TRB

Special Report 146

ISSUES IN STATEWIDE TRANSPORTATION PLANNING

TRB
Special Report 146

ISSUES IN STATEWIDE TRANSPORTATION PLANNING

report of a conference held February 21-24, 1974,
at Williamsburg, Virginia

subject areas
11 transportation administration
15 transportation economics
81 transportation planning

Transportation Research Board
National Research Council
Washington, D.C., 1974

NOTICE

The conference that is the subject of this report was approved by the Governing Board of the National Research Council acting in behalf of the National Academy of Sciences. Such approval reflects the Governing Board's judgment that the conference is of national importance and appropriate with respect to both the purposes and resources of the National Research Council.

The members of the committee selected to organize the conference and to supervise the preparation of this report were chosen for recognized scholarly competence and with due consideration for the balance of disciplines appropriate to the project.

Responsibility for the selection of the participants in the conference and for any summaries or recommendations in this report rests with that committee. The views expressed in individual papers and attributed to the authors of those papers are those of the authors and do not necessarily reflect the view of the committee, the Transportation Research Board, the National Academy of Sciences, or the sponsors of the project.

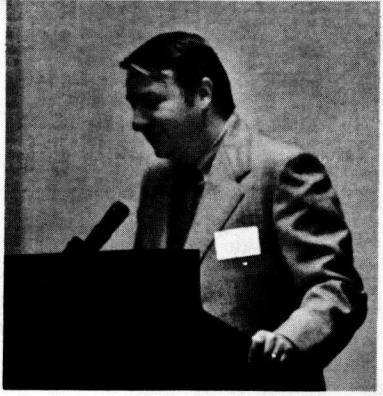
Each report issuing from such a conference of the National Research Council is reviewed by an independent group of qualified individuals according to procedures established and monitored by the Report Review Committee of the National Academy of Sciences. Distribution of the report is approved by the President of the Academy upon satisfactory completion of the review process.

The Transportation Research Board evolved from the 54-year-old Highway Research Board. All HRB activities will be continued but the new TRB will perform similar functions under a broader scope involving all modes of transportation and the interactions of transportation with society.

Transportation Research Board publications are available by ordering directly from the Board. They are also obtainable on a regular basis through organizational or individual supporting membership in the Board; members or library subscribers are eligible for substantial discounts. For further information, write to the Transportation Research Board, National Academy of Sciences, 2101 Constitution Avenue, N.W., Washington, D.C. 20418.

International Standard Book Number 0-309-02277-0
Library of Congress Catalog Number 74-7862
Printed 1974. Price $8.00.

CONTENTS



INTRODUCTION

State governments currently have an intense interest in statewide transportation planning. Approximately 25 of them have state departments of transportation. Because of the financial difficulties of many transportation modes and the essential nature of transportation in the support of the economy and in community viability, the states, local governments, and private industry dependent on or providing transportation services must consider what actions are required to preserve vital transport services. They know that tax dollars and private investments must produce maximum results in terms of sufficient and coordinated transportation systems and services for all people.

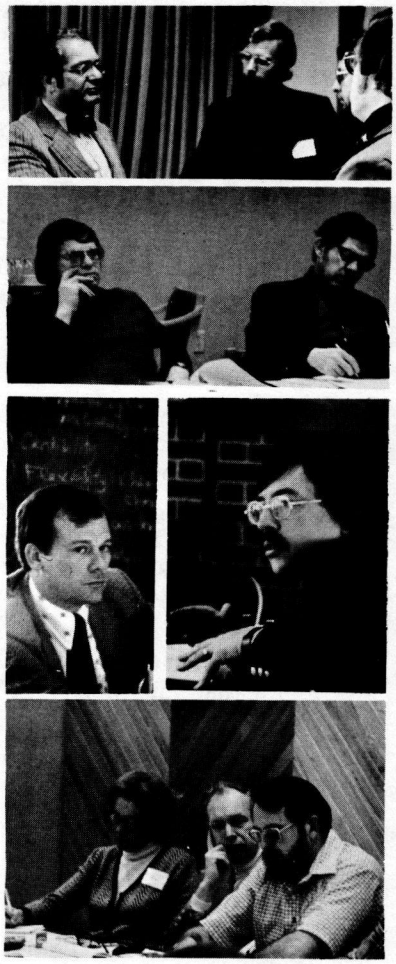
Statewide comprehensive transportation planning is complex; its uses are interrelated, separate, and conflicting, for they involve both public and private organizations and both passenger and freight transportation. Diverse objectives compete for the same transportation dollar. Analytical techniques relevant to transportation needs in one geographic area of the state or one sector of the public may not be relevant to another. The U.S. Department of Transportation and state governments have a direct interest in improving the planning techniques and making them responsive to current transportation issues.

The Transportation Research Board, therefore, was requested by the U. S. Department of Transportation to conduct a study conference on statewide transportation planning. An advisory committee was appointed by the Board to organize the conference and to structure the objectives, issues, and expected products of the working groups. The committee established the following conference objectives:

1. To determine the appropriate role of statewide transportation planning among transportation issues faced by decision-makers, recognizing the everchanging nature of transportation issues and the relation of the technical statewide transportation planning procedures to the political and decision-making process;
2. To determine the relation of statewide transportation plans to the physical development and growth of the states, particularly the growth policies and plans;
3. To review and evaluate current planning methodology (persons and goods) and current capability to incorporate the methodology into operation practice;
4. To recommend needed improvements in existing methodology;
5. To recommend short- and long-range research programs to develop and improve statewide transportation planning capabilities;
6. To identify alternative organizational structures and appropriate relations of governmental units and the private sector insofar as they relate to the development of comprehensive statewide transportation plans, planning methodology, and research requirements; and
7. To identify and define the organizational and methodological alternatives for improving the capabilities of statewide transportation planning agencies to respond to new issues and changing priorities such as those relating to the environment and to energy uses and resources.

Approximately 130 representatives of government, academic institutions, consulting organizations, and private transportation agencies attended the 3-day conference. In the 4 workshops to which they were assigned, they were asked to give primary consideration to analytical techniques for developing multimodal transportation alternatives; for measuring performance of major transportation modes in terms of user, community, environmental, and operator costs; and for estimating dollar costs and social benefits of alternative growth patterns and transportation systems to serve them.

This report contains the proceedings of the conference. Summaries of the findings of the workshops and of the conference papers are followed by descriptions of research projects that were recommended to be undertaken to give statewide transportation planning the methodological base and administrative direction required. The remainder of the report includes the state-of-the-art paper, the workshop reports, and the workshop resource papers that were prepared to provide background information on the issues discussed.



SUMMARY OF CONFERENCE FINDINGS

The work of the conference was done in 5 workshops that met concurrently. Their major conclusions and findings, which are given below, indicate some overlap in subject matter discussed, but, more important, general agreement by the separate workshops on what states must do in dealing with statewide transportation planning issues.

ORGANIZATION AND ADMINISTRATION

Workshop 1 came to 2 basic conclusions with regard to the organization and administration of statewide transportation planning: (a) There are wide differences in the problems, needs, and practices of the 50 states, and policies and guidelines established at the federal level must recognize those differences; and (b) no organization arrangement can overcome ineffective management or incapable staff. Given below is a summary of the findings regarding the major issues the workshop discussed: position, structure, and function of the planning unit; regionalization of the planning process; involvement of other agencies; citizen participation, coordination with the private sector; and federal funding.

1. Each state transportation department should have a single planning unit that reports directly to the head of the department and that is responsible for formulating a policy plan and a multimodal systems plan consistent with established

policies and for providing central direction for preparation of the multimodal improvement program and budget.

2. Statewide policy planning should provide the framework within which metropolitan transportation systems plans are developed and the resource allocation that sets the scale of metropolitan planning.
3. The role of the planning unit staff is to develop and analyze alternate plans, make recommendations to decision-makers, and provide full information regarding the concerns of other agencies, groups, and individuals.
4. Interaction and communication with outside groups must occur during the process of plan development rather than at the time of implementation and should involve all pertinent private and public agencies, groups, and individuals so that their concerns and judgments are identified and presented by them and not by planners speaking for them.
5. Until the time that states can undertake policy planning that integrates all functional elements, the various state agencies should develop their policies and plans cooperatively and in coordination.
6. Each state should voluntarily develop and adopt uniform process guidelines for all modes and for all statewide, regional, and metropolitan transportation planning so that interaction with agencies, groups, and individuals rests on an accepted and understood base.
7. Citizens may not be able to adequately participate in a centralized statewide transportation planning process, and the process may have to be regionalized for that purpose.
8. States should establish advisory groups composed of representatives of privately owned companies that provide transportation services so that their views and recommendations can be included in the transportation planning process.
9. Despite the traditional conflicts that are associated with actions of the state regulatory agency, that agency should also be included in the transportation planning process and an intensive communication effort made to resolve the conflicts.
10. Each state should develop annually or biannually a unified transportation planning program for the state and its subareas to provide a basis for state and federal funding.
11. Allocation of state and federal funds for transportation uses in the state, including all subareas, should be based on a formula developed by the state and local governments and on a single U.S. Department of Transportation review.
12. A single transportation planning grant fund should be established in the U.S. Department of Transportation for any policy, system, or area planning study regardless of the modal source of funds.
13. The U.S. Department of Transportation should prepare a unified set of transportation process guidelines for all modes and for all work phases from policy planning through construction.

POLICY PLANNING

Workshop 2 defined policy planning as the forming of a method for devising and achieving a course of action that is advantageous or expedient; it describes generally what is to be done, who is to do it, how, and within what limits. The workshop identified 4 statewide transportation policy areas: (a) allocating responsibilities for providing transportation facilities and services and developing procedures for reaching transportation decisions; (b) integrating privately provided transportation services into the statewide

system; (c) changing the nature and magnitude of the demand for transportation instead of the supply of facilities and services; and (d) financing and charging for transportation. Major findings are summarized below.

1. The function of policy planning should be assigned to a unit that is identified with or reports to the head of the state agency having responsibility for statewide transportation planning.
2. The policy planning unit must be staffed to perform a variety of analyses of many different types of transportation issues or must have access to special analytical capabilities elsewhere in the agency.
3. Policy planning staff should identify problems and options; coordinate, negotiate, and serve as catalyst in private-government relations; and analyze and interpret information for decision-makers and the public.
4. The transportation legislative program and public information program should flow from the policy planning staff.

SYSTEMS PLANNING AND PROGRAMMING METHODOLOGY—PASSENGER

Workshop 3A considered the differences between the established urban transportation planning process and that required for statewide planning and the changes in public attitudes that have occurred since the urban process began. A process for planning statewide multimodal systems must deal with a wide range of impacts, alternative capital-investment options, political and institutional restraints, and public involvement throughout. Major findings with regard to planning and methodology for passenger systems are as follows.

1. Unless significant changes and adaptations are made, existing transportation planning and programming methodology has limited use in statewide transportation planning.
2. Network simulation models and related techniques may be useful in statewide planning, but the immediate need is for policy-sensitive models that can be used in analyzing questions relating to pricing schemes, subsidies, equity, allocation formulas, and modal trade-offs.
3. There are now no effective ties between planning and programming, and program decisions are based more on what can be built than on what should be built.
4. Research is needed to determine whether "needs" studies are appropriate for statewide planning.
5. States need information on available methodologies and their costs, accuracy, biases, data requirements, and problem context and manuals to explain how to apply these methods.

SYSTEMS PLANNING AND PROGRAMMING METHODOLOGY—FREIGHT

Workshop 3B concluded that, before attention is given to methodology for systems planning and programming for freight transportation, the state must first define and understand its role in freight transportation. The workshop's major findings are as follows.

1. Initial models of freight flow should focus on operational simplicity rather than on theoretical elegance.
2. Areas for which analytical methodology is needed include (a) regional and state development models to determine both the impact of freight systems on development and the impact of development on freight systems; (b) freight demand models

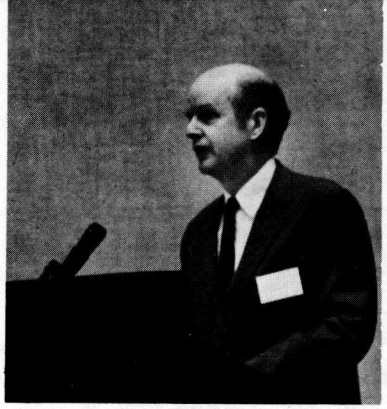
to forecast freight flows on the network; (c) land use impact models including impacts on the economy, environment, and energy resources; (d) corridor analysis models to determine the need to curtail or abandon service; and (e) cost models to compare costs of various transportation modes.

3. States generally do not have freight data and should carefully determine their needs before data collection programs are launched.
4. Mechanisms must be developed whereby the transfer of data from private to public agencies protects the interests of both parties.

STATE AND REGIONAL DEVELOPMENT

The discussions of Workshop 4 focused on the interrelation of statewide transportation planning and comprehensive development planning and the means and mechanisms important to the preparation and implementation of transportation and development policies and plans. Major findings are as follows.

1. The lack of linkage between comprehensive planning and transportation planning leads to short-term planning rather than policy-oriented long-term planning.
2. Transportation facilities should be used to help gain desired development and withheld to deter undesired development.
3. Federal support and mandate are essential to interstate and substate planning and coordination.
4. An environmental-impact-statement process is for all public and private development of regional or critical significance.
5. Coordinating statewide transportation planning and comprehensive planning cannot be accomplished by continued reliance on powerless planning structures. Planning agencies must have power to implement plans and enforce controls and be required to exercise it carefully so that the interests and rights of local governments and property owners are protected.
6. Comprehensive land use planning, designed to achieve accepted social, economic, and environmental objectives and having a level of funding compatible with the national task at hand, can be instrumental in gaining the desired coordinated planning.
7. When a state establishes statewide comprehensive planning, characterized as a purposeful, internally consistent activity and accompanied by power to implement plans, then transportation planning should become a part of that effort.
8. The land use decision system must be directive as well as protective, and land use policy legislation and implementing regulations should reflect this emphasis.
9. National land use legislation is a most significant tool for enhancing the capability of states to develop and administer effective land use planning and regulatory systems.
10. To counteract the fears associated with placing land use controls at other than the local level, information should be gathered and disseminated on the status of land use planning and control systems that have been adopted by the various states and the relative effectiveness of different approaches. In addition, federal statutes, regulations, and actions that now are generating land use and development impacts should be inventoried and evaluated with respect to their effect on state land use planning and regulation systems to determine how these federal and state efforts might best be coordinated.
11. Regional planning and decision-making should strengthen their quality both as to guidance and accountability in order to be more fully reflected in statewide transportation planning.



STATE OF THE ART IN STATEWIDE TRANSPORTATION PLANNING

Roger L. Creighton, Creighton, Hamburg, Inc.

This paper has 2 major purposes: to organize the subject of statewide transportation planning and to report on the state of the art—that is, the state of our ability both to develop and to secure adoption and implementation of policies and plans for multimode transportation facilities serving entire states, including their urban areas. In addition, a corollary, minor purpose is to suggest directions in which it would be fruitful to proceed in the future. These directions include not only means of developing policy plans but also means of planning better systems and carrying out productive research.

ORGANIZATION OF THE SUBJECT MATTER

The subject matter of statewide transportation planning can be organized according to 6 different aspects or dimensions:

The paper suggests 6 topics or dimensions useful in discussing statewide transportation planning: process dimension, real-world setting for the process, levels of planning, mode, linkages between transportation and other sectors, and implementation. The paper then concentrates on 2 levels of planning (policy and statewide systems) and on linkages and implementation.

Policy in statewide transportation is defined as determinations regarding allocations of resources, arrangements of institutions (who does what), and shared policies. Policy is determined by actors in the real world, bargaining in the marketplace and working through a governmental processes. Policy planning is a process of analyzing alternatives and communicating the results to those who establish policy. Policy planning is dependent on systems planning and other levels of statewide transportation planning. The state of the art in policy planning is mixed, being most advanced in states where alternative capital budgets (resource allocations) are studied.

Systems planning at the state level has not advanced substantially since 1971. There is disagreement as to how much emphasis should be given to this subject. Many technical advances have been made, but need to be brought into productive use by state departments of transportation, particularly for rail freight, truck freight, aviation, and highway assignments.

Regarding linkages between transportation and related sectors of the state, the state of the art is rudimentary. However, increasing and measured understanding of such linkages is essential to making diverse government programs mutually supporting.

The major current thrust in legitimating transportation plans is to regionalize the planning process. This has promise in terms of better understanding of local problems, greater local acceptance, and easier interfield planning.

1. Process by which statewide transportation planning is done;
2. Real-world setting for the process;
3. Levels of statewide transportation planning;
4. Mode of transportation;
5. Relations between statewide transportation planning and other disciplines of planning or forecasting; and
6. Means of implementation.

Any one of these dimensions can be discussed profitably by itself, although not, of course, in total isolation from the other dimensions. This structuring of the subject matter of statewide transportation planning is not intended to limit discussion, but rather to establish the general planes in which it can most profitably take place. In the following sections, the key aspects of each dimension are briefly identified.

Process Dimension

All planning processes have certain elements in common. Statewide transportation planning is no exception, no matter at what level it takes place or with what mode it is concerned or how it is to be related to economic planning or land use planning.

The elements are 5 or 6 in number (depending on how they are categorized) and are arranged in a basic sequence to form a definite and orderly process (Fig. 1).

Lying behind the process of planning is the basic meaning of the word "planning." It is worth looking at this meaning because sometimes, when the term "planning" is forced into certain contexts (such as "national planning"), inconsistencies emerge between the original idea and the new use of the word. Unless we recognize these inconsistencies at the outset, the resulting discussions are likely to become very unproductive. Basically, planning carries with it the following ideas and implications:

1. It is a conscious, deliberate process or activity;
2. It is purposeful, that is, directed toward achieving certain goals;
3. It is capable of dealing with complex subjects;
4. It considers alternative solutions or courses of action; and
5. The power exists by which plans can be implemented.

If this is correct, then we have to consider whether statewide transportation planning for all modes, public and private, is possible. But more on that later. In the meantime, a number of critical issues regarding the "process" dimension of statewide planning might be considered. Among these are the following: (a) Do techniques exist by which alternative solutions can be tested? in which modes? (b) How should we go about preparing alternative plans or statements of policy prior to testing them? (c) Should there be a separate process for each mode, or one process for all modes?

Real-World Setting for the Process

A picture of an entire state, or an entire country, can now be taken from a satellite. Such a picture would show, if we had time to examine it carefully enough, every road, rail line, airport, house, store, factory, farm, and so forth. However, in planning we cannot possibly deal with these things individually. We must collect things or activities into useful groups as suggested in the following diagram:

THE STATE -- AS IT IS				
POPULATION	LAND USE	TRANSPORT SYSTEMS	ECONOMY	NATURAL RESOURCES

A state, of course, does not remain constant, but changes over time. Each grouping changes and, in its changing, influences other groupings, as shown in Figure 2.

The mechanisms by which change is accomplished are extremely complex. Except for population growth, the mechanisms are bundles of individual actions, which are basically organized by the rules of the market ("the invisible hand of Adam Smith") and of politics and government. This is the setting in which statewide transportation planning has to find its place, as shown diagrammatically in Figure 3.

The key characteristics of the "nonplanning" situation are that decisions in the different sectors tend to be made separately, without coordination, in the interest of the person or group making the decision and through the mechanism of an accepted market or parliament.

When we introduce the concept of statewide transportation planning into this real-world situation, we are implying that

1. We have or can rapidly develop a conscious, organized process or processes;
2. Such a process is capable of coordinating different modes of transportation and coordinating transportation with other sectors (fields) of the state better than present processes do;
3. Such a process is capable of dealing with complex situations and is capable of estimating reliably and rapidly the consequences of alternative courses of action; and
4. Enough power exists, or can be assembled, to implement the plans that are prepared.

These implications—in fact, the whole concept of a viable statewide transportation planning activity—can be challenged. In part, the task of this conference was to respond to such challenges and to see whether, through technical advances in the art of planning, or through organizational changes, we can in fact do better in a planning situation than in the "nonplanning" situation that was described earlier.

Levels of Statewide Transportation Planning

Bouchard and others (1) identified 5 levels at which planning is done in urban areas. These levels, with slight changes in wording, are systems planning, corridor planning, project planning, engineering design, and planning for operations.

For statewide transportation planning, a different designation of levels seems appropriate. The suggested levels are policy planning, statewide systems planning, regional (substate) planning, and intrastate corridor planning.

In this listing, policy planning is predominately nonphysical planning (the term will be defined more fully later), whereas statewide systems planning has to do with the arrangements of physical facilities or services of different modes that cover the entire state. Statewide systems planning implies a concern for the larger facilities serving longer movements. Regional planning is considered to be planning for transportation facilities at the substate regional level—perhaps for groups of counties; it implies concern with facilities serving intraregional travel. Included as regions should be the major urban regions of the state and their hinterlands. The final level is intrastate corridor, in which a special study might be focused on the problems of movement by several modes between a pair of cities.

Mode

We are all familiar with the various modes that make up a total transportation system in a state. Discussions on the subject of mode can start with questions such as

1. Which modes should be included within a statewide transportation plan? Should all be given equal emphasis? If not, on what basis should appropriate emphasis or priority be selected?

2. To what extent should shifts take place from private to public ownership, or vice versa?
3. What public powers are needed to achieve improvements?

Relations Between Transportation and Other Disciplines

As indicated earlier, a state is composed of many elements to which we apply labels, thus grouping them into categories for greater convenience in problem-solving. The key categories or fields may be considered to be population, economy, land use (that is, the spatial distribution of human activities), transportation, and natural resources. Each of these fields interacts with the other fields (Fig. 4). However, we need to go beyond the generalities of the kind shown in Figure 4. We need to know the specific relations between transportation and these other dimensions—that is, between some particular facet or aspect of transportation and some aspect or facet of the economy or settlement patterns or natural resources.

