface Transportation Assistance Act sets minimum standards and a system of goals and incentives to encourage adherence to the speed limit. Full compliance is estimated to save 1.7 percent of total highway fuel consumption (about 1.3 percent of TDTE).^{12/} Sixty percent compliance is estimated to result in a 0.75 percent TDTE savings. Most of these

savings occur on rural interstates with somewhat lower savings on other rural roads and urban freeways.

In the event of a rather sudden energy crisis, such as occurred during the 1973-1974 oil embargo, all levels of government must be prepared to act swiftly to minimize its impact. Some measures, such as a rationing program, must be handled at the Federal level, but even then the State and local governments would have responsibility for handling special cases, setting up boards and panels, and conducting a public information program. Each of these activities should be organized as a part of a contingency plan before the emergency to ensure the smoothest and most expedient possible transition into the crisis situation.

In an extensive contingency plan, the North Central Texas Council of Governments (Dallas-Ft. Worth) outlines strategies to modify its mass transportation in the event of an energy crisis.^{15/} Concerns about bus service expansions or reductions include:

- Route eliminations or additions
- Purchase of extra bus capacity
- Provide peak service only along certain routes
- Lengthen headways
- Eliminate weekend service
- Reduce number of stops
- Improve flow of buses in traffic
- Decrease number of deadhead bus miles

The Dallas-Ft. Worth plan also recognizes the usefulness of using taxis and ridesharing to provide transportation to low-density areas where bus service would be inefficient.

Scheduling of activities is important to efficient transportation system operation. Employers could be asked to voluntarily institute flex-time or staggered work hours as much as possible. School buses might be used for public transportation when they are not transporting students.

The nationwide energy savings to be realized by implementing any one conservation strategy generally falls within a range of 0 to 5 percent. Two major exceptions are: (1) Using taxes to encourage a shift to more efficient autos and (2) increasing the price of fuel at least 50 percent. Both of these strategies would generate considerable savings--as well as controversy. Although national savings due to conservation efforts may not be great, local savings could be significant depending upon the area and the strategy. The value of a conservation program is that it is generally low in cost and it can buy time. The major factor in its success is public support which can be enhanced through adequate and credible education.

LAND USE

The interrelationship of land use activity and travel has been well observed, both by the transportation system user and the property owner. A basic cycle is created that typically has transportation system improvement playing "catch up" to satisfy need created by

development, which, in turn, improves land access, which improves land value and stimulates more development, and so on. The two-edged issue of the role of the transportation system to influence land use change and accommodating the impacts of land use on the existing transportation system is basic to transportation planning. While the relationship has been well studied, analysts have generally had difficulty in quantifying it (to the extent that feedbacks are obtained, for example, between land use and transportation network models),^{16/} and institutions have had less than full success in trying to coordinate development with transportation improvements.

Contributing to these difficulties is the recent shift by the States away from the development of new transportation facilities and toward the preservation of the existing system. Therefore, better land use controls and constraints, such as access control, that will help preserve or improve the utility of the existing transportation system should be added to the land use-transportation cycle.

Traditionally, local jurisdictions (cities and counties) have been responsible for land use planning and regulations. Attempts by States to take a more active role in land use planning have been held in check by several factors: (1) Planning at the State level is often oriented to broad policy development dealing more with budgeting and capital improvement than with the specific function of statewide land use planning and regional growth and development objectives, (2) limited resource at the State level and limited statewide growth objectives have generally left local agencies on their own in land use planning,

and (3) the large number of local jurisdictions, each concerned with their own growth and each wanting to retain their land use development authority, inhibits an effective State-level comprehensive land use planning effort.

Another factor, it seems, contributes to difficulties in achieving a State-level land use/transportation planning integration. While responsibility for land use planning has been delegated to cities and regional agencies, certain activities, such as transportation, have been retained at the State level. Thus, the responsibilities for these two functional planning areas rest at two different institutional levels. Also, any activities within the same level related to land use and transportation are often found in widely separated departments or agencies. Thus, the problems in developing an effective State level interrelationship between land use and transportation fall into four categories: Geographical, institutional, technical, and agency.