The reason for this need is that, unless we can demonstrate that some change in transportation is needed to support some social program or that some change in land use (for example) is needed to support a more energy-conserving transportation system, then we have no logical basis for asking any policy-maker to change present policies.

We need to build bridges of measured relations between the subjects that we group under transportation and the subjects that come under the disciplines of economics, demography, land use planning, and natural resource planning.

The identification of the most critical relations between transportation and these other topics could be one of the most useful products of this conference. Some of those that might be considered are listed below.

1. What arrangements of land uses minimize transportation of people and goods? What percentage of reductions can be attained? What are the social costs and benefits of such arrangements?
2. What arrangements of land use (distribution of people and economic activities) in a state would minimize the total impact of a given population (both from static and moving sources of pollution) on the environment?
3. To what extent does faster or lower cost transportation affect settlement patterns across a state?
4. To what extent do federal housing insurance and tax write-down laws affect building practice and, hence, choice of mode?
5. What are the constraints that set limits to our ability to alter land use or transportation to the mutual advantage of both? Social constraints? Energy constraints? Money resources?
6. Are there transportation or land use solutions that would provide a better life for all social groups?

Means of Implementation

Obviously, implementation is of enormous importance to statewide transportation planning. It is the component that gives reality to planning, and the state of the art of implementation is of as much concern as the state of the art of technical planning.

Different state transportation departments have different powers with respect to the various modes of transportation and also across the boards. Nevertheless, all have access to some parts at least of the following 3 types of implementation.

Public Powers

States have 4 direct powers that they can use to influence both public and private transportation systems.

Figure 1. Planning process elements.

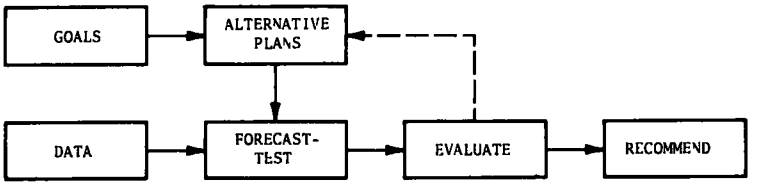


Figure 2. Changes in activity groupings and their influence.

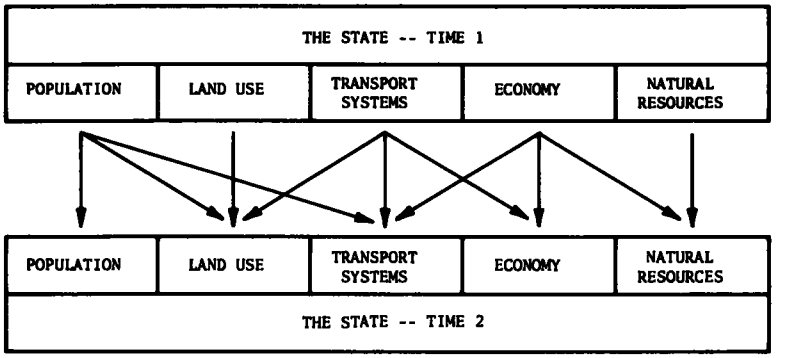


Figure 3. Setting for statewide transportation planning.

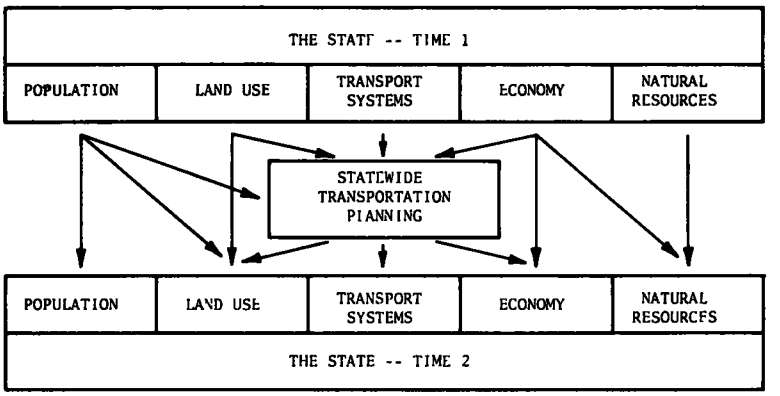


Figure 4. Interaction of fields.

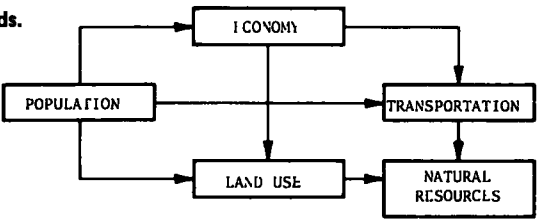
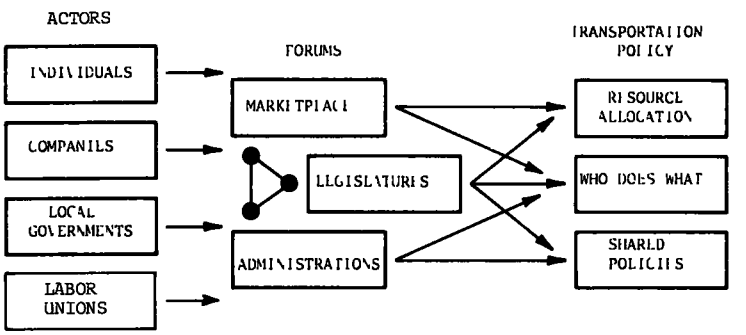


Figure 5. Processes for establishing policy.



1. Ownership. If the state owns a system, it can do with it what it wants. This is the strongest power.
2. Spending. By giving capital or operating grants, a state can influence decisions in the direction it desires.
3. "Police" Power. This is the power by which a state regulates what people or institutions may do in order to protect the public health, safety, and general welfare. Here are powers to regulate (such as the operations of vehicles), to license, and to set rates.
4. Taxation.

Persuasion

Where they do not have direct power, state transportation departments may have to depend on persuasion. Persuasion is probably most successful when it shows change to be in another person's (or public agency's) interest. This presumes at the outset, of course, that the state department knows more about "how to do it" than the other party. The key elements of persuasion are

1. Good information—knowing what the problems are, how severe they are, and what can be done to alleviate them; and
2. Demonstration—showing working examples of success.

Shared Planning

More and more, states consider that successful implementation starts with planning that includes the people being planned for. This applies not only to public planning but to planning with private transportation companies. Key aspects of shared planning, therefore, are regionalism in transportation planning and coordination of technical planning work between private transportation companies and public agencies.

PLANNING AND POLICY

Four topics in planning and policy are taken up in this section. First, what, after all, is transportation policy? Is there such a thing as policy planning? Second, what is the role of the professional in connection with policy formation? What are the processes that he might employ? Third, what is the present state of the art of policy planning? Finally, how can the state of the art be improved?

Content of Policy and Policy Formation

Transportation policy is something that is constantly talked about, but what is it? Or, what is its content? It seems to me that there are 3 principal components of transportation policy. I tried this quasi-definition out on representatives of 4 state departments of transportation, and they seemed to agree—so perhaps it has some validity. The components are resource allocation, institutional arrangements, and shared policies. Figure 5 shows the processes by which policy is established.

Allocation of Resources

Resources of all types—human, material, and energy—are allocated to transportation facilities and services of different types and in different parts of the state chiefly through the control of money, but not always. Examples are

1. Government spending for capital or operating costs of transportation facilities of different types through the budgetary process;

2. Market mechanisms of supply and demand and decisions of companies to expand or retract service;
3. Market controls through government rate-setting;
4. Taxation;
5. Declaratory policies such as "no more urban expressways"; and
6. Gasoline or fuel rationing.

Arrangements of Institutions

Decisions as to who is to do what in providing transportation facilities and services determine institutional arrangements. Examples are

1. Changes that will come about through the Regional Railroad Reorganization Act of 1973;
2. Changes from private to public operation of urban transit services;
3. Establishment of special authorities, such as port authorities, to undertake certain special functions;
4. Assignment of planning responsibility;
5. Assignment of funding responsibility; and
6. Granting of franchises.

Shared Policies

Other sectors of the state (such as land use, the economy, the environment, and natural resources) have an important interacting relation with transportation. Some policies in these other sectors have a direct bearing on transportation and must be considered to be shared policies. Examples are housing insurance policies that favor low- or high-density housing, environmental policies that would limit the use of vehicles in dense urban areas, and lack of positive policies on industrial location.

Douglas Haist, of the Wisconsin Department of Transportation, considers one important function of policy planning to be the "lookout" function—that is, keeping an eye on the future to anticipate changed public attitudes, technologies, and patterns of growth that could warrant policy revision.

If the foregoing is the content of transportation policy, then clearly such policies are determined not by planners (although some may be suggested by planners) but by the actors of the real world. Policy is established in the marketplace, by politics and through legislatures, by social and media pressures, and sometimes by strong executives. Even the courts now may be said to have a hand in policy formation.

Role of the Planner and Process of Policy Planning

The planner or engineer in a state department of transportation looks at present processes of policy formation—both public and private—with mixed emotions. On the one hand he is a realist and recognizes that this is the way the world works—it is, in fact, the world at work. On the other hand, he thinks that here is a realm in which what he can do will be better than what is now being done.

The realist knows that at present the existing process of policy formation is dominated by crisis, which means that changes are rarely made in timely fashion. In addition, transportation "solutions" are often single programs taken without regard to support actions that might make them more effective, and they may be narrow solutions that do not take social impacts into account. However, the realist also knows that he is not all-wise and that, if he is to do better, he has to adopt a role for himself. What should that role be?

Alan Altshuler, Secretary of Transportation in Massachusetts, suggested that it should be the role of an "honest analyzer of alternative policies." William E. Schaefer,

of the California Department of Transportation, called it the role of "homework doer for the legislature." Both felt that top state administrators and legislators sincerely wanted to have unbiased facts that they could trust.

Figure 6 shows what the planner's role might be. If transportation policy is established by actors who bargain with each other in different forums (as indicated in the top boxes), then the planner's role (or the transportation department's role) is indicated by the 6 elements shown in the lower boxes.

The value of the transportation department or the planner in the process of determining policy is determined by both the skill and the speed with which response is made to critical questions. Perhaps also, the value is determined by the planner's ability to ask the critical questions and to get them considered. What are the possible alternatives? What impacts will they have? Will the impacts be good or bad in terms of the accepted goals of a state? What supporting policies are needed in related fields, such as land use or natural resources or the environment? Who gains and who loses? To obtain the needed answers, the planner should engage in a process such as the following.

1. Define present policy. The first step is to identify what current policy actually is with respect to the allocation of resources, the arrangements of institutions, and the relations between transportation and other fields. What has been spent in the past by mode and by region within the state? Who does what? What are the rules of the game?
2. Articulate goals. This step, the same step that occurs in many other types of planning processes, can be swiftly accomplished. (Breuer, in a later paper in this report, points out that, although generalized goals may be readily stated, it is much more difficult to define and employ operational goals or standards that are used to evaluate equitable distributions of costs and benefits, proper balance of public and private interests, and alternative land use patterns.)
3. Propose alternative policies. Given the statement of existing policy, the planner can develop proposals of future policies fairly readily, although this is not neccesarily an easy task. Actually, some alternative policies have already been set forth in the 1972 National Transportation Study. But alternative policies should also be developed regarding institutional arrangements and regarding the relation between transportation and other fields such as land use, economy, and the environment.
4. Estimate impact. This step is the most difficult step in the process of policy formation. To estimate impact, a department of transportation must have data; it must know how things work, and it must have a fairly good picture of what the near-term future will be. Impact estimation is where answers are obtained to questions such as, Can it be done? How much will it cost? Is it worth it? What are the impacts on specific social groups? There is a danger, of course, that forecasting and simulation of impacts will become overly sophisticated and will not produce simple and effective results fast enough to enter the arena of public policy formation; but this can be guarded against.
5. Evaluate and recommend. The final step in policy planning is an evaluation of the alternative policies. This should be done in the light of the goals that have been previously articulated.
6. Communicate. After the alternative policies have been evaluated, recommendations should be addressed to the legislative or administrative authorities to whom the department of transportation is responsible. This matter of communication is a two-way street; it requires not only good professional practice but good organization on the part of the state administration and legislature to hear it. If politics muddies the water too much, then the role of the professional is weakened.

In the earlier listing, policy planning is at the top of a hierarchy that descends from the most general level to the level of detailed matters of design, construction, and operation. The basic cutoff line between policy planning and other kinds of planning is the line of physical design. Policy planning has to do with allocation of resources to the different modes and the different parts of the state, but it does not have to do with the configuration of a system that is being designed or with hardware, management and operations, or any of the more detailed items of design.

The preceding description of the process that a transportation department should use in playing its role shows that policy planning cannot proceed independently of systems planning at the statewide or the regional level or independently of careful studies and planning at even more detailed levels in the hierarchy. Ultimately all policy must be concerned with accomplishment. To the degree that policies are based on imaginary or unrealizable kinds of transportation facilities or unworkable institutional arrangements or unrealistically depend on changes in land use, then such policies are wrong and, in fact, deceptive. What this is saying is that policy generation must proceed hand in hand with sound technical planning at the systems and lower levels in the hierarchy of planning processes.

State of the Art in Policy Planning

What is the state of the art in policy planning? How well are we doing in developing policy alternatives? How well are professionals serving and working in relation to the governmental and marketplace processes by which policies are hammered out? Unfortunately, my sampling of states is too small to give a complete picture, and all I can reflect is a subjective evaluation. That evaluation is that the state of the art is quite uneven—and this should not be surprising, considering the newness of the field.

Resource Allocation

In terms of the allocation of public resources, the state of the art is quite advanced in a number of states, and there appears to be a steady progression of improvements. At its most elementary level, resource allocation of public funds is simply budgeting: allocating to programs (such as highway, transit, or rail freight) within a given funding level established by forecasting revenues (and by legislation) and then listing projects within each program. An examination of published state transportation plans (2, 3, 4, 5) indicates that most have multimode budgets, sometimes detailed to the level of project identification.

There is no point in getting into the complicated processes by which professionals interface with policy-makers in the preparation of these budgets. The procedures vary widely. For example, in California part of the resource allocation policy is predetermined by law that stipulates what percentage of highway revenues shall be spent in different parts of the state, subject to provisions built in to allow flexibility and review by the State Highway Commission. In New York, resources are allocated by an executive budget prepared after a regular cycle of work that takes a year to accomplish. Generally, with the fairly well-developed tradition of capital budgeting in this country and with the increasing assistance of computers to do the accounting, there is no reason why performance in resource allocation should not be uniformly very high.

Recently the development and presentation of alternative budgets have raised the general level of sophistication. The 1972 National Transportation Report (7) presents 3 alternative combinations of funding levels and allocations among modes. New York's most recent statewide transportation plan (5) contrasts a proposed allocation with that of the past—which is, in effect, an alternative. The Ohio Transportation Development Program is considering alternative budgets in preparing its first policy plan. Whenever alternatives are presented, the question of why one alternative is prepared over another must be raised and answered and this brings both professionals and policy-makers to grips with the real issues.

The state of the art of transportation department capability to comprehend or to cope with resource allocations in the domain of private transportation companies is very low. This should not be unexpected, because transportation department professionals are planners and engineers—not lawyers, economists, or businessmen. Further, there has been no directive or incentive yet for transportation department personnel to move into this private company domain; moreover, there have been many obstacles to getting good information on travel of people, the movement of goods, and the capital and operating costs of private transportation companies.

A change may come through the provisions of the Railroad Reorganization Act of 1973. This act will, at least in 17 northeastern states, force transportation departments to look at railroad capital and operating costs and needs because they will probably be handling subsidies.

Institutional Arrangements

My impression from visiting various states is that upper echelon officials in transportation departments are quite sophisticated about institutional arrangements. However, since arrangements are so varied, there is no particular way to define what a desirable state-of-the-art level should be. Arrangements as to who does what that are effective in one state may be ineffective or unnecessary in another.

One does see changes initiated by transportation departments taking place here and there.

1. In California, Connecticut, Massachusetts, Pennsylvania, Ohio, Wisconsin, and Kentucky (to name a few), some transportation planning work has been delegated to regional agencies.
2. In Massachusetts, the 1973 legislation established 9 regional transit authorities, not counting the eastern Massachusetts region. That same legislation made the MBTA a more integral part of state government.
3. Assistance by the Pennsylvania Department of Transportation helped one county to acquire an abandoned rail line so that it can be maintained in service.
4. The Wisconsin Department of Transportation initiated moves that resulted in legislative authorizations for the department to give operating aids as well as demonstration grants to transit operations in urban areas.

More examples could be cited. They are generally fairly small changes in the overall scheme of things, and perhaps this is fortunate. When major institutional changes occur, such as the Railroad Reorganization Act of 1973, it is most likely to be the result of a major catastrophe.

Improving the State of the Art

Part of the difficulty that any state department of transportation may have in dealing with policy may lie in having too grandiose a conception of what policy is. If, as suggested here, transportation policy consists of simple things like budgets, laws, or regulations defining areas of responsibility and of specific relations with other fields like land use or the environment, then these policies can be declared and revised on a regular basis. Then, over time, sophistication can be added.

Some high-priority actions to improve transportation department capability in policy planning include

1. Establishing a highly systematized budgeting process for all publicly owned and aided transportation systems, including municipal, county, and authority investments as well as state investments;
2. Establishing regular channels for communicating staff work in transportation policy areas to legislators;
3. Proposing alternative budgets and assessing their impacts;
4. Learning what is being done by private transportation companies in the way of investing or disinvesting in their own systems; and
5. Examining present institutional arrangements and considering alternatives.

With regard to the last action, for example, many transportation departments have disproportionate powers and responsibilities for highways in relation to those for other modes. Does this bias their work? Would other arrangements improve results?

Figure 6. Suggested role of planner.

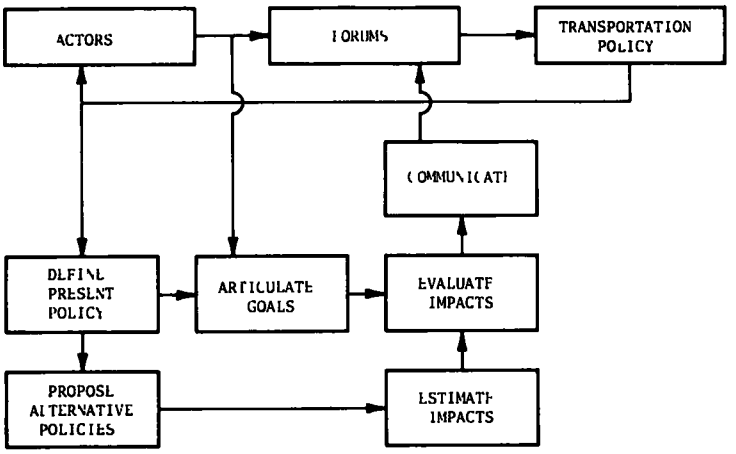
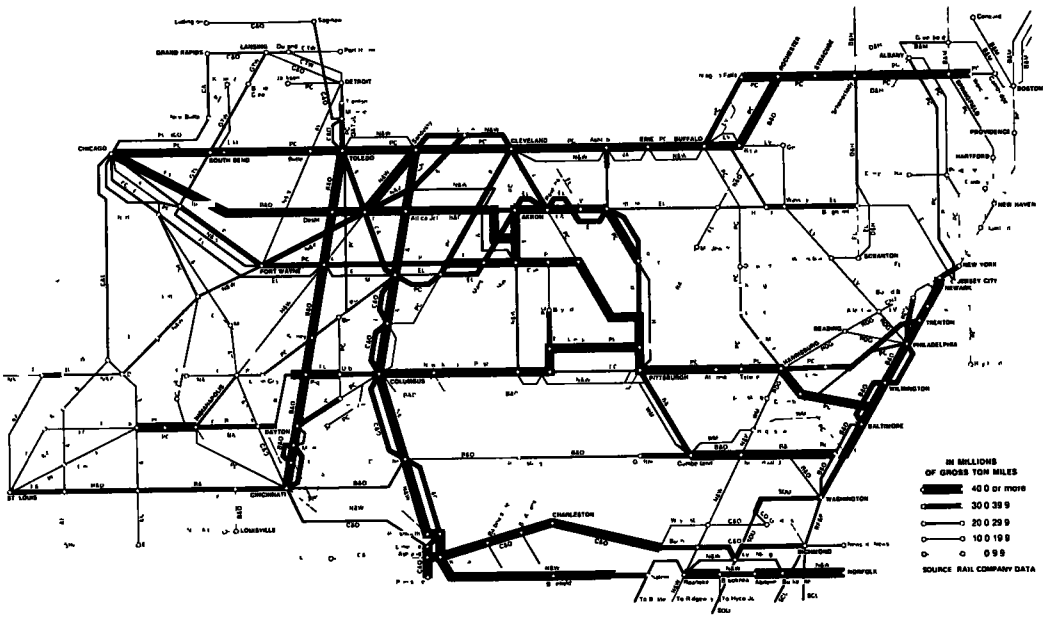


Figure 7. Traffic density on signaled main lines in midwest and northeast region.



SYSTEMS PLANNING

Systems planning at the state level is the subject of deep-seated differences among officials who decide how money and manpower for technical services will be allocated. Should state transportation departments get into this field, or should they adopt an ad hoc approach, dealing with individual problems and projects as they come along? The arguments against a systems planning approach are that

1. It is too costly and time consuming;
2. It may not be relevant when tough decisions have to be made; and
3. It leads to fixed master plans that are not changed frequently enough.

The arguments for a systems planning approach are that

1. Alternative policies cannot have their impacts estimated without the testing capability of systems planning;
2. An optimum system plan is needed as a framework for making project decisions; and
3. We cannot afford more surprises like the rail crisis, which is due in part to complete ignorance about how that system is working and where it is likely to fail.

We should take a position in this controversy. Some of the factors that we should consider are discussed in the following sections.

Origin and Content

Our understanding of systems planning comes mainly from urban transportation planning, where the design and testing of highway systems and transit systems was developed in the 1950s and 1960s. The essential features of such systems planning are (a) representing entire networks of transportation facilities in mathematical terms, (b) developing alternative plans for improving the system, (c) estimating how many travelers will move where and by what route of travel, and (d) producing results in terms of costs and environmental, social, and economic impacts.

The ability to do systems planning rests on many separate pieces of knowledge and measured relations. In highway systems planning, for example, these include (a) speed-density-capacity relations, (b) travel costs, (c) highway construction costs, (d) trip length frequency distributions, (e) temporal distributions, and (f) trip generation rates of different land uses. Without these separate pieces of knowledge, it would not be possible to use computers to evaluate the consequences of alternative changes to urban highway systems.

To a considerable extent, we tend to equate systems planning with computer simulation of traffic flows or the simulation of people moving through a transit system. Some systems can be studied without computer simulation, even at the state level; among these are port planning, planning for waterways, or planning for intercity rail passenger service. Wherever networks are simple, capacities are not constraining factors, or traffic movements are uncomplicated, then hand techniques of testing alternatives may be perfectly valid. But where networks are complicated, capacities are constrained, traffic movements are complex, and variations in possible physical systems are numerous, then computer simulation is essential to test and evaluate alternatives.

In summary, then, systems planning is a process whose purpose is to help plan complex transportation systems. It can be used to produce long-range plans, but the process and the plan are not the same thing. The process is dependent on a thorough understanding of the phenomena of travel and transportation for the mode being examined.

Purposes

There are several distinct but interrelated purposes that encourage the development of system planning techniques at the state level.

Testing of Alternative Policies

This is the most important purpose. If more money were put into highways or transit, how many people and vehicles would use such systems and what would the impacts be? If land were developed in different patterns or if fuel supplies were cut back, what would be the change in travel habits? If certain rail lines were eliminated, how well would a state's industries be served? There is no way to answer these questions by legislative debate, and market decisions rarely take account of anything except the buyer and seller. Hence, systems planning is essential as a tool for testing alternatives.

System Architecture

The original purpose of systems planning—to produce the best or most efficient physical plan—is still a valid purpose. (This does not mean that the "best" plan is immutable for 20 years; conditions change and new "bests" must be sought.) Systems architecture means now, of course, more than simply a physical pattern of roads or rails; it also means scheduled services for air passengers, rail freight, and bus transportation.

The "Lookout" Role

One useful function of systems planning is to forecast future travel and, thus, to discover the kinds of problems that will occur in the future.

State of the Art

How well are we doing in systems planning at the state level?

Highway Systems Planning

In the highway field, the state of the art in statewide systems planning is more or less where it was 2 years ago, as described in an NCHRP report (6). The capability exists to simulate flows on road networks of various sizes. However, the degree of detail of the resulting estimates is not very great (except in the smaller states), and there is considerable room for improvement in technique.

Some thought is being given to developing a hierarchy of highway assignments either by doing the work independently for each region in the state (which is the case now for urban regions) or by creating a special hierarchical assignment process in which networks, zone sizes, and trips of different lengths would be coordinated so as to focus on different kinds of problems with different degrees of detail.

Conceptually there is no major problem in improving the statewide highway assignment process and, with it, highway systems planning capability. However, a great deal of ingenious work must be done to make that process reliable and to make it produce the kinds of detailed results useful in making decisions.

Nonhighway Systems

In nonhighway systems planning (air, rail, bus, pipeline, and possibly waterway), some new techniques have surfaced, but are not really being used yet by state transportation departments.

1. In the aviation field, the intercity transportation effectiveness model was prepared in 1970 by Jessiman and Ward for the U.S. Department of Transportation. It "approximates the mix of aircraft, routes, schedules, and terminal facilities that satisfy intercity air-carrier passenger and cargo demand at minimum social (time) and economic cost." I suspect that this model could be used for intercity bus planning as well as for aviation.
2. In the railroad field, Transportation and Distribution Associates developed a computer model capable of simulating operations of collecting freight cars into trains and moving them over rail networks to their final destinations.
3. Again in the railroad field, inventories of rail lines and computer plotting of rail densities have been completed as part of the Ohio Transportation Development Program.
4. The Federal Railroad Administration did some computer assignments of traffic to a national railroad network.

I suspect that there are other models, computer programs, and procedures that are lying around in different places, waiting to be picked up and used by state transportation departments. Some of these may be in the possession of private transportation companies.

Without necessarily using any of these models, various states have prepared statewide plans for individual modes. Statewide aviation plans have been prepared by a number of states, and new statewide aviation studies are being funded by FAA in others. New York, Massachusetts, Ohio, and Michigan are undertaking statewide work on railroads, and 13 other states will doubtless follow as the Railroad Reorganization Act of 1973 starts to bite.

However, my limited number of contacts with various state transportation departments leads me to believe that not enough weight is being put into statewide system planning. Staffs are utterly too small. Data have not been obtained. The models that do exist are not being adapted to state use. And the lack of progress in the past few years, even in highway planning, suggests that there is great uncertainty about systems planning or opposition to it.

Directions for Improvement

My recommendation is that this conference endorse making substantial improvements in statewide systems planning for the following modes of transportation: highway, rail freight, aviation, trucking, and possibly a combination of bus and rail passenger service.

My reasoning is that we have only within the past year felt the full, hot breath of the rail crisis and the energy crisis. These crises have caught most states and (in the case of the energy crisis) the federal government without a policy, without a program, and even without the most elementary information about the subject. This has come about (in part) because most of the companies involved have been adamant about parting with data and have held states at arm's length when it comes to planning.

To illustrate: Figure 7 shows a map of rail-freight density for the midwest and the northeast states (8). This kind of map should have been in geography textbooks 20 years ago. Ohio has, as recently as a month before this conference, been trying to get such data from 2 recalcitrant railroads without success. But only now is it available!

A density map is not system planning, but how can one conceivably develop a position on a project or on a subsidy program without knowing something about the system of which it is a part? Equally important, the study of that system must include a measured understanding of critical relations. Figure 8 shows the relation between

revenues, costs, and numbers of freight cars per mile on branch lines (8). This should be as much a part of rail system planning as speed-volume-density relations are a part of traffic assignment.

State transportation departments should give the highest priority, I believe, to the following areas:

1. Building up a structure of measured relations that describe how the rail freight system in a state works and how it relates to economic activities (this should be done with the objective of protecting the state's overall economic interests as well as maintaining an effective and efficient rail transport system);
2. Repeating the above process for the aviation field and for trucking; and
3. Improving the highway assignment process, either at the state or substate regional level, including evaluation and dimensioning of environmental, social, and economic impacts.

The foregoing calls for substantial improvement in the supply of information that state transportation departments should have. We should learn from the oil crisis and the rail crisis that government needs complete and accurate information even about private operations if it is going to protect itself against devastating surprises.

INTERFIELD RELATIONS

My first thoughts and conversation with others about developing better understandings of the relations between transportation and other fields (such as land use, the environment, and the economy of a state) were rather negative. The state of the art seemed weak.

Officials in Massachusetts, for example, said that they had been grappling with the relations between transportation and land use, but that they had reservations about what could be done at the state level. They noted that developing such relations required great energy and may produce will-o'-the-wisp results because land use policy is so vague. Further, they were extremely wary of the idea of trying to achieve "total comprehensiveness."

Connecticut has gone perhaps farther than any other state in the field of work with both transportation and land use. The Connecticut transportation department tested 4 land use alternatives for the state, in concert with other agencies, and found that highway differences were mostly in terms of requirements for additional lanes rather than for different corridors. Current efforts are aimed at satisfying corridor demand on a multimode basis. Connecticut officials cited the fact that, although major transportation systems are owned by the state, land use is controlled at the town level. The difficulty of working in these complex areas of interfield studies is increased by evolving federal policies in areas of environment, energy, and land use.

One reason for the lack of advance in interfield relations is that state transportation departments are so new and have been concentrating their energies on making the transition from highway departments to transportation departments. Another reason is that most land use planning agencies have not moved, on their own part, to develop quantitative measures or to build bridges from their fields toward transportation. The same can be said of agencies dealing with environmental matters and economic development.

Purpose

There are 2 compelling reasons for suggesting that state transportation departments support interfield studies.

1. The need for making public programs mutually supportive. We know that there are clear relations between different fields and that each is influenced by public policy. Examples are travel and energy consumption, travel and air pollution, housing density

and mode choice, location of factories and freight generation, and amount of freight generation and profitability of rail branch line operations. If we have measurements of these relations, then we are in a better position to suggest changes in policy that will help to achieve society's goals.

2. The need for making integrated, interfield forecasts. To be able to evaluate alternative policies (the "honest analyzer" role) and to be able to forecast problems better (the "lookout" role), state transportation departments should have the capability to produce integrated interfield forecasts. What this means is a series of forecasts of population, economic change, travel production, pollutant production, energy consumption, and land use consumption—all coordinated and balanced with one another. This kind of thing has been suggested by many authors for many years, but has not yet been systematically attacked on a large enough scale to make it operational.

State of the Art and Directions for Improvement

The present state of the art is one in which bits and pieces of work are being done in different states, but are not yet being integrated satisfactorily or brought on line into regular planning operations. My survey of what is being done was too narrow to permit wholesale conclusions to be drawn, but some of the pieces of progress that have been achieved can be listed as follows.

1. Population forecasts. A number of states have computer programs that produce cohort-survival types of forecasts of statewide population, with detail at the county level. Some of these programs also forecast employment, automobile drivers, and automobile registrations.
2. Economic forecasts. Battelle has developed the DEMOS model that produces multiple regional economic forecasts with substantial detail and allocates this growth to counties.
3. Freight forecasts. The Ohio Transportation Development Program has nearly completed a freight generation forecast that is developed from an economic forecast. Outputs will be tons of freight shipped by mode.
4. Land use. New York's LUNR inventory is probably at the forefront in terms of measurement of land use across an entire state.
5. Air pollution models. California has an air quality model that estimates production of oxides of carbon, sulfur, and nitrogen. This model was developed for application in air basins like the Los Angeles air basin.

Although these are individually important as technical advances, clearly a great deal of developmental work needs to be done and even more work is required to integrate such modeling work into a true interfield capability. The directions for improvement are virtually in all directions.

The whole weight of developing useful interfield relations should not be borne solely by transportation interests. Land use planning funds, housing funds, environmental funds, economic development funds, and social welfare funds could profitably be directed toward a goal designed to make different governmental programs more consistent and mutually supportive.

LEGITIMATION, REGIONALISM, AND THE PLAN

In an early meeting of the conference advisory committee, Jack Kinstlinger raised the question, "How should we legitimate our statewide transportation plans?" This is a question that is perhaps unique to our present times; earlier it might have been phrased, How do we implement plans? But now that so many things are being contested, legitimacy is an important consideration, and the question is very pertinent.

There are a number of reasons why plans are being contested. One reason is that society is more democratic—or perhaps less autocratic. Another reason is that there

Figure 8. Relation of rail line length and traffic volumes for financially viable local service operation.

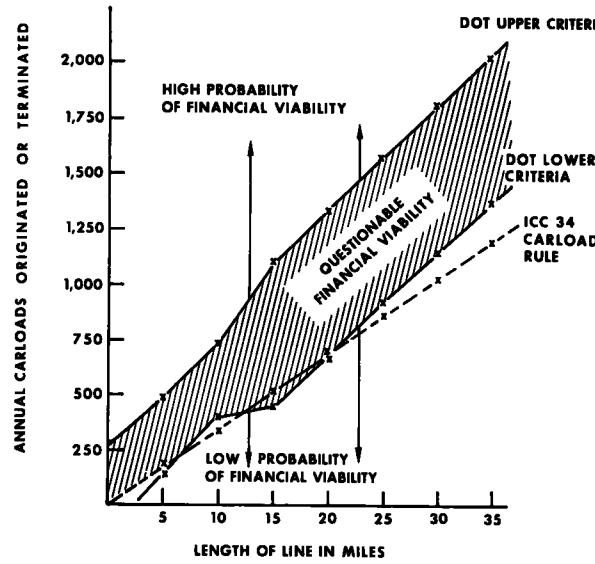


Table 1. Authority of state departments of transportation to prepare and effectuate comprehensive transportation plans.

Item	HA	NJ	NY	WI	CT	FL	OR	DE	PA	RI	MD	MA	NC	GA	ME	OH	IL	TN	CA	KY	MI	SD
Authorization for comprehensive transportation planning	X	X[a]	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X[ee]
Has a comprehensive transportation plan been prepared?	X[1]	X	X	X[a]	X[d]	X			X	X[hh]	X[j]			X[hh]						X[hh]	X[u]	
Is comprehensive transportation planning in process?	X	X	X	X	X	X	X	X	X	X	X	X	X[cc]	X	X	X	X	X	X	X	X	X
Authority to build, operate, and maintain																						
Highways (state)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Airports	X			X[k]	X	X	X	X	X	X	X		X[cc]		X	X	X	X	X[e]	X	X[r]	X
Ports	X				X	X				X	X				X		X[2]				
Canals and waterways			X		X	X				X	X	X			X		X[2]				
Urban transit					X	X		X[b]			X										
Authority to give financial aid to																						
County or municipal roads		X	X	X	X	X	X	X	X	X	X	X	X[ss]	X	X	X	X	X	X	X	X	X
General aviation airports		X[a,b]	X	X	X[a]	X	X	X	X	X	X	X	X	X	X	X	X[c]	X	X	X	X	X
Commercial airports			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X[c]	X	X	X	X	X
Ports					X	X			X[c]	X	X		X		X		X[a]			X	X	
Urban transit		X	X	X	X	X	X	X	X	X	X	X		X	X	X	X[z]	X	X[b]	X	X	
Authority to regulate, license, and set rates for																						
General aviation airports		X			X	X	X		X[r]	X	X					X	X[ee]	X[ff]	X	X	X[w]	
Commercial airlines					X				X[r]	X	X[f]						X[hh]			X		
Bus passenger service		X[a]	X		X[f]			X[b]			X[k]									X		
Rail passenger service		X[a]	X[o]		X[f]			X[b]			X[l]									X[cc]		
Truck freight			X																	X		
Rail freight			X																	X[cc]		
Urban transit		X[a]	X[p]		X[f]			X[b]			X[k]									X[dd]		
Authority to license																						
Motor vehicles				X			X		X	X	X		X						X[e]	X		
General aviation airplanes		X		X[q]	X[q]		X	X		X	X					X	X			X	X	X

[a]State law provides authority but by policy it is not exercised
[b]Planning only
[c]By department of motor vehicles
[d]Updated annually
[e]Publicly owned only
[f]Only for service under contract to state
[g]Authority to register but not to license
[h]Power to create authorities, which in turn have administrative power
[i]Updated for major modes, but not republished in single document
[j]In preparation
[k]Baltimore area only
[l]Commuter rail only
[m]Except water transportation
[n]Only when carrier is receiving public aid
[o]Authority to give financial aid to Amtrak for subsidy of additions to the basic service
[p]Provided by public authorities exempt from New York State Department of Transportation regulations
[q]Authorized by implication only
[r]For airports but not airlines
[s]For highways and airports only
[t]Authority in statutes but unclear
[u]1968 for highways, airport plan now being prepared
[v]Authority only exercised on one airport
[w]No authority to set rates
[y]Specific case by case legislative authority needed
[z]Only capital improvements unless specific legislative authority given
[ee]Safety regulation only
[ff]Only intrastate third level carriers
[cc]Pending new legislation
[dd]At discretion of local operating agencies
[ee]Authorization, but no funding
[ff]Airport licensing only
[gg]No county roads only state and municipal
[hh]To be published in 1974

are more goals to consider, such as air pollution, noise pollution, water pollution, energy conservation, aesthetics, and historic preservation. These matters were much less popular 20 years ago. A third reason is a general distrust of government. A fourth reason is the increased power that has been given to (or taken by) local governments to veto plans for major new transportation facilities. A fifth reason is citizen participation, which one state official reported to me was, in effect, getting out of hand to the extent that a class of self-appointed, professional citizen representatives has been created.

There appear to be 2 basic answers that the states I visited have to this problem: One is by regionalizing planning and the other is by changing the nature of the transportation plan.

Regional Planning

Three of the 4 states I visited (California, Massachusetts, and Connecticut) are strongly committed to a policy of decentralizing many planning activities to regions. Wisconsin, perhaps because of its geography, has not been so strong an advocate of regionalism, except for the southeastern region. Kentucky is strongly committed to regionalism in planning and intends to group a number of other planning programs (701 and OEO) along with transportation planning programs at the regional level. Basically, the reasons for regionalism are as follows.

1. Obtaining greater knowledge about the immediate concerns of people and local governments;
2. Creating a forum in which local concerns can be voiced;
3. Forcing decisions on statewide transportation down to the lowest possible level at which they can be readily handled; and
4. Obtaining local decisions to provide legitimacy for plans.

Regionalization, of course, is not all gain; there are problems and costs associated with it. Some of these problems may be mitigated by careful writing of laws or contracts. Some problems may be in the nature of tensions deliberately created in order to achieve the gains listed above.

1. Regions may be physically too small or too large. In Connecticut, the state has 15 planning regions, which makes each region very small. Some Connecticut officials think a smaller number—say, 5—would be better.
2. Regionalization of planning separates the planning function from any working unit of government, and therefore the planning staff does not report to any administrator or legislature that has the power to implement. County and municipal governments are smaller than the region; the state is larger. One remedy for this problem is to make the regional planning agency an arm of state government, but this may then weaken its character of being a representative of local interests.
3. When regions are created, who is to arbitrate between the region's interests and the state's interests? Or, who is to prevent a region from making an out-and-out bad decision? This may not be too important a problem, but it does call for decisions at the beginning as to the role of the various planning agencies and rights of review by the state transportation department.
4. The problem of finding adequately trained personnel and of developing appropriate methods for regional transportation planning.

Despite these problems, regionalization will probably be productive for statewide transportation planning. It will not likely be productive in terms of designing major new systems or working with private modes. But legitimation should be gained through this process. I suspect also that it will be at the regional level where the greatest gains will be made in coordinating transportation with land use and the environment because this problem of interfield coordination may be too big to handle at the state level.

Statewide Transportation Plan

Although there appears to be a definite trend toward regionalism as a means of securing legitimacy for statewide transportation planning, there does not appear to be any consistency of viewpoint on the nature of the statewide transportation plan. One fairly widespread viewpoint is that the publication of a long-range master statewide transportation plan, complete with lines showing new highways and symbols showing other planned improvements, is something to be avoided. The reasons for this viewpoint are as follows:

1. Commitments should not be published for projects that have not gone through the mill of citizen participation, public hearings, and environmental impact statements (Massachusetts);
2. To make commitments beyond the range of the term of a governor or legislature is undesirable;
3. A transportation department's ability to speak out regarding modes (especially private modes) that it has not thoroughly researched can be questioned;
4. Long-range plans should be avoided altogether because the long-range future cannot be predicted; and
5. Most state transportation departments are new.

Probably for such reasons, most transportation departments do not have published statewide transportation plans (Table 1). Some states, like California, are approaching the subject of publishing a statewide plan with a great deal of caution; California's legislature does not require a transportation plan to be prepared until 1976.

On the other hand, some states, like New York and Connecticut, have gone through 3 versions of reports on statewide transportation. Connecticut officials said that, although their first report was mostly a statement of policies, the succeeding reports have become more and more specific, presenting specific projects and their costs. In a similar vein, Wisconsin officials felt that a statewide plan should contain both policy and system-level proposals, should include shortened time horizons, and should increasingly become concerned with services, not just facilities.

It seems to me, after reviewing the New York and Connecticut documents, that the planners who have worked on these successive plans have become more and more sure of what they are doing. Practice produces better plans. The plans are specific where they can be, and deliberately fuzzy (although not objectionably so) where uncertainty exists. For example, the urban freeways shown in the 1973 New York Statewide Master Plan for Transportation are shown as bands of varying widths where decisions as to exact location have not been made.

The practice of regularly updating plans on an annual or a biennial basis removes a great deal of the rigidity of a plan prepared only once a decade. This can certainly be said for the biennial national transportation studies.

It seems to me that state transportation departments should adopt the practice of producing statewide transportation plans or reports biennally. These reports should contain system plans, even if they are only sketch plans, that are to be revised every 2 years. Such plans should be geared to the budget process. Finally, these statewide plans can incorporate the plans of each region, and this would provide a useful thing for regional agencies to produce.

Biennial revisions of master plans would provide the benefits of having a long-range plan without the penalty of rigidity that infrequently prepared plans have.

Powers of State Transportation Departments

As part of the research undertaken for this paper, 22 state transportation departments responded to a request to update a table published in NCHRP Synthesis 15 (6). This new material is given in Table 1, where states are arrayed according to the time of establishing transportation departments. The specific years are as follows:

States	Year
Hawaii	1959
New Jersey	1966
New York and Wisconsin	1967
Connecticut, Florida, and Oregon	1969
Delaware, Pennsylvania, and Rhode Island	1970
Maryland, Massachusetts, and North Carolina	1971
Georgia, Maine, Ohio, Illinois, and Tennessee	1972
California, Kentucky, Michigan, and South Dakota	1973

CONCLUSION: DIRECTIONS FOR FUTURE WORK

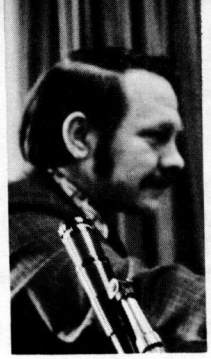
The state of the art in statewide transportation planning is quite uneven, being more advanced in some states than in others and more advanced for certain modes than others. An enormous amount of work needs to be done—so much so that state transportation departments must be very discriminating about where they direct their energies. The amount of work needed to be done also suggests the need for extensive cooperation among states, with technical and methodological advances shared rapidly.