There are a number of relatively recent actions that States have initiated or concerns being studied that either directly or indirectly affect the land use/transportation issue. For example, State legislation addressing environmental concerns and access needs of energy resource development is emerging. These issues impact on transportation service, and the impact of land development patterns on energy use is becoming more critical.

At the more analytical level, the impacts of transportation development on land development have received considerable study in the past. Typical are the studies on the effects on central business district growth by a proposed bypass and before/after studies on growth at freeway interchanges and along corridors of new facilities. On the other hand (land use impacts on transportation), studies have included the usual trip generation analysis part of an urban transportation study or a statewide study using urban type travel forecasting techniques. Site analysis of the impact of a proposed traffic generator on the surrounding street system is another example.

Land use control and impacts of development on maintaining the existing functional class or level of service of a facility have become a critical concern. Protection of the utility of highways that make up an existing highway system at a point in time when few new large-scale facilities are being built increases the need for emphasis on land use control. In a review by the Highway Users Federation, it was found that most of the State efforts at control focused on "critical areas."^{17/} The following were among the examples mentioned in the report. Other State actions more recently taken are also included.

- In Connecticut, a land use policy map is used as a guide for assessing the consistency between land use and State public investments.
- The Florida Environmental Management Act (1972) allows critical environmental areas to be set aside by officials and protects major public investments. The act also required the preparation of a State land use development plan and a review process for

- projects of regional significance. The availability of adequate transportation service is one of the criteria used in the review of housing and commercial development of regional significance.
- Coastal States have moved to manage growth better along their coast lines either directly by State legislation or as a result of the Federal Coastal Zone Management Act of 1972. The act essentially provides CZM agencies with a review function on projects (including highways) within the State established CZM area.
 - Indiana will soon begin an inventory of State resources to set protection priorities under the Indiana Heritage Program. Ten other States have similar programs.
 - Minnesota also has taken a "critical area" approach similar to that of Florida.
 - A number of States have passed flood plain and wetland protection measures.

As of late 1974, there were 21 States that had a land use planning program underway.^{18/} Twenty-six States have established a policy planning process that includes land use development aspects and some of the approaches are briefly listed below:^{19/}

Alternative Futures

- South Dakota has studied three alternative industrial and two farming policies for future growth. Consequences of alternative courses of action can be tested to provide information to decisionmakers. California has also used it.

- Utah has used economic and demographic analysis and projection to test alternative combinations and consequences of proposed development.
- Arizona is developing a similar modeling approach.

Identification of Significant Issues

- In Kentucky, the focus was on key decisions to be made within State management to effect improved policy.
- In Maryland, guidance was provided for decisionmakers in relating long-range goals to short-term actions.

Public Investment Planning to Guide Growth

- California has studied development strategies to renew and maintain existing urban areas.
- Massachusetts has taken actions to guide capital investment in central cities.

In addition to the above examples, the experience in Oregon is significant. The State passed a Land Use Act in 1973 which created the Land Conservation and Development Commission (LCDC) charged with developing and adopting statewide planning goals and identifying critical areas for additional study. The approach used in Oregon is significant in the way it incorporated citizen concerns and attitudes on land use planning and land development. Fifty-six workshops open to the public were held to obtain this input. Public hearings and other workshops were held to review drafts of the statewide goals. The goals were adopted in 1974 and are currently being used as guides by the State

and local jurisdictions in developing comprehensive plans. A citizen involvement goal was also adopted to ensure adequate input during the plan development stage. The LCDC has recently made grants totaling \$3.5 million to cities and counties in Oregon for comprehensive planning assistance and coordination.

In summary, land use/transportation interaction is becoming even more critical than in the past to orderly growth and development. State transportation agencies are moving toward the preservation of the existing transportation system and away from the development of new facilities. Land use activity that enhances the utility of the existing transportation system will be an important factor in whether travel demand can be accommodated. Active coordination among responsible agencies in these two planning areas is critical and is receiving increasing consideration.