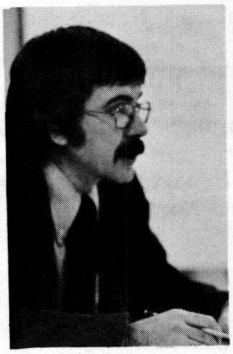
The following 7 points are recommended as priority directions for future work.

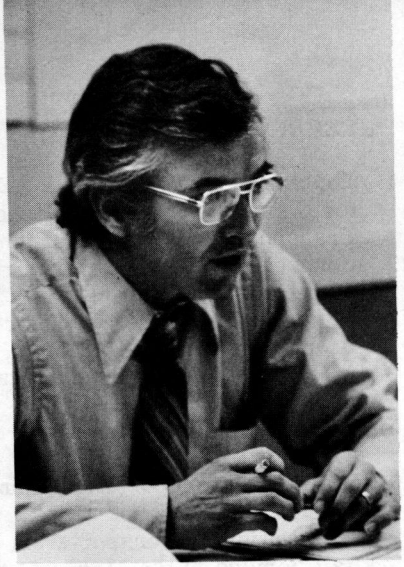
1. Policy planning cannot proceed independently of systems planning or planning at the regional, corridor, or even project level. Policies must rest on objective estimates of what can be accomplished and what the impact of alternatives will be. Hence, a major need in policy planning is to build up an objective understanding of how the more important modes work and what the impacts of changes in those modes will be.
2. If a state transportation department has an effective capital budgeting process that is communicated well to other branches of government, then priority should be given to proposing alternative budgets and to bringing at least a skeleton indication of private transportation company finances into the public budget process. If a state's transportation planning is regionalized, the regions may be helpful in the budgeting process.
3. Priority should be given to improving understanding of rail freight, truck freight, and intercity air, bus, and rail passenger modes of transportation so that alternative physical and operating plans can be tested and their impacts evaluated against a broad range of criteria.
4. Improvements in highway traffic simulation are needed primarily at the regional (substate) level to aid regional transportation planning.
5. Substantial improvements in the supply of information regarding all modes of transportation for people and goods across states are needed. This includes private as well as public modes.
6. Attention should be given to measuring relations among transportation and other fields of the state such as the economy, the environment, land use, and the quality of life experienced by different social groups. Many individual advances have been made in measuring these interfield relations, but they need to be integrated and brought into regular, productive use by state transportation departments. Information needs are very great in this work. The cost and work load in this priority area should be completely carried by the transportation department, but should be shared with other agencies.
7. In many large and populous states, regionalization of planning seems to be the coming answer to developing and gaining acceptance of plans. If planning is regionalized, the role of the regions should be carefully defined. Manuals for regional transportation planning (and programming) should be prepared. Lack of trained people will be a danger.

REFERENCES

1. Bouchard, R. J., Lehr, E. L., Redding, M. J., and Thomas, G. R. Techniques for Considering Social, Economic, and Environmental Factors in the Planning of Transportation Systems. Highway Research Record 410, 1972, pp. 1-7.
2. Connecticut Master Transportation Plan—1973. Connecticut Department of Transportation, Wethersfield, Dec. 1972.
3. Florida's Statewide Transportation Plan and Program. Florida Department of Transportation, Tallahassee, March 1973.
4. A Master Plan for Transportation. New Jersey Department of Transportation, Trenton, 1972.
5. Statewide Master Plan for Transportation. New York State Department of Transportation, Albany, 1973.
6. Statewide Transportation Planning: Needs and Requirements. NCHRP Synthesis 15, 1972.
7. 1972 National Transportation Report. U.S. Department of Transportation, 1972.
8. Rail Service in the Midwest and Northeastern Region. U.S. Department of Transportation, February 1974.







WORKSHOP I: ORGANIZATION AND ADMINISTRATION FOR STATEWIDE TRANSPORTATION PLANNING

Horace Brown, Leo E. Busser III, J. P. Buckley, William John Cameron, Hollis R. Goff, Peter Graziano, Jere J. Hinkle, Raymond L. Kassell, Robert C. Kirk, G. Terry Lathrop, Howard B. Leatham, Ian MacGillivray, Roy Messer, Clyde E. Pyers, Harry Reed, Faud Rihani, Richard Boyd Robertson, Robert E. Royer, Larry Saben, Byron D. Strum, William Taylor, Gene R. Tyndall, L. Ellis Walton, D. L. Wieman, William E. Willey, Norbert Zucker

Report

Clyde E. Pyers, Maryland Department of Transportation, chairman of workshop; Harry Reed, Minnesota State Planning Agency, chairman of Task Force 1; and G. Terry Lathrop, Consultant to Southern Growth Policies Board, chairman of Task Force 2

The need for a general review and evaluation of the

OBJECTIVES

To identify current statewide transportation planning strategies being developed and used by the states and to classify and evaluate their essential characteristics.

To recommend improvements in the overall administrative framework to ensure continuity in statewide transportation planning.

To recommend a program of research related to the organizational and administrative aspects of statewide transportation planning.

ISSUES CONCERNING INTERNAL ORGANIZATION

What are the various administrative and organizational approaches being used by the states in transportation planning at the state level?

What administrative mechanisms have been established for addressing problems of all modes of transportation?

What is the administrative responsibility of such units on a day-to-day basis?

What kinds of mechanisms have been used by the states for funding the state transportation planning process?

What are the advantages and disadvantages of the regionalization of central office functions?

ISSUES CONCERNING EXTERNAL RELATIONS

What is the proper role of the planning unit, especially in its relations to other department of transportation units such as design and construction?

How can a state organize to adequately harness all participating state agencies in a total coordinated planning effort?

What is the proper relation of a state transportation planning unit to regional and metropolitan planning agencies?

How can citizen groups be properly involved in the activities of the state transportation planning unit?

What is the proper relation of the state transportation planning unit to private sector organizations such as railroads?

What is the proper division of responsibilities between the state transportation planning unit and the state comprehensive planning unit?

organization and administration of statewide transportation planning was derived from the trend in recent years for states to establish departments of transportation. To date, 23 states have transportation departments, and 13 other states are reviewing legislation that would create such departments.

The broad responsibilities of these new organizations, some of which are being assumed by state government for the first time, require new guidelines for relations among both the units within the organization and the public and private agencies outside the organization. The workshop was, therefore, divided into task forces to deal with the issues in these 2 areas. The combined reports of the 2 task forces follow.

A general theme in the discussions of both task forces was that the great differences among the 50 states necessitate great flexibility and variety in organizational and administrative mechanisms. These differences are reflected in the state constitutions themselves; in the wide variety of boards, commissions, authorities, and agencies in which the transportation planning process is vested; in the different modal needs of each of the states based on geographic and population size; in the number and size of urban areas; and in funding limitations.

Because of these wide differences, the underlying recommendation of both task forces is that any policies or guidelines established at the federal level provide a maximum of latitude and flexibility for state action in solving state needs and problems. Furthermore, internal state transportation agency organizational structure, as well as state planning and policy procedures, should be determined at the state level.

Both task forces agreed that, regardless of the individual choice of organizational arrangements for statewide transportation planning, the effectiveness of the planning is basically determined by the effectiveness of management. Inadequate organizational structure and lack of communication and interaction, both within the state transportation planning unit and among the state transportation planning unit and external agencies, organizations, and individuals, can cripple the efforts of capable professionals. However, the best organizational and administrative structure cannot overcome limitations in the technical capabilities and the dedication and sincerity of personnel.

POSITION, STRUCTURE, AND FUNCTION OF THE PLANNING UNIT

Current Organizational Practices

Each of the 23 transportation departments currently in existence consists of staff divisions to establish procedures and advise the chief executive officer in policy formulation and the operating divisions in implementing department policies and programs. The organization can be classified as modal, functional, or mixed modal and functional, according to the responsibilities of the operating divisions.

A modal organization categorizes primary operating divisions by modes of transportation, such as highways, aviation, urban transit, railroads, and water. Most duties and powers are performed under each division for that mode. The planning function is in a staff advisory unit or within a modal division or both. Nine transportation departments have a modal form of organization.

In a functional organization, the operating divisions are responsible for a specific function for all modes, such as planning, design, construction, and safety. Only 2 states, New Jersey and New York, have a functional organization, although several states are studying reorganization along functional lines.

A mixed organization includes both modal and functional divisions at the operating level. Ten states have a mixed modal-functional type of organization. As a rule, planning for all modes is conducted in an operating administration division.

Definition of Policy, Systems, and Project Planning

The distinctions among policy, systems, and project or facility planning affect the posi-

tioning, organizing, and staffing for each level of planning. The identification of policy planning as a relatively new and critically important element of statewide transportation planning, in fact, may be one of the most significant products of the conference.

Policy planning can be defined as a conscious process leading to a set of coordinated policy decisions that, in turn, lead to the achievement of a defined set of goals and objectives. Policy planning is involved with questions of resource allocation throughout the state, both in terms of allocation by geographic area and by transportation mode. It is not involved with the review or recommendation of specific facilities or corridors or even transportation networks. In this sense, policy planning is a "top-down" approach, starting from basic state goals and working through the general state plan to evolve transportation policy consistent with those goals.

Systems planning, as the term is used in this report, is a process under which transportation networks and corridors are defined in a "bottom-up" effort, starting from forecasts of population and economic growth and continuing through estimates of person and goods movement to a physical description of the systems required to meet those real or implied needs.

Providing scale and direction to this effort throughout the process are the basic state transportation policies and allocations of state resources derived from those policies and consistent with them. The latter information is a product of the state policy planning effort.

Among the principal tasks associated with this line-level systems planning activity are the following:

1. Collection of data for the determination of modal needs and demands and the design of data recording and retrieval systems for this purpose;
2. Overall statewide system planning at the scale of the multimodal network, including terminal consideration;
3. Design of the physical integration of networks and the modal balance that is responsive to the demonstrated needs, demands, and resources;
4. Design of unimodal networks that are viable and can operate at optimal conditions when considered separately from other modes;
5. Technical assistance to urban transportation studies and local transportation studies involved with 701 planning to ensure adequate technical quality, compliance with federal and state requirements, and conformity with the needs of interregional movements;
6. Public transportation studies at both the local and the regional level; and
7. Environmental impact analysis of systems.

Project or facility planning is a third level of activity that is necessary to achieve comprehensive state transportation planning. Individual facilities require an unprecedented number of design procedures that often involve activities normally carried out by planners. Typically, the following are among the areas of detailed planning involved:

1. Scaling of individual facilities to demand considerations and coordination between designer and planner to ensure that the scale of the facility reflects the true scale of the demand;
2. Assessment of the environmental impact of individual facilities on small areas and communities; and
3. Integration of the planning requirements associated with overall corridor planning for individual transportation facilities in both urban and rural areas.

Principal Functions and Responsibilities of the Planning Unit

There should be a single planning unit reporting to the chief executive of the transportation department. The unit should be primarily responsible for maintaining a consistent, central, and strong direction for the overall transportation planning and programming process from policy planning through systems planning and programming.

The central function of the unit is to ensure the logical flow of this overall planning and programming process. This unit must be given the responsibility for formulating an overall policy plan for the department and a multimodal transportation systems plan that is consistent with those policies. This unit should house or direct departmentwide activities such as environmental planning and research relating to planning. It should encourage the implementation of the systems plan through all planning and design stages of projects.

It should participate in all programming, budgeting, and other activities that aid in the implementation of the plan and be specifically responsible for the coordination of the individual capital improvement programs into a single multimodal program.

Position of the Planning Unit

An assessment of each state's problems and strategies should determine its appropriate organization. For most states contemplating the creation of a transportation department, a staff-level planning unit probably represents the most logical and efficient organizational alternative. That planning unit should contain, as a minimum, both policy planning and multimodal systems planning as basic functions under its responsibility. This is true, particularly, for states that are organized along modal lines. The intimate relation between policy planning and systems planning organizationally is important because of the strong linkages between these activities. Policy planning cannot and should not be undertaken in a void. It must draw on previously undertaken systems planning activities if the policies that are to be promulgated are to be based on hard information. Similarly, the multimodal systems plan must gain its direction from the policy plan for the scale of each modal investment.

Policy Planning and Multimodal Systems Planning

Policy planning is uniquely a statewide function that should have high visibility within the planning unit. It must be a separate and distinct function of the statewide transportation planning process and maintained separately from the multimodal systems planning function. This is not to say, however, that a physically separate policy planning unit need be created. Whether a separate staff is maintained to undertake policy planning is a function of the size and complexity of the state and the available manpower within the planning unit. Multimodal systems planning should similarly be identified as a central responsibility of the planning unit, whether located at the staff or modal level.

The different planning requirements for less developed modes or modes over which the state does not have direct implementation responsibility, such as railroads and pipelines, may have to be treated quite differently from modes such as highways, transit, and aviation. For the former, planning through the policy planning process may be a sufficient level and the only practical level at which such planning can be conducted.

Staff Disciplines Required

Planning staffs to implement planning in each level should be determined only after an examination of the planning problems peculiar to the state. In general, however, there should be modal specialists available for both policy planning and multimodal systems planning. In addition, there should be transportation generalists, environmentalists, transportation economists, administrative specialists, specialists in the area of public finance, behavioral psychologists, sociologists, and others as necessary.

Project Planning

Project or facility planning should be carried on by modal divisions in a mixed or modal

organization. If the successful completion of a project plan involves a major corridor study with multimodal or policy implications for the state, the planning for the project should be undertaken as a cooperative venture between the central planning unit staff and the modal division.

Detailed facility planning should be separated as a function from the unit that is responsible for policy systems planning in that day-to-day responsibilities for facility planning and implementation will drain the energies and time that should be devoted to the broader statewide issues.

Early Evaluation of Current Problems

Early evaluation of current problems such as energy shortages, rail reorganization, and environmental degradation is a joint responsibility of both the policy planning and multimodal systems planning staffs. Two separate and distinct functions related to this area may be identified as the "lookout" function and the "mobilization" function.

The lookout function involves responsibility for constant monitoring of transportation systems performance and identification of impending problems so that plans may be developed in advance of a potential crisis. This is clearly the responsibility of the systems planning staff, who monitor information for the department and, through ongoing analyses, should be capable of anticipating such situations.

The mobilization function is logically the prerogative of the unit assigned the policy planning function. That unit should be responsible for focusing all efforts of the department in the formulation of an immediate response to problems that may occur without warning or that cannot be anticipated. This staff would not, by themselves, formulate responses to these problems, but would ensure that the proper attention is brought to bear on the problem.

In situations of immediate or grave concern to the department, this function would probably be assumed by the chief executive and his immediate staff. Less grave situations or problems may be assigned to a unit that can undertake more protracted analysis.

Capital Improvement Programming and Budgeting

The typical process of preparing unimodal capital improvement programs needs to be revamped and strengthened by a broad-based multimodal program produced by the statewide systems planning process. To make these programs more fiscally responsible, the planning unit should work closely with the fiscal unit that prepares long- and short-range financial forecasts and with the modal units that prepare catalogs of permanent improvement needs. District or regional offices or agencies can and should aid in this effort. The planning unit should provide the central direction for preparation of the multimodal transportation improvement program and budget and depend on the modal divisions for detailing that program.

It was generally concluded that the state transportation capital improvement program should be widely distributed so that local subdivisions are aware of state short-range financial scheduling and can schedule resources compatibly.

REGIONALIZATION OF THE PLANNING PROCESS

Each state must determine the degree to which the statewide transportation planning process is to be decentralized and conducted at the substate or regional level. Substate planning is clearly most viable in those states that are larger and more complex.

Policy Planning

The statewide policy planning effort is not a function that can be effectively decentralized. The nature of policy planning is uniquely a statewide function that must be conducted out of the central office and that provides scale and direction to the systems planning to follow, whether that latter function is provided as a central office or substate function.

Metropolitan Transportation Planning

The metropolitan area transportation planning processes that have been in existence in most urban areas since the early 1960s have developed relatively sophisticated transportation systems plans. These established processes should be recognized as an integral part of the statewide planning process. In most states, metropolitan area transportation systems plans can be integrated directly into the statewide transportation planning effort.

The statewide policy planning effort will provide the principal framework within which the metropolitan transportation systems plans are to be developed. The statewide policy planning effort should provide a basic resource allocation to all areas of the state and to all modes of transportation, thereby providing an appropriate scale for the metropolitan systems plan.

INVOLVEMENT OF OTHER AGENCIES

Importance of Broad Involvement

As important as it is to statewide transportation planning to involve all agencies, groups, and individuals responsible for the planning and delivery of transportation services, it is equally as important, if not more so, to ensure that other agencies, institutions, and individuals who have any previous, current, or past linkages with transportation also are involved in some manner throughout the process of statewide plan development. Transportation competes in the state budget with other services such as education and health services. Even more directly, the delivery of transportation services tends to influence the form and direction of state development and, consequently, the need for delivery of those services. Similarly, the actions taken by many other federal, state, and local agencies may have profound influence on the aggravation or alleviation of the need for transportation services.

Although these observations have become almost axiomatic to planning theory, there has not been adequate treatment of these external relations, particularly at the level of statewide transportation planning in most states. Consequently, a key charge to the workshop was to deal with the external relations of a state transportation department and to prepare recommendations for the improvement of those relations.

The following types of groups, agencies, and individuals should be involved in the process of policy and plan development:

1. General policy planning and budget-making groups in the executive branch of state government;
2. State legislature;
3. Other state functional agencies;
4. Regional, substate, and local agencies;
5. Citizens and citizen groups;
6. Special interest or lobbying groups;
7. Representatives of the private sector that provides transportation services; and
8. Interstate or multistate coordinating groups.

Timing of Involvement

Prior coordination and interaction with other groups and agencies are fundamental to the eventual implementation of transportation plans and policies. In the process of involving other agencies and groups, coordination in the name of implementation and at the time of implementation is too late, wrong, ineffective, and often counterproductive. Those who prepare transportation plans have frequently seen an alignment of individuals or groups oppose a transportation plan or program without adequate understanding of the basic issues underlying the plan. Generally, this is caused by a lack of adequate and open involvement with groups outside the implementing agency. Consequently, there must be external interaction and communication with groups outside the planning unit, and that interaction and communication must occur during the process of plan development.

The issues around which the technical work program is structured should be identified early. The proper role of the transportation planner is to develop and analyze alternative plans and to make recommendations to the decision-makers and, in this process, to ensure that the decision-maker has a full understanding of the issues that concern other agencies, groups, and individuals who may be influenced by that plan. This requires full communication and interaction. The transportation planner should neither presume to speak for other agencies nor identify or evaluate their concerns. They must be directly involved throughout the planning process.

The mechanisms to achieve an adequate level of coordination and interaction with the agencies external to the transportation planning agency are somewhat less defined than the mandate to so do. Furthermore, the multidisciplinary expertise needed to solve complex problems relating to a transportation plan or program can often be found within these agencies. In general, a variety of techniques may be required to achieve the required degree of interaction.

Use of Committees

Setting up committees of individuals representing agencies or groups is a time-honored mechanism used at every level of government to provide a measure of communication. Examples are the policy, technical, and citizen committees that represent state departments, regional planning organizations, the private transportation sector, and special interest groups. By themselves, however, they are insufficient for handling the level of interaction that is called for in the statewide transportation planning process. Without a stated task and without a stated set of limits to their areas of defined responsibility, the efforts of such committees are often unfocused.

A-95 Review

Similarly, the agency review guidelines promulgated in circular A-95, issued by the U.S. Bureau of the Budget, are a proper and necessary vehicle to inform a broad variety of official agencies of impending projects and, consequently, of the results of planning programs. The A-95 review process is necessary, but by itself is not an adequate provision for ensuring input to important decisions made during policy and systems planning. The A-95 review is a vital project review procedure, but cannot be construed as a substitute for proper coordination. A drawback of the application of this procedure in most common practice is the exclusion of all but official government agencies from that limited process.

Executive and Legislative Support

Active and explicit expressions of support from the executive and legislative branches of state government reinforce the planning process. State transportation departments

should ensure that there is real interaction and coordination with these branches of government. This interaction should go beyond the departments' public relations offices. State legislators, in particular, must be involved in the planning for those projects that directly affect their constituencies if their support for implementation of the plans is anticipated.

Total Statewide Development Plan

Unquestionably, a state should undertake a total development plan that coordinates and unifies all aspects of land use, health, education, welfare, transportation, recreation, and other statewide systems facilities, programs, and policies. The interchange of information, procedures, and proposals among state agencies responsible for these functional areas is invaluable in the preparation of an overall statewide transportation plan at both the policy and the systems planning levels. The coordination of such an effort is most appropriately the function of the state comprehensive planning agency or department.

Given the state of the art, however, most states probably cannot hope to achieve a fully integrated policy plan incorporating all of these functional elements. Consequently, it is not recommended that the funding for all of these functional areas be pooled, at this time, into a single planning technical studies fund. Rather, it is suggested that the states focus on developing an adequately integrated set of multimodal transportation plans and similar plans for other functional areas in mutual coordination and cooperation with all appropriate state functional agencies. In the future, as a more complete integration of these functional plans is feasible, a total state development plan funded by a single federal fund may become an attainable objective.

Coordination of State Transportation Agencies

At the state level, substantial coordination within the overall transportation planning process may be achieved by coordinating the many separate transportation boards, commissions, agencies, and authorities that traditionally exist within states. They need not necessarily be consolidated into a single commission or authority. Such coordination could be expected to encourage multimodal planning and programming and to facilitate implementation of transportation projects throughout the state. The agencies should include those responsible for regulation of transportation services.

Coordination With Regional Agencies

Established regional policy bodies for metropolitan areas should play a major role in the statewide planning process by providing direction and leadership to metropolitan systems planning functions. These bodies, in turn, must develop a cooperative working relation with the state to ensure the fiscal responsibility of any plan that they promulgate.

Adoption of State Transportation Planning Process Guidelines

A useful mechanism to ensure widespread understanding of the ground rules for the statewide transportation planning process and a first step to ensure the enlightened participation of other agencies are adoption and publication of a set of uniform process guidelines. Such guidelines shouls be established and adopted by each state. These guidelines would be similar to the federally mandated Action Plan for highway planning, programming, design, and construction. Although the general thrust and the intent of the workshop are not to suggest that the U.S. Department of Transportation require the establishment of such procedures, we did agree that it is in the interest of each state

that such guidelines be considered.

In the development of these guidelines, differences in the facility planning processes for each of the modes should be considered and recognized to ensure a logical implementation process. The process guidelines should be extended to include substate and metropolitan transportation planning as it may exist and may be incorporated into the statewide transportation planning process. The differences between substate or metropolitan transportation planning processes should be recognized. In most states, this will require the preparation of regional process guidelines that are, in turn, incorporated within the overall state process guidelines or Action Plan.

CITIZEN PARTICIPATION

Scale Considerations

Direct participation by citizens in the planning process is essential, but, nevertheless, extremely difficult at the statewide level. Further, there can be no explicit guidelines set for the best manner in which to establish citizen participation at the statewide level. New techniques must be developed.

The greatest experience to date has been with citizen participation at the regional, local, and project levels, where citizen groups have a much more direct interest and understanding of the problems of their specific communities. As the base for planning becomes larger, the direct relation between a citizen and a plan becomes more distant. An adequate citizen participation process through a single, centralized statewide process may be impossible and may require that the process be regionalized.

Two-Way Communication

The flow of information must occur in both directions: from the state transportation agency to the outside and from the outside to the state transportation agency. All too frequently, this necessary exchange of information has not occurred and, in fact, has been superseded by a number of more or less active public affairs programs of these agencies. The transportation planner should be considered an "honest evaluator of alternative plans and programs." To provide such an honest evaluation, the planners cannot assume that he or she understands all of the conflicting objectives of the external agencies and groups, but instead must learn to listen actively and openly to the positions, interests, and concerns of these groups and individuals.

COORDINATION WITH PRIVATE TRANSPORTATION SECTOR

Modal Advisory Groups

Advisory groups should be established for each transportation mode to permit the interests, views, and recommendations of those that provide transportation services, such as the railroad, intercity bus, trucking, and marine shipping industries, to be heard. These transportation modes have frequently been ignored or even excluded from the statewide transportation planning process.

Involvement of Regulatory Agencies

The regulation of private transportation operators is a needed and traditional authority and responsibility of state government. Strained working relations and differing points

of view among the state transportation planning unit, the state regulatory agency or agencies, and the elements of the private sector that provide transportation services cannot be resolved by excluding the regulatory agency or agencies from the process of plan development. Such an exclusion will neither improve regulatory policy nor eliminate the regulatory function or its importance. The modal advisory structure adopted provides one appropriate mechanism for such involvement.

However, the inherent distrust of the private sector of the state regulatory function may jeopardize, at least initially, relations between the state planning unit and the private industry sector. This indicates the necessity for a much more intensive communication effort.

FEDERAL FUNDING AND INVOLVEMENT

Unified State Transportation Planning Program

Many of the administrative improvements that have been made in funding the metropolitan transportation planning processes might well be extended to the statewide transportation planning process. Even the new metropolitan transportation funding arrangements, however, do not go nearly far enough to meet the needs of statewide transportation planning, which requires maximum flexibility if the multimodal implementation powers and responsibilities of the state transportation department are to be fully utilized.

Unified state transportation planning programs should be developed by each state annually or biannually and could provide the basis for both state and federal funding of the transportation planning process. They should incorporate all statewide policy and systems planning efforts, the unified transportation planning programs prepared by the metropolitan areas of the state, and planning for nonmetropolitan regions and smaller urban areas of the state.

Distribution of Federal and State Planning Assistance

Both federal and state transportation planning assistance should be tied to the adopted state unified transportation planning program. Federal funds to be allocated to the state and any of its component jurisdictions should be aggregated as a "block grant" that could be applied to the unified state program without the current categorical or geographic limitations and obstacles.

Priorities for the distribution of both limited federal and state planning assistance to statewide, metropolitan, and nonmetropolitan planning could be accomplished through a formula to be developed by the state with local participation. This formula should receive a single federal review in which the comments of all affected federal agencies should be coordinated and should be reviewed on a regular basis by the state and adjusted as needed. It should clearly reflect transportation needs throughout the state as defined by the state transportation policy plan.

If a state is to assume the responsibility for meeting its own transportation needs, it must be given the latitude to determine where and in what amounts federal and state transportation capital funds are spent. Concomitant with this is the responsibility for allocation of state and federal transportation planning funds. The allocation-formula approach will ensure that the allocation of planning funds is accomplished rationally and not capriciously.

Consistent with this approach, the states must be granted maximum responsibility and flexibility in the preparation of these work programs. This suggests the provision of federal planning funds with limited federal guidelines for their application.

Single Federal Funding Source

To carry out unified state transportation planning programs requires that a singly administered source of federal funds be provided. Such a source of federal funding could be composed, at least initially, of the combined planning grant fund programs of the Federal Highway Administration, Urban Mass Transportation Administration, Federal Aviation Administration, Federal Railroad Administration, and Office of the Transportion Secretary.

Along with these funds, however, additional nonearmarked funds will be needed to support and expand statewide planning programs, particularly for those modes that have received little attention from transportation planners. Additional funding also will be called for to support policy planning. New funds perhaps should be provided directly from the Office of the Secretary of Transportation so that their multimodal application will be ensured.

This single planning grant fund should be available for any policy, system, or corridor planning study, regardless of the original modal source of those funds. Many of the mistakes made in the name of transportation planning in the past stem from the inherent interest of states and metropolitan areas to take advantage of established funding programs for a particular transportation mode. The lack of "modal strings" associated with a single-source planning fund could ensure maximum objectivity in future statewide multimodal transportation planning.

It follows logically that all of the planning funds used within the single-grant fund should be adjusted to a common state or local matching ratio.

Federal Coordination

Federal coordination of the unified state transportation planning programs should be through review by a single federal source similar to the federal Intermodal Planning Groups. A clear need exists, however, for greater coordination and direction of these groups. If they are to assume these new responsibilities, they must have expanded professional staff resources to assist in this task and to provide day-to-day liaison with their state counterparts.

Representatives of the federal government should participate at all levels of the planning organizational structure. Federal involvement, however, should be nonvoting on committees and supportive of the process. Care should be taken that the federal agencies do not become directly involved in local policy issues.

Federal Process Guidelines

A great deal of confusion exists because of the variety of and differences among the process guidelines promulgated by the federal modal administrations. Differences, for example, have made it extremely difficult to hold a single corridor public hearing for a combined highway and transit project, a situation that must be corrected immediately. In response to this problem, it is suggested that the Office of the Secretary of Transportation, in cooperation with the modal administrations, prepare a unified set of U.S. Department of Transportation process guidelines similar to the action plans of the Federal Highway Administration.

These guidelines should cover the entire planning process, from policy planning through construction. They should include common requirements for modal administrations for items such as public hearings, environmental impact statements, certification of state and metropolitan planning processes, and labor standards for minority participation. They should supersede existing process guidelines established by each of the modal administrations.

Resource Paper

Byron D. Sturm, Dalton•Dalton•Little•Newport

This paper is organized in the following manner: existing organization and administrative practices; issues and problems, internal and external; recommendations for improving organization and administrative practices; and recommendations for research programs for improving organization and administrative mechanisms. The author has used publications and papers on statewide transportation planning, various state department of transportation development studies, and a telephone survey conducted in December 1973. This survey was conducted for 23 states that have formed departments of transportation and 4 states that have not. The questions and responses have been summarized in this paper.

EXISTING ORGANIZATION AND ADMINISTRATIVE PRACTICES

Since 1959, 23 states have passed legislation creating comprehensive transportation agencies, most during the past 5 years: Arizona, California, Connecticut, Delaware, Florida, Georgia, Hawaii, Illinois, Kentucky, Maine, Maryland, Massachusetts, Michigan, New Jersey, New York, North Carolina, Ohio, Oregon, Pennsylvania, Rhode Island, South Dakota, Tennessee, and Wisconsin. In addition, 14 states are considering legislation to create departments of transportation: Colorado, Iowa, Kansas, Minnesota, Nevada, New Hampshire, North Dakota, Oklahoma, Texas, Utah, Vermont, Virginia, West Virginia, and Washington.

Ashford (1, p. 49) explains that the pressure on states to create unitary transportation departments is part of an underlying change in governmental philosophy that is motivating extensive reexaminations and restructurings involving all divisions of state government, not only transportation. He further states that the creation of departments of transportation appears to relate to 3 principal areas of philosophical change in government: first, the increasing legislative emphasis on urban needs and urban problems, brought about by relatively recent reapportionment in the state legislatures; second, increased federal activity in the area of social legislation that has engendered a multiplicity of federal programs requiring extensive restructuring of state administrative capability and general state government reorganization; and, third, a movement toward the rationalization of state agencies along functional lines that resemble new federal organization structures (1, pp. 49-50).

Two additional and basic reasons for the creation of state transportation departments are (a) response to the desire to coordinate planning for all modes of transportation in a single state agency and (b) desire to consolidate many of the state boards, commissions, and agencies whose functions overlapped to reduce the complexity of state government and permit more efficient management.

There is substantial variance in authority, responsibility, and organization among the 23 state transportation departments that are now operating or preparing for operation. They include highway departments, aeronautical commissions, transit agencies, highway safety offices, traffic safety enforcement agencies, motor vehicle registration and driver licensing departments, highway patrols, and authorities for bridges, turnpikes, harbors, and tunnels.

The basic objectives of state departments of transportation are as follows (2, pp. 4-5):

1. To create a statewide transportation development plan, set goals for the future, and determine existing conditions;
2. To coordinate and centralize regulation, licensing, and taxation of transportation modes;
3. To coordinate transportation with the economic development of the state;
4. To promote and protect the state land use act;
5. To minimize transportation costs and maximize benefits;
6. To supply a broad framework to which regional, metropolitan, and local trans-

portation needs can be related;

7. To facilitate the supply of federal and state aid to those areas that will benefit the state as a whole;

8. To coordinate and implement the National Transportation Plan with the state transportation planning program; and

9. To ensure the consideration of social, economic, and environmental impacts of transportation.

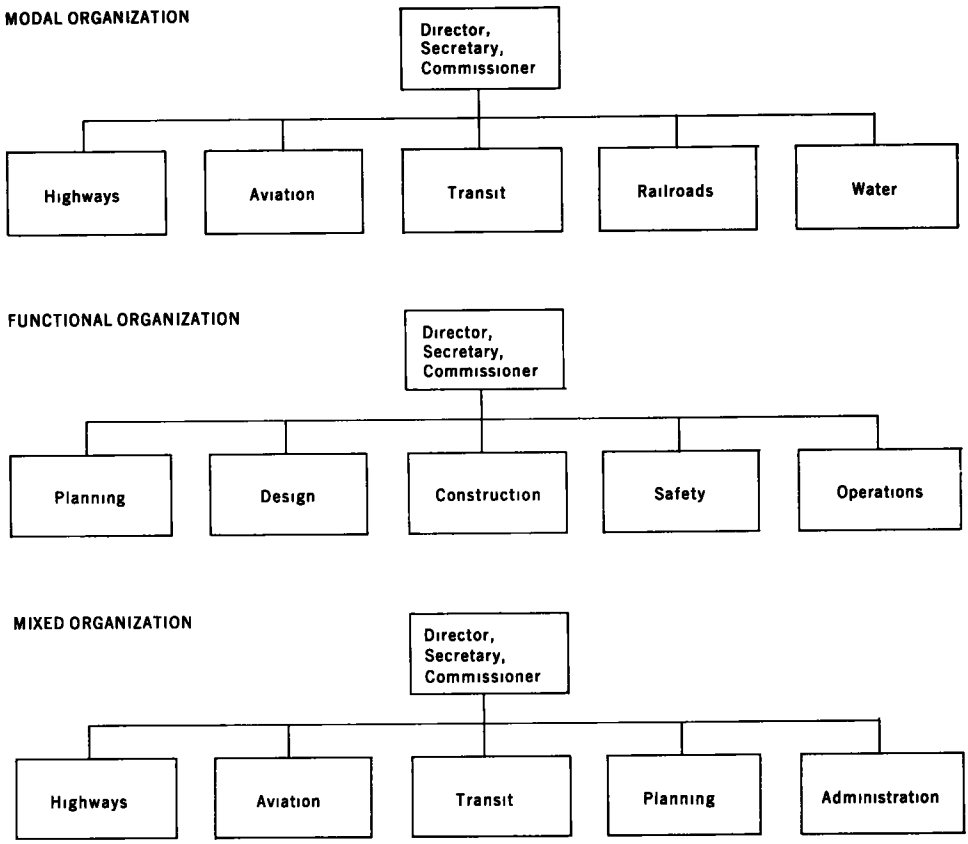
Organization of State Departments of Transportation

Each transportation department is headed by a chief executive officer whose powers vary by state. The title is secretary of transportation in 11 states, director in 5 states, and commissioner in 5 states.

Each department has staff divisions to establish procedures and advise the chief executive officer in policy formulation and operating divisions to implement policies and programs. The organization can be classified as modal, functional, or mixed modal and functional according to the respective responsibilities of the operating divisions. (Modal is sometimes referred to as "high modal," and functional is sometimes referred to as "low modal".) Figure 1 shows the organizational structures.

In a functional organization, the operating divisions are responsible for a specific function for all modes. Typical examples of such responsibility are divisions of plan-

Figure 1. Basic organizational structures of state transportation departments.



ning, design, construction, and safety, each of which is responsible for all modes of transportation. Only 2 states, New Jersey and New York, are classified as functional, although several states are studying reorganizations along a functional line.

In modal organization, operating divisions are responsible for a specific transportation mode such as highways, aviation, transit, railroads, and water. Most duties and powers are performed under each modal division. The planning function is in a staff advisory capacity or in a modal division or in both. Nine states have a modal form of organization.

A mixed organization includes both modal and functional divisions on the operating level. Ten states have a mixed modal and functional organization. Planning for all modes is conducted at the level of the modal operating administrations as a rule.

Organization and Classification of Transportation Planning

Ashford (1, p. 51) suggests that, in the transportation department, planning can be placed in either an equal-status division or an advisory staff agency. There are exceptions to this, of course; Wisconsin has a special staff advisory unit on policy planning in addition to an equal-status division of planning.

Planning is placed in an equal-status division in the functional or mixed organization. The planning division head reports to the chief executive officer in the same way as heads of other line divisions such as highways, aviation, or transit. Placing the planning group in a position equivalent to the line or operating divisions appears to create a strong tendency for line-oriented rather than policy-oriented planning (1, p. 51).

The second type of organizational framework is placing planning in a staff agency that advises the chief executive through administrative channels that differ distinctly from those of the line or operating divisions. The result is that planning focuses more on policy planning (1, p. 52). The advisory planning staff agency is suited to the modal form of organization, but this is not to say that, given proper administrative procedures, policy-oriented planning cannot occur in the functional or mixed form of organization.

The requirements of planning range from goal formulation to detailed physical and environmental planning. Ashford (1, pp. 56-60) classifies planning as policy planning, line or system planning, and project planning and planning research.

Policy Planning

Policy planning leads to coordinated policy decisions that lead to the achievement of a defined set of goals and objectives. Ashford indicates that state departments of transportation can be expected, by the adoption of proper policies, to achieve the following major objectives:

1. Creation of a statewide transportation development plan, setting of goals, and determination of existing conditions (through budgetary and administrative planning procedures, mutually supporting transportation and general state planning goals can bring about resource reallocation);
2. Coordination and centralization of the chief administrative methods of promotion and control, i.e., regulation, licensing, and taxation;
3. Coordination of transportation with economic development by means of aligning transportation policies with those of the principal public instrument of state economic development, the general state plan;
4. Use of policy coordination to recognize the strong interdependence between accessibility and land use (the transportation plan, with other state planning policies, can be used as a prime determinant of land use change);
5. Minimization of statewide transportation costs and maximization of benefits within the context of available state funding (state transportation resources can be assigned to modes according to policies that maximize the impact of investment, subject to provisions of universal minimum acceptable levels of service);

6. Establishment of policy concerning modal investment and networks as they relate to the statewide transportation plan and the general state plan so that the various regional, metropolitan, and local agencies can be provided with a broad framework to which they can relate (under those circumstances, statewide planning is directed from the "top down," and general state goals become feasible);
7. Establishment of policy to supply federal and state transportation funding on a basis that sets overall state benefits above local considerations (areas that might otherwise exhibit minimal transportation needs can receive transportation investments under conditions that indicate that sufficient benefits will accrue to the state as a whole); and
8. Establishment of policy that leads to a more integrated state approach to the 1972 National Transportation Needs Plan and the Evaluation of Urban Transportation Planning Study and to forthcoming federal activity (in turn, federal policy decisions will be more easily made and can be expected to be more productive after the inclusion of state-level inputs).

Line-Level or System Planning

The following are the principal line-level tasks:

1. Collection of data for the determination of modal needs and demands and design of data recording and retrieval systems for that purpose;
2. Overall statewide system planning for a multimodal network, including terminal consideration;
3. Design of the physical integration of networks and the modal balance that is responsive to the demonstrated needs, demands, and resources;
4. Design of unimodal networks that are viable and can operate at optimal conditions separately from other modes;
5. Technical assistance to urban transportation studies and local transportation studies involved with 701 planning to ensure adequate technical quality, compliance with federal and state requirements, and conformity with the needs of interregional movements;
6. Public transportation studies at both the local and the regional level; and
7. Environmental impact analysis of systems.

Project Planning and Planning Research

To tailor transportation facilities to the needs and demands of the public now requires an unprecedented number of design procedures that involve activities normally carried out by planners. Typically, the following are among the areas of detailed planning involved:

1. Scaling individual facilities to demand considerations, which requires coordination between designer and planner to ensure that the scale of the facility reflects the true scale of the demand;
2. Assessing the environmental impact of individual facilities on small areas and communities; and
3. Integrating the planning requirements associated with overall corridor planning for individual transportation facilities in both urban and rural areas.

Planning-oriented research has become an area to which state transportation planners must increasingly give attention. Extensive basic and applied research is required in the area of personal transportation before investment in new modes and technology can be justified. Both the Office of High-Speed Transportation and the Urban Mass Transportation Administration have engaged in extensive research and demonstration programs. The UMTA research program involves widely divergent areas such

as transportation planning and decision-making; economics; marketing and information; social, psychological, environmental, legal, political, and governmental concerns; technology; management; training; and personnel. Line-oriented equal-status divisions have been least responsive to research needs for the minor modes. Consequently, much of the work in this area has been initiated by universities, private enterprise, and research institutions.

EXISTING STATEWIDE TRANSPORTATION PLANNING EFFORTS

A telephone questionnaire was conducted by Dalton•Dalton•Little•Newport in December 1973. A number of questions were addressed to key planning professionals in 27 states, including the 23 that have transportation departments. Responses to selected questions by the 23 states are presented.