SURVEILLANCE AND EVALUATION

Surveillance and evaluation are distinct but closely related procedures. The objective of surveillance is the observation of characteristics of the transportation system including its uses and the items that may affect it. The objective of evaluation is to form judgments as to the implication of the changes noted through surveillance and determine alternative responses. The key is (1) a clearly stated State transportation or highway policy, (2) a set of objectives that implement the policy statement, and (3) criteria that can measure success of the policy.

Surveillance and evaluation activities are receiving increased emphasis since the Nation's highway agencies have entered a period of extremely limited monetary and personnel resources. The response at the State level is found in recommendations such as in Pennsylvania for "performance standards and a Department 'report card' with which to communicate the level of performance to the legislature and the public."^{20/}

Surveillance and evaluation procedures should meet the basic objectives of providing:

1. An early warning system to identify external trends and events that call for the review of existing policies and activities or the establishment of new policies and activities.
2. A system of accountability for agency functions and identifying what has been accomplished with the public's funds.

The surveillance activity should be guided by the principles of the agency's mission and the guidelines embodied in a plan or program document. The data collected should relate directly to the anticipated mission and related objectives. This implies that the plan or program is specific enough to relate to the physical effects that would accompany its development.

The types of information that should be monitored through a surveillance activity typically include population, vehicle registrations, travel volumes, and, more generally, the use of and impacts on the system. The surveillance activity essentially includes the classic types of studies and activities that were and are central to an effective

planning process, such as inventories, fiscal studies, needs studies, travel projections, functional classification, sufficiency ratings, and ridership.

Evaluation takes the information obtained through surveillance, determines changes, and makes a judgment as to the effect that the changes will have on the success of the agency's mission.

The following are some of the typical uses of data that would be developed by the surveillance and evaluation activity:

1. Review of progress and trends in providing transportation services. This includes identification of problem areas and progress that has been made.
2. Resource allocation decisions will be guided by the highlighting of problem areas. The comprehensive approach to determining the need for changes will help to temper demands that may be made by special interest groups.
3. Budget formulation can be enhanced by referring to the issues noted by the surveillance and evaluation process.
4. Detailed program evaluation and analysis of future options are basic management activities. Surveillance and evaluation would provide the types of data necessary for such evaluation.

The major questions management needs to answer are: Has its management been successful? Are observed trends indicating the achievement of management's objectives? Positive responses to these questions will require that management be able to determine meaningful criteria to

measure success and develop a clear understanding of what trends are worth watching.

The State highway agencies' goal may be to provide fast, safe, and economical transportation. Objectives may have been overshadowed during the attempt to achieve some intermediate goal, however, such as plan development, certification, or approval of an annual element or annual program. This approach has led to rather constrained ways of perceiving problems along with an associated set of prescriptive techniques. What is lacking in these approaches has been an evaluation of management in terms of the agency's true objective. For example, that there is an accepted plan is not the same as saying that transportation has actually become faster, safer, or more economical than before the plan existed. Suppose, instead, certain levels of achievement could be set, such as travel during the peak hour, will improve by 1 mile per hour over the next 5 years; that highway-related deaths will decrease by 5 percent; and that 7 percent less energy will be used per mile of travel. After the levels of achievement are set, the participating States, cities, or counties could develop proposals that would achieve the objectives along with methods of measuring their success. Certainly, this approach could be more difficult to manage than the prescriptive approach since the methods of meeting the objectives would be more numerous. However, it would have great payoff in testing many approaches to solving a problem, would tap the creativity of planners, engineers, and managers, and most importantly would be dealing with the actual objectives of the agency and not surrogates.

An often used measure of performance is expenditure. The assumption is that, if a State spends 10 percent of the estimated cost to develop a highway system, then 10 percent of the objective has been achieved. Safety programs provide an example of using expenditure as a performance measure. The programs are to reduce deaths, injuries, and property damage, and these would seem to also be the best measure of success. Unfortunately, collecting and coordinating the necessary data become so laborious that the surrogate of expenditure becomes easier to use.