	Question	Response	Number Responding
1	At what organizational level is transportation systems planning accomplished?	Staff advisory unit level	8
		Equal-status line-level division	6
		Modal division level	1
		Staff advisory unit level with input by the modal divisions	2
		Equal-status line-level division with input from the district or regional offices	4
		Staff and equal-status line levels	1
		Line level with input from the modal divisions	1
2.	Are planning functions performed for corridors? By what unit in the organization?	Yes, by system planning unit	14
		Yes, by modal divisions	2
		Yes, by district or regional offices	2
		Yes, by system planning unit and district or regional offices	2
		Yes, by modal division assisted in some cases by system planning unit	1
		No	1
		No response	1
3.	Are planning functions performed for projects? By what unit in the organization?	Yes, by central office	7
		Yes, by modal divisions	7
		Yes, by district or regional offices	3
		Yes, by modal divisions and central office	2
		Yes, by districts and central office	3
4.	Have changes occurred in the transportation department since it was established?	Added modal divisions, changed organization to mixed and functional types, and placed more emphasis on public transportation	10
		None yet	13
		May shift system planning function from central office to region	4
		May change planning unit functions	7
5	Who is responsible for capital improvement programming?	Central office planning unit or programming unit or both	10
		Modal divisions	4
		Fiscal section	1
		Regional offices	1
		Central office planning unit or programming unit or both and fiscal section	2
		Central office planning unit or programming unit or both and modal divisions	3
		Central office planning unit or programming unit, or both modal administrations, and fiscal section	1
		No response	1
6.	Who is responsible for capital budgeting?	Central office staff unit	11
		Modal divisions	1
		Fiscal section	4
		Regional offices	1
		Central office staff unit and modal divisions	1
		Central office staff unit and fiscal section	2
		Modal division and fiscal unit	1
		Central office staff unit, modal divisions, and fiscal section	1
		No response	1

	Question	Response	Number Responding
7.	Does the transportation department have all the comprehensive skills necessary for planning?	Yes	8
		No	14
		No response	1
8.	What is the type of planning to which your Action Plan applies?	Statewide system planning and urban transportation planning levels for all modes	6
		Statewide system planning and urban transportation planning levels for highways only	6
		Statewide system level for all modes	2
		All modes in system planning	3
		Highway-related planning only	3
		Urban transportation planning level for all modes	1
		Statewide system planning and urban transportation planning level	1
		Statewide system planning level for highways	1
9.	Is the Action Plan applied at the statewide level, or are there individual implementation plans for each district or region?	Individual implementation plans for various districts or regions in the state	7
		Administered statewide	15
		No response	1
10.	Does your state have a statewide transportation plan or planning effort under way?	Completed plan	5
		Planning effort under way	11
		Planning efforts not yet started	7
11	Will the planning process be continuing?	Yes	18
		No response	5
12.	Will the plan be periodically updated?	Yes, in cycles varying from 1 to 10 years	15
		No	2
		No response	6
13.	What elements does or will the state plan address?	Urban person travel, urban goods movement, intercity person travel, intercity goods movement, and rural and other small urban areas	10
		The above excluding urban goods movement	2
		The above excluding rural and small urban	1
		The above excluding urban and intercity goods movement	2
		The above excluding urban goods and rural and small urban	1
		Urban and rural and small urban person travel	2
		Urban person travel only	1
		No response	4
14	What modes or traveled way are or will be covered by your statewide transportation planning effort?	Highways	20
		Urban public transit	19
		Aviation	18
		Railroads	16
		Intercity public transit	15
		Ports	14
		Water transportation	13
		Terminals	10
		Pipelines	9
		Trucking	9
		Other modes including bicycle paths, pedestrian trails and paths, rural public transit, car pooling, and park-and-ride at freeway interchanges	8
		All modes	6
15	Have you established or will you establish a policy committee for statewide transportation planning?	Yes, membership includes both department and other state officials	7
		Yes, membership limited to department officials	4
		No, except transportation board or commission	7
		No response	5
		Governor's office has direct input to the policy committee	9
		Legislature has input to policy committee	6
16.	Have you established or will you establish a technical advisory committee for statewide transportation planning?	Yes	11
		No	8
		No response	4
17	Do you have or will you have a citizen advisory committee for the overall statewide planning process or any modal elements?	Yes	6
		No	13
		No response	4

	Question	Response	Number Responding
18.	Have there been or will there be other types of citizen input in the planning effort?	Yes	8
		No	6
		No response	9
19.	Have you formed or will you form modal advisory groups to aid the planning effort?	Yes	8
20	What external relations exist with other agencies in transportation planning?	Coordination with planning, environmental, economic development, natural resource, fiscal, or other state agency, or local or regional agency in land use, fiscal, or resource planning that relates to transportation planning effort	15
		No coordination effort	7
		No response	1
21.	How has state planning effort been or is anticipated to be funded?	Federal	
		FHWA, FAA, and UMTA (mostly at urban level)	10
		FHWA and UMTA	1
		FHWA and FAA	2
		FAA only	1
		FHWA only	3
		No federal funding	1
		State	
		Transportation revenue sources only	7
		General fund sources only	2
		General fund and user revenue sources	5
		No state funding	4
		No response	5
22	Has a short-range plan been produced, or will one be produced?	Yes	18
		No response	5
23.	Is the short-range plan or will it be in the form of a transportation capital improvement program?	Yes	15
		No	3
		No response	5
24	Has a long-range transportation plan been produced, or will one be produced?	Yes	16
		No response	7
25	What is the nature of the plan?	Produces either system or systems recommendation by mode	7
		Presents policies, programs, and systems alternatives with or without recommendations	9
		No response	7
26.	Does or will the plan include an implementation schedule?	Yes	10
		No	5
		No response	8
27	Does or will the plan recommend new funding?	Yes	8
		No	6
		No response	9
28	Does or will the plan recommend legislative changes for implementation?	Yes	8
		Do not yet know	6
		No	4
		No response	5
29.	Has the plan or planning effort affected any changes?	Yes	12
		Not yet or no response	11

Question 1 did not address the level at which policy planning is performed. After a review of state transportation department organization charts and various other material submitted by states, the author surmised the following for 19 states:

Level	Number
Separate staff advisory unit outside the administrative direction of the planning division administrator	1
Division of planning and a separate division to carry out the function	7
Planning division, but no separate staff unit was created	2
Not performed at all	9

Responses to question 7 indicated that the following disciplines were in demand: environmentalists, economists, sociologists, and biologists. Furthermore, responses indicated that other disciplinary skills were available from other state agencies and that the various transportation departments have retained consultants and university people to supplement existing staff.

None of the states responded to question 20 by indicating that a total statewide development planning program was under way, i.e., a comprehensive development plan that included overall state goals and objectives and was a coordinated multistate agency plan for development, transportation, recreation, statewide facilities, and the like. This may be due to the way the question was asked, for the author is aware that in Rhode Island the planning division in the transportation department assists the state planning agency in preparation of transportation elements of the long-range state guide plan.

Changes mentioned in responses to question 29 included the following: response is now made to urban transit needs, commuter rail, small urban area transportation needs; a basis exists for resource allocation; financial recommendations are made; interdepartmental coordination is better; regional area is strengthened as decentralization occurred; recommendations are less political and more rational; plan has effected better decision-making; capital improvement program is being carried out; short-range resources have been defined and capital improvement program is more realistic; and chief executive receives policy direction.

ISSUES AND PROBLEMS

The purpose of this section is to define issues, explore the questions that must be considered in issue resolution, and relate existing practices that may give direction toward that end.

Subclassifications chosen for internal issues and problems in statewide transportation planning include implementation of plan funds for the statewide transportation planning program, regional versus centralized approaches, position and structure of the planning function, characteristics of the planning division, federal direction, and internal direction of the transportation department.

Subclassifications for external issues and problems relate to implementation, coordination with other planning groups, coordination with citizen groups, coordination with the private transportation sector, federal involvement and direction, goal setting, and total state development plan concept.

Internal Issues and Problems

Implementation

The issues with regard to the role of the planning unit in promoting the results of the planning effort are as follows:

1. To what degree should the planning unit participate in promoting the plan to the transportation department executive officer? To the state administration? To the legislature? In a hearing process to the citizenry and regional and local public officials? In mustering other state departmental support? In preparing summary plan reports and brochures?
2. Should the planning unit recommend policy, technical, or citizen committees to direct and advise the planning effort or to frame alternatives early in the planning process? Should the state Action Plan provide for this coordinating mechanism?
3. Should the transportation department contain a public affairs, citizen involvement, or public relations division to aid in the plan approval process, or should the planning unit contain this expertise?

The issues with regard to the role of the planning unit in capital programming and capital budgeting are as follows:

1. Should the planning unit develop goals and objectives and the related priority-selection criteria that can aid in programming and budgeting?
2. After the statewide planning effort, should the various modal divisions prepare a list of permanent improvement needs that can serve as a catalog of improvements for programming? Should this be developed as part of the planning effort with the full involvement of the modal divisions?
3. Should the planning unit work closely with the fiscal and modal divisions in capital programming and budgeting? What should be the role of each? Should the fiscal division undertake long- and short-range financial planning and projection, the planning unit prepare priority selection criteria and communicate basic plan recommendations, and the modal divisions supply lists of permanent improvement needs for ranking by the planning unit? What should be district or regional involvement? Should either the planning unit, fiscal division, modal division, or districts have sole authority for capital programming or budgeting?

The role of the planning unit in carrying out the state Action Plan at the system and corridor levels and in the location, design, and construction phases of transportation development is as follows:

1. How should the planning unit, modal divisions, and regions or districts be involved?
2. Should there be an Action Plan for each district or region of the state, and should this set the direction for the structuring of the statewide transportation planning effort, i.e., regional versus centralized approach?
3. Should the U.S. Department of Transportation establish or direct all states to develop multimodal action plans from planning at the system level through construction? Should the U.S. Department of Transportation, as part of this directive, standardize procedures for preparing environmental impact statements and conducting public hearings for all modes in support of statewide intermodal planning?
4. Should the states publish 5- to 7-year capital improvement programs to provide all units of government with an expression of statewide transportation development intent so that local financial resource planning and priorities can be established to ensure facility implementation?
5. Do different federal funding ratios for different modes of transportation bias the results of multimodal transportation plan recommendations and thwart intermodal development? Do state revenue earmarking and modal participation have the same effect? Should these considerations be studied by a policy planning staff unit and direction be supplied to system planning efforts? Should the federal government establish single matching ratios for all forms of transportation improvement?

Funding for the Statewide Transportation Planning Program

1. Should federal funding be available for all forms of transportation in statewide systems planning (e.g., highways, rail, transit, aviation, waterways, and pipelines) for all elements of the program (e.g., urban, intercity, and rural person and goods movement)?
2. Should planning for certain modes or travel ways be supported totally by state resources?
3. Does lack of federal planning funds for facilities such as railroads and ports cause planning efforts to be less than multimodal?
4. Is earmarked funding at the state level producing the same effect? Should planning funds, regardless of the source, be applied to a complete examination of all modes that move people and goods throughout the state?

Regional Versus Centralized Approaches

1. Do the structuring of the state Action Plan and the regional or statewide implementation set direction for a centralized or regional transportation planning effort?
2. Can a properly organized regional effort and the interaction mechanism established produce results that stand a better chance of implementation because of the individuated nature of the approach? Would the process be more participatory than a centralized effort? Would it offer a better opportunity not only for district involvement but also for existing urban transportation planning process input?
3. Should intercity person and goods movement and rural plan elements be addressed on a centralized statewide basis and urban person and goods movement on a regional basis? When should these come together for coordination of alternatives and recommendations?
4. Should the approach and organizational structure of other state agencies provide direction for the structuring of the statewide transportation planning process?
5. Should the size of a state and its number of urbanized areas dictate whether the approach is regional or centralized?
6. In a regional approach, should the regional or district offices have the same organizational structure or professional disciplines as the central office? Should policy planning be carried on by the central office only, and system planning and facility planning be carried on by regions or districts with direction and advice from the central office? Would there be a difficulty in securing the required technical expertise at the regional level?
7. What type of organizational structure should be formed for policy, technical, and citizen committees? Would representatives of each of these committees at the regional level constitute statewide policy, technical, and citizen committees?
8. Would goals and objectives be developed for each region and blended into a statewide goal and objective statement?
9. Should the central office planning unit establish guidelines for the statewide effort so that all regions move consistently and uniformly in the event of a regional approach? Would this ensure that planning results could be combined? What intersection must occur between the central office and districts to ensure comprehensiveness and timing of effort?
10. Should a regional approach be organized in such a way as to effect a blending of transportation and land use planning?

Position and Structure of the Planning Process

1. Should multimodal systems planning be established as a separate staff advisory unit? Would the lines of administrative communication between the chief executive and this unit be different from those between the chief executive and the modal or operating divisions? Should they be? Would this offer greater potential for policy planning?
2. Should multimodal systems planning be established as an equal-status line division? Would this offer a structure that neglects or provides for cursory examination of policy planning considerations? Are those modal divisions with the most resources likely to control policy development and thwart intermodal development?
3. Should modal system planning be the responsibility of the various modal administrations? Should there be a staff advisory unit to blend these efforts into a multimodal plan?
4. Should policy planning, system planning, and facility planning be accomplished by the same planning unit regardless of its status as an advisory, equal-status, or modal unit?
5. Should policy planning, system planning, and facility (project) planning and research be considered different functions and be distributed throughout the organization? Should policy planning for all modes be in a staff unit, system planning for all modes be in a line unit, and project planning and modal technology research be in modal or operating units? What administrative procedures are required to coordinate these

functions at the various levels?

6. Are there modes whose planning needs support this type of structuring? Do highways and aviation need system planning, and transit, railroads, and waterways need policy planning (especially those private modes that impact the state transportation system)? Can policy, system, and facility planning be applied at the same scale for all modes in one staff division?
7. Can one structural form be recommended for all states?
8. Should there be an environmental unit or research unit or both to ensure that environmental requirements are met in system and facility planning, or should these disciplines be located in the system or facility planning units? Should research be a function carried on in each of the modal divisions? How can this research be brought to bear on planning multimodal systems?
9. Should administrative procedures ensure that all levels of planning are coordinated or have input into the statewide transportation planning effort?
10. What kind of organizational unit should concern itself with problems like the current energy shortage?
11. What steps can be taken to instill modal development?

Characteristics of the Planning Division

1. What kinds of disciplines are required for policy planning?
2. What kinds of disciplines are required for system planning?
3. What kinds of disciplines are required in facility planning?
4. Are present transportation departments overstaffed with highway specialists? Is there a need for more transportation generalists and modal specialists to ensure integrity of multimodal approach? Should retraining educational functions be provided at the state or federal levels?

Federal Direction

1. Should the federal government publish directives or guidelines that relate to organization and program content for statewide transportation planning as was done for urban transportation planning?
2. Should these guidelines be developed by all the federal administrations so that planning specifications are uniform?
3. Should the Intermodal Planning Groups in each federal region address statewide transportation planning as another step in ensuring coordinated statewide and urban transportation planning efforts?

Internal Direction of the Transportation Department

1. Should a policy committee be formed by pulling together representatives from existing boards or commissions that set policy under separate modal administrations?
2. Should attempts be made in the formulation of a state transportation department to combine these separate boards or commissions in one transportation board or commission?
3. Should each modal agency that has responsibility for developing internal plans and programs subject these plans and programs to a review by all other modal agencies?
4. Should the transportation department have a chief administrative officer who is responsible for ensuring that vertical coordination exists among construction, design, and facility, system, and policy planning?

External Issues and Problems

Implementation

1. To what degree should external interests be involved in promoting the implementation of the plan, assisting in the passage of necessary legislation, assisting in the adoption of necessary funding mechanisms, or assisting in the adoption of new revenue sources that may require voter approval?
2. Would plan implementation be easier if the planning unit worked with external groups like the other state, regional, and local agencies; citizen groups; special interest or lobbying groups; and representatives of the private sector who provide transportation services?
3. Should the legislature be involved in a special legislative subcommittee for the statewide transportation planning effort? Would this develop ownership in plan results? Would a regional approach toward plan development have more of an impact on the legislative subcommittee?
4. Should the plan have an extensive review by other agencies? How much time should be given for this review?
5. Should parts of the external organizational structure be maintained after the initial planning effort to assist or advise on priority programming or capital budgeting?

Coordination With Other Planning Groups

1. Should relations with other state, regional, or local planning agencies be formal or informal in plan development? Should there be a written agreement with other state agencies to indicate responsibilities in developing the statewide transportation plan?
2. Should other state agencies review the plan, alternatives, and recommendations before the plan is selected and adopted?
3. Should the state administration direct that a state development plan be produced, in which transportation is one element, and that all affected state agencies assist in its development?
4. Should the work program of the urban transportation planning groups (regional and local agencies) be expanded to include elements such as goods movement, railroad rationalization and efficiency, and terminals? Should the state or the federal government, through its planning guidelines, direct this modification?
5. Should there be a statewide policy and technical committee composed of transportation officials and representatives of other state agencies, including finance and public service or utility commissions that have regulatory responsibility, and regional transportation comprehensive planning agencies?
6. Should agencies of the federal government be involved at the technical committee level? Should they sit at the policy level in an ex officio capacity?

Coordination With Citizen Groups

1. Should a citizen group be established during the planning effort to advise on plan development, formulation of alternatives, goal ranking, and plan selection? Could the state Action Plan provide for this involvement mechanism and set the areal structure?
2. Should citizen groups include users and suppliers of transportation service for both person travel and goods movement, lobbyists, and special interest groups?
3. Should public hearings or other information meetings be held in various parts of the state early in the planning process to receive recommendations to guide the planning effort?

Coordination With the Private Transportation Sector

1. What relations should be developed with the private transportation sector for both person and goods movement?
2. Should professionals representing the planning interests of these groups be involved in the technical effort?
3. Should these groups be represented on separate modal advisory committees?
4. Should the state public utility or service commission responsible for regulation of common carriers be on modal advisory committees?

Federal Involvement and Direction

1. How should the federal government be represented on statewide transportation planning committees?
2. How would federal transportation revenue sharing proposals affect the role of state transportation planning units?
3. How would federal reorganization proposals affect state transportation planning activities?

Goal Setting

1. Should the committees assist in establishing goals and objectives?
2. Should the setting of state transportation goals involve other state agencies?
3. To be sure that the interests of communities, regions, and users and suppliers of transportation are served, should they be involved in establishing goals, objectives, performance measures, and evaluation criteria?
4. Are goal statements too vague to be employed in the planning process? Will objective and performance measures reduce vagueness?

Total State Development Plan Concept

1. In addition to transportation, what elements should a total statewide development plan address?
2. As transportation department issues infringe on issues of other state agencies and vice versa, is a total statewide development plan necessary to ensure comprehensiveness of effort?
3. Would goals and objectives developed under this concept call for the total coordination and involvement of all state interests in plan development?
4. Would this approach link land use and travel demand considerations, provide for comprehensive analysis of transportation problems such as rural public transportation, bicycle trails, pedestrian trails and paths, rail abandonment proposals, regulatory practices of goods and person movement modes, and use of state school buses?
5. Would this concept provide direction to state resource allocation?
6. Can comprehensive planning be carried out effectively at the state level?

RECOMMENDATIONS FOR IMPROVEMENT

Internal

Implementation

1. There should be on the chief executive officer's staff a planning unit that aids in

establishing and executing policy for the department and is primarily responsible for the developing plans and programs. The unit should house or direct those department-wide activities related to planning that permeate the department, encourage the implementation of the systems plan, and participate in all activities that aid in the implementation of the plan.

2. The staff-level planning unit should work with any other state planning units and with policy, technical, advisory, and citizen committees.
3. The planning unit should develop priority-selection criteria and rank improvements in capital programming and budgeting. It should work closely with the fiscal unit in long- and short-range financial planning and with the modal divisions or subdivisions in cataloging permanent improvement needs.
4. The U.S. Department of Transportation should establish requirements for the states to develop a uniform action plan for all modes and to develop a statewide unified work program.
5. The planning unit should be heavily involved in the system planning level, share responsibility for location or corridor planning, have some involvement in design, have minimal responsibility in construction and operation, and have some input into regulation of transportation.
6. State transportation capital program of 5 to 7 years should be distributed to external agencies and be part of a statewide capital improvement program.
7. Federal transportation funding programs should encourage a balanced transportation system and not favor certain modes.

Funds for the Statewide Transportation Planning Program

Both state and federal planning funds for system planning should be provided from a fund that offers no earmarking so that multimodal planning is encouraged. The U.S. Department of Transportation should take the lead in this revision by providing planning money from other than the modal administrations and requiring matching money in the same manner.

Regional Versus Centralized Approaches

Flexibility needs to be encouraged so states can use techniques best suited to their size differences. State action plans should reflect this approach, and every attempt should be made to carry this strategy through all phases and levels of planning.

Position and Structure of the Planning Function

1. Policy planning should be carried on by a separate staff advisory unit.
2. Systems planning may be accomplished by a line or staff unit, but the staff unit is preferred.
3. Project planning should be carried on by modal divisions in a mixed or modal organization and by operating divisions in a functional organization.
4. Recognition of different planning requirements for less developed modes should be taken into consideration when planning units are established.

Characteristics of the Planning Division

In general, there should be modal specialists on the planning staff.

Federal Direction

The federal government should publish flexible planning guidelines that states can apply in organizing statewide transportation planning. Federal procedures for planning and implementation should be standardized for all modes.

Internal Direction

Every attempt should be made in the organization of state transportation departments to combine previously separate boards and commissions into one policy advisory unit. In any event, a policy committee with representatives of each pertinent board or authority should assist the chief executive officer in directing the planning effort. Interagency or division review of plans and programs should be mandated by the chief executive officer.

External

Implementation

There should be a statewide development plan that coordinates and involves all state agencies and departments in goal setting, plan preparation, plan selection, and plan implementation. There should be a policy committee composed of the chief executive officers of each department, the governor's office, and, perhaps, legislators. Great care should be taken to consider the mechanisms necessary for implementation early in the planning process.

Coordination With Other Planning Groups

There should be a technical advisory committee formed with subcommittees on all elements of the plan including one on transportation.

Coordination With Groups

A citizen committee should be established for the planning effort with a central committee for statewide approach or regional committees for a regional approach (representatives from each region would form a statewide committee). The committee should include representatives from all special interest groups and be formed before any planning effort or technical work begins.

Coordination With the Private Transportation Sector

There should be advisory groups for each mode to permit the interests, views, and recommendations from those elements to be considered.

Federal Involvement and Direction

The federal government should be represented at all levels in the planning organizational structure. A special intermodal planning group subcommittee is recommended for federal participation. The federal government should ensure continuity of direction in any federal reorganization.

Goal Setting

All committees should take part in establishing statewide development goals, including transportation goals.

Total State Development Plan Concept

A total statewide development plan concept best allows a state to move in unity and with full coordination of health, education, welfare, transportation, recreation, and other statewide systems, facilities, and policies.

SUMMARY

About organizing for statewide transportation planning, Ashford (1, pp. 61-62) says:

> It would seem that neither the policy level nor the facility and research planning level can be omitted if the principal goal of improved resource allocation combined with technical innovation and environmental improvement is to be attained Under these circumstances it would appear that state departments of transportation should move towards transportation planning at the staff level to carry out both advisory and operational planning, while retaining, certainly for the forseeable future, a level of planning at the level of the equal status divisions to insure sufficient innovation and attention to the needs of the more neglected modes
>
> A dual level of planning of this type is already in effect in Wisconsin, where policy planning is located in the Office of the Secretary and operational planning is carried out by the Division of Planning as an equal status division With such a two-tier structure, the advisory staff level can insure that the operational planning division devotes sufficient attention to modal research and modal innovation As DOTs mature, it is likely that they will move to a planning organization structure that more closely resembles the Wisconsin form and what has been described as a "second generation DOT " As the degree to which the newly created state departments of transportation reach the goal of balanced transportation investment depends greatly on the efficacy of transportation planning, care must be taken to tailor the organizational structure to the wide range of planning considerations

In the telephone survey, the following comments were received regarding the best type of organization for statewide transportation planning: All states are different, and no form is best; modal specialists are needed in system planning; planning head should enjoy deputy or assistant director status; staff-level unit is needed for policy planning, and a line-level unit is needed for systems planning; functional organization is preferable; regional planning staffs should report to the central planning office staff administrator; planning should be responsive to the chief executive office; planning should be a policy staff function and not report to modal administrators; planning division should be responsible for multimodal planning; fiscal policy formulation and planning should be under one administrative officer; and regional approach that ties regional plans together is preferable.

The following methods are recommended for determining how to organize to carry out a statewide transportation planning program:

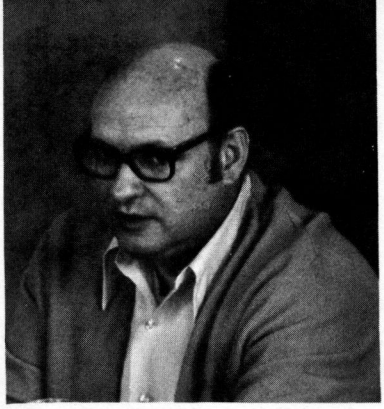
1. Establish a fixed planning program that is fully multimodal and includes policy and system planning and then determine the best structure to accomplish the program;
2. Use a fixed planning program model to examine a number of transportation department organizational structures that locate planning at various levels in the structure and determine how each organization would execute the planning program;
3. Analyze transportation department organizational structures that locate planning at various levels in the organization and determine what system planning these organizations could effectively carry out;
4. Compare the results of the above 3 methods;
5. Prepare a paper on the successes and failures of present systems planning efforts and the relations of such efforts to organizational structure;
6. Continue research into the advantages and disadvantages of regional versus statewide planning approaches; and
7. Establish national goals and objectives for interagency involvement to accomplish systems planning.

ACKNOWLEDGMENT

The author wishes to express gratitude to the following members of the firm of Dalton•Dalton•Little•Newport for their assistance in conducting the telephone survey: Dennis H. Sherman, Richard Beckert, Neil Chase, Bryan McCoy, Les Bolstad, and Michael Werner.

REFERENCES

1. Ashford, N. The Planning Function in State Departments of Transportation. Traffic Quarterly, Vol. 27, No. 1, Jan. 1973.
2. State Departments of Transportation and Other State Transportation Coordinating Mechanisms. Council of State Governments, Lexington, Ky., Aug. 1973.
3. Proposed Ohio Department of Transportation. Dalton•Dalton•Little•Newport, pp. III-1—III-5, Feb. 1972.
4. Hand, I. State Development Policies and Planning. Highway Research Record 401, p. 4, 1972.
5. Creighton, R. L., and Hamburg, J. R. Current State of the Art in Statewide Transportation Planning. Highway Research Record 401, 1972, pp. 21-27.
6. Pyers, C. E. The Federal, State, and Local Role in Transit Planning. Maryland Department of Transportation, March 1973.
7. Gottemoeller, F. Multimodal Priority Ranking for Capital Improvements. Maryland Department of Transportation, Feb. 1973.
8. Action Plan Summary. Ohio Department of Transportation, July 1973.
9. A Status Report of State Departments of Transportation. Highway Users Federation, Washington, D.C., Dec. 1970.
10. Action Plan Describing the Transportation Planning Process. Maryland Department of Transportation, June 1973.
11. Maryland's Transportation Opportunity. System Design Concepts Inc., Washington, D.C., Jan. 1970.
12. Statewide Transportation Planning. NCHRP Synthesis 15, 1972.
13. Recommended Inter-Regional and Interstate Planning Coordination Process for Ohio State Planning Regions and State Service Districts. Ohio Department of Economic and Community Development, Columbus, Nov. 1973.



WORKSHOP 2: POLICY PLANNING

Robert Breuer, E. Wilson Campbell, Harrison Campbell, Gorman Gilbert, James Grannum, Douglas Haist, Donald Houghton, E. Ralph Johnson, Tom Lamphier, Thomas D. Larson, William E. Loftus, Oscar Mabry, Marvin Manheim, William R. Martin, Arrigo Mongini, Robert G. Rhodes, Larry Schulman, John Staha, Anton P. Talvittie, Bill Taylor, Theodore G. Weigle

Report

E. Wilson Campbell, New York State Department of Transportation, chairman

Workshop 1 first defined policy planning for transportation. Then, drawing on and expanding the discussion of policy planning issues in the conference state-of-the-art paper by Creighton and the workshop resource paper by Breuer and Schad, it considered how those issues can be dealt with by a

OBJECTIVES

To identify the current strategies being prepared and used by the states to develop and implement multimodal transportation policies and the importance of those policies in the transportation planning and decision-making process at the state level.

To recommend improvements in the development of policy as an essential element of the statewide transportation planning process.

To recommend a program of research in statewide transportation policy planning that considers the varying nature of state organizations.

ISSUES

What is policy planning at the state level? How are policies formulated? What is the transportation planner's role in the formulation of said policies?

What is the importance of goals and standards in establishing guidelines for the development of specific policies and programs?

What are the fiscal constraints that hinder or impede the development of specific transportation plans of a multimodal nature?

What is the role of the public in establishing statewide transportation priorities? How are the priorities brought into the process of decision-making?

How should responsibilities be assigned for the provision of transportation facilities and services to public and private agencies? What should be the subsequent relation of the state to them?

What is the relation of the state transportation department to other state and local organizations, such as comprehensive planning units, in the development of policy plans?

Are capital budgeting and programming of transportation improvements essential elements at the state level? If so, what appropriate techniques are currently being used to establish short-range as well as long-range capital improvements?

How can appropriate transportation decision-making processes be developed to include relevant environmental, fiscal, and other factors?

What effect will energy limitations have on both long-range and emergency plans, especially modal-mix and regulatory planning?

What policies are needed for distribution of transportation costs, particularly in relation to policies for user charges, tolls, taxes, or other revenue forms?

Should minimum standards of service be developed for special groups, such as the handicapped and the aged, or for particularly depressed areas, both economic and social?

transportation department. The present and most promising approaches of investigation, analysis, and evaluation for different types of issues were identified, and some organizational consideration was given to where policy planning should be located and what kinds of skills and capabilities are required. Then areas of research were suggested that could advance the ability of states and others to propose, develop, adopt, and implement transportation policy. Some conclusions and recommendations applicable to all of the policy areas were made.

DEFINITION OF POLICY PLANNING

The structure in defining policy planning is as follows:

1. Value, which is a broad statement of societal purpose, e.g., justice;
2. Goal, which includes a value and an action to be taken, e.g., increase safety or decrease pollution (goals may not be completely attainable, but achieving one goal may conflict with another);
3. Objective, which contains a value, is an action statement, and adds specific quantitative statements of the levels of achievement intended and time spans for its achievement, e.g., reduce air pollution by 50 percent in the next decade (objectives provide targets for program design, and implicit in them are acceptable levels of compromise and trade-off in attaining conflicting goals); and
4. Policy, which is a statement of the framework of freedoms and constraints within which society must operate to achieve goals, e.g., highways will not be located or built that raise air pollution levels above specified targets, or automobile pollution per mile must be reduced to a specified level.

Policy indicates a specified direction to be taken, but can be general enough to allow alternative objectives and actions to be proposed and evaluated. Policy planning, then, can be defined as the forming of a method for devising and achieving a course of action that is advantageous or expedient. It deals with constraints (financial and legal) affecting the authority, powers, and responsibilities of agencies and governments; the procedures, processes, and participants in decision-making and implementation; and the rules, standards, and criteria. Its products describe generally what is to be done, who is to do it, how, and within what limits. Systems planning, on the other hand, defines physical facility and service requirements for specific locations.

TYPES OF POLICY ISSUES

The workshop resource paper identified 6 policy areas; the conference state-of-the-art paper classified policy issues in 3 areas. For workshop discussion, policy and subpolicy issues were grouped into 4 areas:

1. Allocating responsibilities for providing transportation facilities and services and developing procedures for reaching transportation decisions;
2. Integrating privately provided transportation services into the statewide system;
3. Changing the nature and magnitude of the demand for transportation instead of the supply of facilities and services; and
4. Financing and charging for transportation.

These areas encompass most of the policy issues that influence the problems and activities of a state department of transportation.

ARRANGEMENT OF INSTITUTIONS

There are 2 aspects of institutional arrangements.

1. The allocation of responsibilities for providing transportation for all modes. For example, who owns, operates, assists financially, regulates, and mandates the nature and amount of facilities and services by mode? The state, the local government, the private sector, or a combination of these?
2. The procedures for reaching decisions on plans and programs to appropriately reflect implementing agency policies as well as comprehensive planning relations and social-economic-environmental factors. For example, the A-95 and the urban transportation planning processes attempt to ensure that comprehensive goals bear on decisions and that levels of government relating to land use and transportation development coordinate their actions. The 2-hearing process and development of environmental impact statements, for example, are designed to reflect socioeconomic and other considerations in decisions.

Techniques for Analysis and Evaluation

Budget Analysis

An analysis of the changing financial burdens on those responsible for different portions of the transportation system may reveal critical problems. This is particularly true for transit services, for which a projection of operating costs and revenues may indicate the need to modify the current responsibilities and, perhaps, state and local participation in supporting transit services.

Studies Similar to the National Transportation Planning Study

A summation of all metropolitan and state plans and programs and their comparison with anticipated revenues and funds prepared for the 1972 national study resulted in recommendations for changes in policies, program specifications, and responsibilities. These studies will be updated biennially.

Environmental Action Plans

The environmental action plans developed by states in response to the directive of the FHWA consist of 2 parts: an analysis of existing procedures for federally aided capital project development and a proposal for changes to better account for socioeconomic and environmental factors in transportation policy, plan, program, and project decisions. Although limited in some states to the highway mode, they offer a valuable inventory and assessment of the variety of procedures for participation and approval in decision-making and should aid states in improving current procedures for all modes.

Who Should Do Policy Planning?

The workshop agreed that there should be a focal point at the transportation department level or above to ensure that responsibilities and procedures for decision-making are being considered. For example, if the state policy is not to participate in capital or operating assistance or in the operation of urban transit, that policy should be established by a conscious decision rather than by default.

The workshop did not agree as to whether a policy group should be part of the commissioner-secretary's office or combined with the planning function in a transportation department. If there is no transportation department the policy group should be in the governor's office or in an executive office state planning group.

Proposals for policy changes should come as well from system planning. In carrying out their job, system planners will frequently perceive policies that need adoption

or modification. They should alert the policy group and participate in whatever analyses will support policy recommendations. Good systems planning is needed to contribute to better policy planning.

Skills and Background Needed

The following professional skills are needed:

1. Political scientist-public administrator to propose and evaluate new governmental procedures and responsibilities;
2. Budget analyst-program planner to estimate department capabilities, such as financial and staff, for undertaking new responsibilities;
3. Economist to project costs, revenues, and funding implications;
4. Lawyer to analyze and develop institutional structures;
5. Business manager to analyze the operations and capabilities of public and private agencies for providing proposed transportation services and facilities; and
6. Transportation planner to discern and identify transportation problems that are appropriate to organizational or procedural correction (rather than to correction by system or project decisions) and to help identify, analyze, and evaluate options.

INTEGRATION OF PRIVATELY PROVIDED TRANSPORTATION INTO TRANSPORTATION SYSTEM

Elements of the state transportation system provided by private enterprise—truck, bus, rail, air, water, and pipeline facilities and services—must be integrated into the total system, and the optimum service must be provided at minimum cost to the users by the appropriate private transportation industry. Bankruptcy of railroads and abandonment of branch lines and inadequate or excessively costly truck, water, bus, and air service require consideration of state regulatory and, possibly, taxing, charging, and investment policy actions. The state can also be an important advocate in national policy decisions in these areas.

Techniques for Analysis and Evaluation

Economic Analyses

Studies of (a) cost and value of privately provided transportation services for different modes, commodities, distances, and other differentiating characteristics, (b) the number of suppliers and users, and (c) the extent of competition will aid in assessing current and modified regulatory policy. The need for more data on private shipments was noted, as were the difficulties of securing such data from private companies.

Quality of Service

Studies of the areas of service and of the schedules, routes, equipment, and performance of carriers can help identify problems and suggest needed policy changes.

Secondary Economic Factors

Privately supplied freight transportation is a prerequisite to economic vitality. The effect of current service and the impact of transportation improvement on commerce, industry, recreation, resource development, and other economic activities in states and

regions should be analyzed and estimated. Opinion surveys are one source of information from the economic sector.

Who Should Do Policy Planning?

The workshop agreed that there needs to be a focal group at the level of the transportation department or at a higher executive level (e.g., in the governor's office) to consider the public-private relation. There was no great enthusiasm for an ad hoc committee of agency heads, even though the state public service commission (or other regulatory body) and the motor vehicle department will have to be involved along with the transportation department in most cases.

The workshop felt strongly that the private operator should be involved in the policy decision-making process and should be able to relate to a policy group (in or out of the transportation department) for regulatory or tax issues. Private operators should also be able to relate to the systems or project planner for many concerns such as rail consolidations or abandonments and terminals. Private operators should be compensated for costs of participation, e.g., supplying shipping data that public agencies may require for general planning purposes.

Skills and Background Needed

The following professional skills are needed:

1. Economist to analyze shippers and markets, competition and industry makeup, any costs and charges;
2. Lawyer to analyze, develop, and help implement strategies for regulatory change;
3. Financial analyst to (a) analyze carrier operations, costs, and reports, (b) assist in developing public financial assistance programs for support of needed but uneconomic service, and (c) analyze tax and revenue relations;
4. Regional planner to estimate regional accessibility needs and economic development impacts of service and cost changes; and
5. Transportation planner to (a) help obtain data on freight and passenger movement, (b) identify regulatory, charging, and investment options and help analyze them, and (c) estimate public facility cost implications (in many cases, the transportation planner should be a modal specialist with private carrier experience).

CHANGES IN TRANSPORTATION DEMAND

A state can influence the demand as well as the supply of transportation. In addition to providing or aiding in the provision of transportation facilities and services, a state transportation department should identify, investigate, and recommend policies that affect the magnitude and nature of transportation demand. Some of these have long-range and some have short-range effects. They include controls and incentives on land development, regulations and incentives for greater car pooling, staggered work hours, and rationing of fuel. These and other policies can reduce the amount of transportation demand or make it easier for that demand to be served by public transit, for example.

Techniques for Analysis and Evaluation

Simulation Models

The transportation models used in metropolitan transportation planning can be used to

assess the performance consequences of assumed changes in demand. They should be aimed at predicting the effects of policy alternatives on transportation demand and the characteristics that affect modal use and performance.

Studies of Accessibility and Land Use Impacts

Transportation facilities and services can be used as positive influences in shaping metropolitan and state patterns. Studies of highway and transit impacts on economic development, land use, and tax base are sources for predicting these impacts.

Economic Studies of Impacts on Community Segments

Policies affecting land use and travel generation have secondary economic impacts of major consequence to specific segments of the community. Tracing these effects on social groups (the handicapped, low-income, and minority groups), geographic areas (the central business district and suburbs), and economic sectors (industrial, agricultural, and retail activities) is essential.

Who Should Do Policy Planning?

The workshop agreed that a partnership is required among transportation department planners, local and regional comprehensive planners, and the business community. Within the transportation department, the systems planner will have a key role. Many needed policy changes will emanate from system planning studies, and cooperating agencies, rather than the transportation department, will be responsible for their implementation. The cooperation of the state planning agency will be essential if state policy and legislation changes are required.

Skills and Background Needed

The following professional skills are needed:

1. Land use planner to analyze and predict the impact of policy changes, particularly accessibility, on land use densities and patterns;
2. Economist to evaluate and trace economic consequences of policy changes;
3. Lawyer to develop legislative procedures, especially where the limits of allowable public control are being tested; and
4. Transportation planner to analyze, predict, and demonstrate the transportation benefits, costs, and other impacts of changes in community structure and operation.

FUNDS AND CHARGES FOR TRANSPORTATION

A state will want to recommend the investment magnitude and allocation to modal types and geographic areas. The allocations are used as a guide to systems planning. (This would be an iterative process. The allocation might be based on the results of prior system planning, although not necessarily identical to it.) The state will be concerned, therefore, with the mechanisms and policies that determine these amounts.

Funding arrangements include trust funds, pass-through funds, earmarked funds, and cost-to-complete funds (such as the Interstate program). They all have system programming implications that might prevent the implementation of the best kind of transportation solutions.

Present methods for charging for transportation by government, authorities, and private companies often have disadvantages that are not really clear or obvious. They

may be inequitable to different users, may encourage overuse of one mode and congestion, or may preclude a mode from receiving adequate funds for continued operation and investment. A state may want to propose altering taxing, pricing, and charging policies to achieve some of its broader goals.

Techniques for Analysis and Evaluation

Needs Studies

Studies of needs might be used, but should be modified and expanded to include varying levels of physical and service standards and evaluation of the resulting levels of cost, performance, and benefit.

Cost and Revenue Allocation Studies

Studies of costs and revenues attributable to different geographic areas and classes of users, especially in the private sector, are a prerequisite to examining the equity of charging.

Alternative Budgets

Developing and evaluating plans and especially programs under alternative budget assumptions will be helpful.

Price Elasticity Studies

The relation between transportation demand and use and level and means of charging is needed. This is not usually reflected in current metropolitan transportation simulation models.

Modeling

Gross models of the type developed for the 1972 National Transportation Study relate performance measures to investment levels (rather than to particular system configurations) and should be of value.

Who Should Do Policy Planning?

A partnership of the transportation department with other agencies that charge or distribute transportation funds (such as the motor vehicle and tax departments, federal and local governments, and private enterprise) is essential.

Within the transportation department, a policy group must coordinate financial policy changes with the legislative and other executive participants in policy-making. The policy group must be able to consider multimodal budgets and policies. The systems planner will be working closely with cooperating agencies who have the responsibility for charging for and funding nonstate facilities and services.

Skills and Background Needed

The following professional skills are needed:

1. Budget-financial analyst to analyze and estimate the incidence of costs and the revenues of various options (bonding and state and federal aid) for various levels of government;
2. Economist to analyze and estimate the incidence of costs and charges to private suppliers and, ultimately, transportation users as well as governments;
3. Program planner to assess impacts of funding procedural changes on current programs; and
4. Transportation planner to analyze and predict the impacts of changes in funding level and type on transportation needs and to interpret and convey information to the public and to policy-makers.

RECOMMENDATIONS

1. Policy planning is a function too important to leave to happenstance. It should be the basic function of a special group closely identified with or reporting to the highest agency in state government having primary responsibility for state transportation planning. It could be attached to the governor's office, the commissioner-secretary's office, or the state planning office in states without transportation departments.
2. The policy planning staff should be equipped to perform the variety of analyses applicable to the different types of transportation policy issues. If such analysis ability exists elsewhere in the agency, it need not be duplicated in the policy staff, but that staff must be knowledgeable enough to call on and use other staff services. The types of analysis most frequently required of or to be used by a policy planning staff are studies of needs, standards, performance measures, and relation to benefits; studies similar to the National Transportation Study; budget and financial analyses, e.g., carrier ledger sheets and operating statements; economic analysis, e.g., costs and values of service, benefit-cost competition, and price elasticity of demand; quality of service relating to performance, schedules, and customer satisfaction; simulation modeling; impact incidence on users, nonusers, providers, and governments; studies analyzing and leading to resource allocation to total transportation and to subareas such as regions, modes, or governments; and surveys of opinions and habits.
3. The types of skills and backgrounds most applicable to the range of transportation policy issues include the following:

	Policy Issue			
Skill	1	2	3	4
Political scientist and public administrator	X			
Budget analyst and program planner	X			X
Economist	X	X	X	
Transportation planner, analyst, and engineer	X	X	X	X
Lawyer	X	X	X	
Financial analyst		X		X
Regional (land use) planner		X	X	

4. The roles of the transportation planning professional in policy planning include problem identifier (discern whether solutions are organizational-procedural or systems-project); options identifier; coordinator, negotiator, and catalyst, particularly in relation to private-government relations; innovator and initiator of new policies; and interpreter of information and analytical results for the public and policy-makers.
5. The transportation department's legislative program should flow from the policy group. That group should coordinate the development of and monitor the progress of legislative programs to ensure consistency with policy. Further, it should monitor and analyze federal legislation for impacts on state policy.
6. Policy groups should serve as a principal resource for public information personnel relating to policy matters. Public information people prepare speeches and responses for the commissioner-secretary, and frequently, if they are not sure or clear

on what department policy is, they may inadvertently create it. They should use the policy group as a resource and allow the policy group to review all important statements.

Resource Paper

Robert Breuer and F. David Schad,
New York State Department of Transportation

Plans are often subject to 2 contradictory types of criticism. On the one hand, if they are made without the constraints of financial resources, the limitations of legislated powers and policies, and a realistic assessment of political factors, they can be criticized as being impractical and idealistic. On the other hand, if plans are developed within these constraints, they are often criticized as being too narrow and limited in scope and for attacking symptoms and not the underlying institutional-political basis of problems.

One way out of this Scylla and Charybdis of planning is to realize that different types of plans may be appropriate for different clients. A department that sees its role as implementing given policies and programs will undoubtedly require the latter, more practical approach. A department that intends to alter the framework of transportation activities and is willing to consider changes to institutions and budgets and programs will want the former, less constrained approach. In such a case, many of the plan's facility recommendations may never be carried out, but the plan may still be significant for the policy changes it ultimately achieves.