The work in California described earlier under fiscal problems presents an interesting example of how a well-managed expenditure of funds can actually be more beneficial than an indiscriminate expenditure. On a dollar for dollar basis, the system-oriented approach provided 30 percent more benefits than the previously used project-oriented method.^{3/}

A surveillance and evaluation process, generally, will only be instituted at the demand of upper-level officials. Even with top-level backing, a surveillance and evaluation system may be criticized initially by those who feel the old methods are achieving desired results or that enough, or possibly, too much data are already being assembled. In the face of such criticism, advocates of surveillance and evaluation can point out that much data now being compiled does not address the impact of proposed alternative courses of action. Similarly, the increasing use of planning, programing, and budgeting systems and management-by-objectives constitutes a demand for regular information about agency and program effectiveness.

In summary, surveillance and evaluation is just beginning to be recognized as a necessary statewide activity for transportation agencies. While much data has been collected that constitutes a surveillance activity, the evaluation phase has generally not been a regular accomplishment. State transportation agencies are, however, beginning to carry out evaluations to ensure that they are efficiently and effectively fulfilling their mission.

CONCLUDING REMARKS

The various issues that have been discussed here must be dealt with as related and not disparate and must be linked to key statewide planning products. The approach to all of the issues can be viewed as management's response to a need for State governments to more effectively deal with available resources.

The overriding issue in most States is that expected highway revenues will not meet expected highway needs. As a result, State transportation managers have had to determine how best to preserve the transportation service improvement gains that have been made so far. Responses have ranged from jurisdictional realignment, to redefinition of appropriate improvement standards, to consideration of additional sources of revenue.

The plans and programs that are now being developed out of this utilitarian ethic emphasize the possible over the desirable. Plans are more closely scaled to the funds expected over the long haul. Programs are more responsive to preservation of the existing transportation

system and reflect an awareness of dealing with project decisions in a system context.

Many States are looking at ways to ensure early and continued input by the public and interested agencies in statewide transportation planning. Typical approaches have included public meetings on specific topics, advisory committees, and greater use of the media. All of these seek to determine the true issues and desires of the State and the communities that are affected. Involvement is critical to establishing support for programs and project development activities.

Multimodal planning and programing solutions to specific near-term problems are tending to focus on particular corridors in a State. Successful multimodal planning recognizes not only technological similarities between modes but also economic and regulatory limitation on modes.

Energy has become a significant issue in program development. It spans modal choice and fund availability. Most of the transportation-related energy issues emphasize conservation as opposed to technological or economic substitution and, thus, must be keyed to a good public informational program. Transportation system management strategies seek to optimize the use of available facilities and thus reduce energy consumption.

The move toward comprehensive State transportation plans has occurred at the same time as an increased focus on statewide land use planning. Difficulties in interrelating these two efforts in the past has stemmed

from the different levels of State control and interest in each type of planning. While many State level transportation systems are under State agency control, land use is not. While the State may have an interest in specific transportation projects, it is not as interested in a particular land parcel. Also, the agencies for land use planning are normally not the same as for transportation planning. Active coordination in these two planning functions is critical and is receiving increasing consideration.

Finally, surveillance and evaluation are necessary activities for management. Decisionmakers are seeking to become aware of issues before they become crises and to measure their successes instead of assuming them. Greater efficiency in the use of personnel and funds, as measured under performance criteria, has become the manager's goal.

In summary, State transportation agencies must focus carefully on these issues as a part of improved overall management of the transportation planning program. The courses of action in dealing with the issues must move toward:

- Efficient management of scarce resources--energy, financial, social, community, and natural.
- Preservation of the existing transportation system and maintaining service improvement gains made so far.
- An emphasis on possible rather than desirable standards and less emphasis on capital intensive improvements.
- Focusing on corridors to better analyze tradeoffs between modes.

- Better education of the public toward an "energy conservation ethic."
- Increased emphasis on land use control to protect highway utility (existing functional class and performance level).
- Early and continued public involvement.
- Effective surveillance and evaluation through a clearly stated policy, a set of objectives that implement the policy statement, and criteria that can measure success of the policy.

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