Increasingly as state transportation departments are formed, they raise questions of the institutional-political-financial framework of transportation, and they must deal with policy changes that affect this framework. Although planning for single purpose, narrowly determined problems may be simpler and safer, it will be increasingly unacceptable to states and other governments. Policy decision-making, therefore, must be a significant element in a statewide transportation planning process.

Numerous transportation policy issues need to be addressed by states and state agencies. The object of this paper is to define responsibilities and to discuss how states might meet the issues. Throughout, it must be recognized that the prevailing national and state situation is one of a multiplicity of separate, uncoordinated, and often conflicting modal policies. Whether the amalgamation of separate state policies, any more than a collection of separate federal policies, will represent a viable national policy remains to be seen.

TRANSPORTATION POLICY: THE PRODUCT AND THE PROCESS

To begin with, the Oxford English Dictionary defines policy as "a course of action adopted and pursued by a government, party, ruler, statesman, etc. Any course of action adopted as advantageous or expedient." Primarily, then, policy is a political matter, something made in a political arena by decision-makers who negotiate and act in the knowledge of what they want and of what is politically feasible. The words "adopted and pursued" suggest an element of forethought that goes beyond usual political considerations. Some prior analysis or planning, dealing with the issue involved, may condition or provide a basis for the policy decision to be made. In any event, policy is something concrete, a course of action no matter how hazy may be the words surrounding it. This course of action most frequently is set out in legislation and in budgets.

This suggests that the legislative and budgetary processes are a ferment of policy-making. Although this is true, that ferment is at a low simmer much of the time. Major shifts in policy are rare; policy changes are usually slow and sporadic. All too

frequently, they are inconsistent.

In many instances, however, the political-legislative-budgetary process does not address policy issues clearly. The usual piecemeal approach to isolated facets of policy issues, although appropriate to the particular concern of the moment and to the loose, ad hoc responsiveness of legislators to their constituents, frequently raises severe difficulties for executive agencies that are charged with implementing the statutes within prescribed budgets.

In addressing their responsibilities in the face of seeming if not real contradictions in the actions of the decision-makers, executive agencies find it necessary not only to ferret out what policies or policy objectives are intended but also to take a course of action in spite of policy conflicts. Some may act as policy-making bodies when no specific guidance has been given in areas of their responsibilities. The proper response in all such cases, however, is not a usurpation of legislative prerogatives but the exercise of policy analysis or policy planning.

Funk and Wagnalls defines planning as "to form a scheme or method for doing, achieving, etc. To have as an intention or purpose." Combining the 2 dictionary definitions yields the following for policy planning: "to form a scheme or method for achieving a course of action by a government, etc., that is advantageous or expedient." Webster defines analysis as: "separation of anything, whether an object of the senses or the intellect, into constituent parts or elements." (In view of the disparate inputs that must be considered in policy-making, we thought it appropriate to employ a variety of recognized sources to help reach unbiased definitions.)

The process to be discussed here combines elements of planning with those of analysis. For our purposes, the meaning of policy analysis should include the following: (a) the definition of transportation problems and the consideration of alternative solutions are to be systematic, employing such tools as systems analysis, and (b) the results of these analysis activities must reflect the realities of the legislative and budget-making processes and include recommendations that could be implemented within those realities. Recommendations that "we all love one another " may be good ethics and philosophy, but they are not operative as policy.

This initial focus on definition is not intended to split semantic hairs, but rather to contrast policy issue decisions with plan decisions. System and project planning identifies and specifies what facilities and services are desirable or necessary or appropriate for a particular time and place. (Services are included because a facility description is not sufficient, especially for public transportation modes—including regulated common carriers—where service is consciously designed and provided by an operator, in contrast with highways, where service is the product of facility characteristics and user volume.)

Policies, on the other hand, describe what is to be done, usually in general terms. Further, and more specifically, policies designate who is to act and how and within what limits the action is to be carried out. They deal with constraints, both financial and legal, affecting the authority, powers, and responsibilities of agencies and governments; the procedures, processes, and participants in decision-making and implementation; and the rules, standards, and criteria that are to be followed in transportation development. In contrast, transportation planning accepts such constraints as conditions within which to plan; it seeks to accomodate transportation needs or desires and does not consider whether those "needs" should be met or whether the constraints should be changed.

Policy Analysis-Planning

Policy analysis or policy planning precedes and follows policy determination. To formulate an adequate transportation policy requires that initial decisions be made concerning the quality of life, costs, and so forth within the context of the political process. With those decisions in hand, the planner or analyst can devise tentative parameters such as those concerning environmental standards, mobility requirements for special groups, and effectiveness of various modes in meeting various classes of travel demand. Detailed strategies to achieve selected goals can then be considered including use of

regulatory power, concentration on public transportation, and diversion of long-distance travel to bus, rail, and air carriers. This is not a sequenced process, however, but a dynamic iteration as decisions at one level affect those preceding and following.

It is necessary to identify the policy that, more often than not, is concealed within the language of the statute, regulation, manual, or budget allocation. Equally as important is tracing out the consequences of the various ways in which the policy might be implemented. This means that the consequences of a transportation policy must be followed through the existing institutions and circumstances of transportation and that the connections of that policy to concerns and considerations outside of the immediate transportation area should be clearly indicated. Further, the policy analyst must examine extratransportation policies for the impacts they may have for transportation.

A problem with many policy statements included in program or enabling legislation is that they are both broad and specific. They are broad in asserting general intentions—or assumed consequences—and, at the same time, are quite specific in the assignment of responsibilities and authority and in establishing procedures. All too often, however, a particular law, regulation, or procedure contains within itself contradictory implications for the intended policy. Further, it may diverge from other ongoing policies equally strongly held, even though they may be implicit. Procedures imposed may not be the best way to implement the policy in question because of too limited a consideration of alternatives. Often a policy as stated is inadequate in assigning responsibilities without commensurate authority or in providing insufficient financial capability. As one means of minimizing these shortcomings, the expression of a policy in legislation or direction of budgetary authorization should emphasize the objectives to be obtained.

The process of policy planning can be cast in terms similar to those describing system and project planning: identify problems, conceive alternative solutions, and evaluate their consequences. In the case of policy planning, however, the alternatives are not for facilities and services, but for authority, responsibility, rules, criteria, and standards. Policy analysis will note inconsistencies between specific rules on program categories and between general policy and program objectives. It will take into account discrepancies between authority and responsibility and recommend changes in jurisdictions and powers. It will measure the gap between financial resources and needs and recommend changes in program allocations, taxation schedules, or user-charge policies. The consequences of a given policy must be traced into facility and service plans in order to assess the impact of the policy on the achievement of goals and objectives.

Hierarchy

Given that there are policy processes proceeding in a mixture of independence and dependence at the federal, state, and local levels, examination of the policy process might appear to be hopelessly snarled. Some order can be made in this situation if we account that policy at one level is another level's condition or constraint.

The legislative process, in setting policy in law, creates an environment within which executive agencies must set their subordinate policies. Viewed in this way, the policy activity of the executive agency is, in our first definition, policy planning intended to achieve the course of action set out by the legislature. In like fashion, transportation planning of the several states in responding to federal policy is also engaged in policy planning, i.e., finding the method to accomplish the federal policy in light of parallel or conflicting policy set by their own legislatures as well as by other federal agencies.

A series of nesting Chinese boxes might be a simile for the policy process; the policy at one level encloses lower level policies while being contained within higher order policy.

Subordinate levels within the hierarchy engage in all aspects of the policy process. Within their purview, they develop and enunciate policy. In many cases, however, subordinate agencies must perceive the need for policy development or alteration to analyze existing circumstances and institutions and to recommend to higher authority policies

that can only be established at the higher level.

In every case, however, policy applies only to the level that enunciates it; that is to say, it is not policy for the federal level to say that, "Our policy is that the several states shall do thus and so." In this there is no course of action for the federal level. Any policy requires that the initiating level will pursue a course of action to achieve certain objectives. Although such a course of action may compel, induce, or suggest certain actions by lower levels, it cannot be construed to be the policy of the lower levels; that must come about through their own policy development mechanisms.

The role or, rather, the roles of the federal government in the hierarchy of the policy process are critical. By its action or inaction, this level compels response at lower levels, particularly by the states. For all of its impact, however, the federal government has yet to develop a total transportation policy or policy guidance for a concept of transportation that embraces all modes.

Although during the past 50 years the Congress and the executive branch have not developed a comprehensive national transportation policy, many policy-oriented studies have been conducted and quantities of data have been gathered. In 1942, for example, the National Resources Planning Board, at the request of President Roosevelt, issued a report, Transportation and National Policy. Among its recommendations was the creation of a national transportation agency "to coordinate all federal development activity in transportation." In 1966, the U.S. Department of Transportation was created. No unified transportation policy developed, however, either in the legislation creating the department or by the agency itself.

A further report titled National Transportation Policy was issued in 1962 by the Senate Commerce Committee, which called for balanced and coordinated regulation as well as promotion of transportation "to the end that the needs of the commerce of the United States, of the Postal Service, and of the national defense be met."

The lack of a coordinated national transportation policy may be the result of many causes. It is evident that any clear and comprehensive policy declaration capable of implementation would conflict with one or more established interests. On this account the Congress may find it difficult, if not impossible, to provide the policy leadership federal agencies need. This is not to say that federal agencies with transportation responsibilities lack policy guidance. What they do have are compartmentalized, separate policies that apply to their special responsibilities. The guidance for the Federal Maritime Commission, for the Federal Aviation Administration, for the Federal Highway Administration, for the Interstate Commerce Commission, and a host of others does not fall under a blanket policy for transportation as a whole. Although it may be said that these policies taken together constitute a national transportation policy, it can be better argued that multiplicity of long-set, client-oriented, separate policies impede the development of an overall policy.

These separate policies, expressed in law and regulation among the divided modal administrations and regulatory bodies, constitute another set of Chinese boxes. State and local policies might be nested within these separate boxes, but there is no set to enclose all transportation activities at all levels.

It should also be said that there may be philosophical opposition to the establishment of a national comprehensive transportation policy. The current Administration has put emphasis on a concept of "New Federalism." The principal elements include returning powers and initiatives to the states and local governments along with revenue sharing, executive reorganization, and deregulation of common carriers. Although there are merits in each of these elements, the overall impact is to lessen substantive national policy-making in the transportation field.

The view of the authors is that from a technical and administrative standpoint the absence of and the impediments to a national transportation policy are unfortunate. For all the unique circumstances among the states and for all the political considerations that must be weighed, the mounting crisis in urban transportation and in railroad transportation requires strong and effective policy guidance at the national level. Things may have to get a great deal worse, however, before sufficient pressure is brought to bear on the issue of national policy.

We cannot recommend waiting for crisis to impel action. The units of local govern-

ment and the states in particular have the responsibility to address transportation issues within a policy context and to bring their technical and political resources to bear not only to move the federal establishment but also to set examples for national action.

Conclusion

This brings us, finally, to a connection between policy planning and statewide transportation planning. This connection is illustrated by the content of the New York statewide master plan for transportation and others like it.

Such plans differ significantly from urban or regional transportation plans in that they are more than a delineation of facility and service plans for intercity passenger and freight systems at the statewide scale. They are more than a summary of urban and regional plans. The significant difference is their inclusion of recommendations for changes in federal, state, local, and private transportation policies. Some recommendations are for state and local action to be implemented through actions of the Department of Transportation. Equally important, the Department of Transportation must be an advocate for changes in the policy constraints set at the federal and state levels within which it, and other providers and operators of transportation, function.

It is hoped that the above discussion has brought out not only the characteristics of policy issues but also some idea as to how to deal with them. In summary, the outcomes and consequences of existing and proposed policies must be examined. For the former, past and current trend data may be instructive. One way—but not the only way—to trace out consequences is to make illustrative plans under present or assumed constraints or, alternatively, estimate plan output. The 1972 National Transportation Study is a good example of such quantitative policy analysis.

Policy outcomes must then be evaluated against goals. The traditional transportation evaluation goals—safety, congestion relief, operating efficiency, return on invested funds—are equally as valid for evaluating policies as for plans. Policy evaluation, however, must put heavy emphasis on the more general goals. Although noted in every planning report, these goals are difficult if not impossible to quantify and have often been overlooked by transportation planners. These are the goals of environmental and social sensitivity, mobility needs of special segments of the population or areas of the community, and an equitable distribution of the charges and benefits of transportation. In these areas, some form of system analysis appears to be most helpful.

All too often, policy recommendations are based on an apparent or intuited relation between the proposal and a desired goal. Usually it develops that certain consequences or circumstances have been overlooked and the policy, in consequence, fails. The professional can help in specifying the consequences and circumstances to provide a better backdrop against which the evaluation analysis can be made. He can then better suggest alternative policies or policy modifications whose outcomes will be closer to the desired goal. It is precisely this sort of role that the transportation planner can come to play.

To structure the following discussion of many and varied transportation policy issues, we have combined the issues into 6 groups:

1. Allocation of responsibilities for the provision of transportation facilities and services,
2. Decision-making process for transportation,
3. Integration of privately provided public transportation into the state system,
4. Changing the demand for transportation facilities and services,
5. Funds for transportation, and
6. Charging for transportation.

ALLOCATION OF RESPONSIBILITIES FOR THE PROVISION OF TRANSPORTATION FACILITIES AND SERVICES

The existing distribution and allocation of responsibilities for various elements of the transportation system is quite complex; probably no 2 states have the same mix. The present situation is a product more of accident than of design; it is the accumulation of many incremental decisions made to meet specific and seemingly separate problems that reached a crisis stage (e.g., the state and municipal rescue of transit systems when private operators fell bankrupt). The difference between what might be ideal and existing patterns of responsibility is further complicated by changes in transportation needs and in governmental capability to meet these needs—lack of competence, financial resources, or incentives in the agency or governmental level responsible.

A statewide plan will inevitably find that, if current jurisdictional responsibilities do not directly contribute to the cause of many transportation system inadequacies, they hamper or prevent their solution. Policy proposals to modify the jurisdiction and responsibility of governments are, therefore, appropriate parts of statewide transportation plans. Such proposals should be part of operational strategies devised to achieve the broad transportation goals of all levels of government and not simply to make things easier for one jurisdiction or another.

New Responsibilities for States

Continually there are pressures for new or altered responsibilities for state departments of transportation or other state-created agencies such as transportation authorities. For example, several states have entered the railroad business, generally acquiring the facilities and equipment of bankrupt railroads to prevent the abandonment of service. The federal government has assumed responsibility for almost all intercity rail passenger service. In the future, as the federal government expands its involvement in rail freight operations, further pressures for state action will be more widespread.

Since the issue of rail branch-line abandonment is discussed in a later section of this paper, it may be sufficient at this point to note that state acquisition of rail property is only one of several options. Given the pressures for maintenance of freight service considered essential to local or regional economic activities, a regional or an independent branch-line operation might be a more appropriate solution. In such instances, the state may assist through using its condemnation powers to acquire the right-of-way or through providing seed money to start the new operation. Possible subsidy requirements should be made explicit so that all parties concerned may better weigh alternative approaches for economic stabilization or improvement. Before major financial commitments are made, measurements should be made of the efficacy of branch-line service maintenance versus other transportation solutions, such as truck service and piggyback service, or in comparison with nontransportation solutions, such as vocational training and tax relief, in achieving the basic economic goal.

Rapid transit systems typically are the responsibility of special authorities set up by the state or by cooperating local governments when, as is the usual case, service extends beyond the boundaries of a single local government. However, direct state ownership and operation are alternatives, as is the case in Maryland. The implications for wider responsibilities implicit in the freedom to shift funds between modes through the Federal-Aid Highway Act of 1973 will be increasingly important as programming of urban system improvements devolves on local governments.

Obsolete Jurisdictions

State responsibility for highways varies significantly among the states. In some, counties and towns have little or no responsibility; in others, a state may extend assistance to projects in lower jurisdictions in addition to supporting its own programs.

The recent highway classification study, a part of the 1972 National Transportation Study, brings out many of the inconsistencies in state responsibility. In New York, for example, a substantial number of miles of collector roads, especially in rural areas, are under state jurisdiction. On the other hand, a significant number of urban arterials, whose future investment needs will far exceed local capabilities under present financial arrangements, are under local jurisdiction.

A realignment of jurisdictional responsibilities to make that of the state commensurate with the interregional and major highways and roads of greatest investment needs was suggested in the draft of the New York State transportation plan. The draft received particular comment on this proposal, comment that questioned the financial and technical capabilities of local governments in rural areas to assume the substantial mileage and cost responsibilities that would be put on them. A modification to a simple functional classification as the basis for jurisdictional responsibility may be appropriate. Instituting changes in local aid formulas for highway maintenance may also be desirable.

In many urban areas, arterials are built to expressway or other high-cost standards. Typically, a state highway system is not extensive in urban areas. Only since 1946 have urban roads been eligible for limited but growing amounts of federal funding, and only recently under the cost requirements of such arterial programs have many state governments responded by enlarging their jurisdictions in urban areas.

An alternative to enlargement of state jurisdiction within urban areas—and the attendant problem of responsible decision-making—is the pass-through concept, i.e., making urban highway funds available to local governments. The Federal-Aid Highway Act of 1973 gives local governments a major role in programming decisions in addition to their participation in metropolitan system planning.

Construction Versus Operation

Policies on the assignment of maintenance and operational duties and costs will also become increasingly significant as demands rise for new types of sophisticated and complex projects to improve urban streets and transit service. Joint highway-transit projects are an example. Such projects offer the potential for improvement at minimal community environmental and energy costs as well as construction costs. Traffic control signals, painting and signing, reversible lanes, and ramp metering are potential areas of operational improvements. In the future, pedestrian and bicycle paths, now eligible for federal assistance under the 1973 highway act, will receive increased attention. All of these projects, however, have major and continuing costs for operation and maintenance.

In some cases, responsibility for operation of certain aspects of highways is required of local governments (e.g., in New York State, lighting will not be provided unless local governments agree to assume the energy costs). In other cases, states contract with county or local governments for operation costs. Although the principle of state assistance and local direct operational responsibility may be attractive, whether this arrangement can ensure that minimum state standards will be maintained is not known.

In addition to the state-local question of transportation responsibilities is the matter of policy consistency among state programs. For example, the New York State Department of Education has a program to completely reimburse local school districts for school bus costs where sidewalks are not available. This has had a predictable impact on the provision of sidewalks by local governments and on their interest in offering to maintain them when they are included in state projects.

Federal-Assistance Policies

Although there is ample opportunity for the study of the allocation of responsibilities between state and local governments and for analysis of the broad spectrum of state policies as they affect such responsibilities, the overreaching concern should be the im-

pact of federal policies and programs. The inclination of the Urban Mass Transportation Administration to deal directly with local government on transit matters and the earmarking of urban highway funds to local governments and areas required in the 1973 highway act raise serious questions as to the state's role and its capacity to frame its own policy to achieve its own goals.

To the extent that a given state has capability, UMTA may elect to deal with the state. Behind this willingness, however, may be greater concern with conformance to the federal agency's goals than with the technical expertise of the state. Whether UMTA deals with the state or directly with localities, its program, as an expression of federal policy, is a condition affecting the state's ability to develop and implement its own transit policy. Further, the lack of a national overall transportation policy framework makes it difficult for the states to relate the independent UMTA policy in transit to an overall state transportation policy.

Although this federal conditioning of state policy-making has been part of every federal program, the impact on state-local transportation relations has been greatest in the 1973 highway act. Before addressing the act's provisions, we should discern the objectives that may lie behind the legislation and compare them with those of the states. In this, care should be taken to sort out the transportation objectives (they may be common for both the federal and state levels) from the institutional objectives of state agencies and from the broad issues of state sovereignty.

DECISION-MAKING PROCESSES FOR TRANSPORTATION

Decisions on transportation facilities and services are not made alone by agencies directly responsible for their provision. Increasingly there are complex formal procedures for the participation in and the review of transportation decisions. Impacts, other than on transportation service, may be at least as important as the direct effects of a transportation decision. Procedures and requirements for decision-making must be changed when, as is often the case, dissatisfaction with the transportation system can be attributed to inadequate consideration of the views of affected parties who are outside the existing process. It may often appear that the power to veto or halt transportation development has been granted to almost everyone; in any case, there has been no analogous broadening of the power, or responsibility, to achieve or act.

The state policies are crucial to decision-making because of the importance of state government in creating the powers and constraints within which agencies act. Equally important, the state is required to determine and implement procedures for the effectuation of federal policies. A statewide plan, therefore, will appropriately consider new policies, both legislative and procedural, to improve the process of transportation decision-making.

Traditional Transportation Decision-Making

Many transportation decisions appear to involve technical factors only, and transportation agencies probably make most of their decisions on the basis of internal criteria that reflect generally accepted technical standards and rules; they answer for those decisions primarily to their chiefs and to national professional organizations. This is the rule for many agencies headed by long-term commissions. Generally, this posture can be retained when the transportation need is clear-cut and there is a consensus in support of the agency's activities. In addition, a strong client group may exist with close links to the agency; the Corps of Engineers, the state highway departments, and regulatory agencies are examples. The major accountability of such organizations to the public is through the chief executive and legislative budget decisions rather than directly through programs or projects.

A critical policy question is how to make such agencies responsive to the public or even to the political process. There is increasingly a realization that affecting the long-range plan is not nearly so significant as affecting the programming decision on

what will be built this year and next. Examining the programming and budget process may be of some assistance. For some programs and agencies, the legislature decides the agency's actions by budgeting on a project-by-project basis, selecting from among those recommended by the agency. In other cases, the legislature votes on a program of projects the agency intends or is committed to implement. In still other cases, the legislature votes on a program budget with varying details about subprogram and area allocations, but not on projects.

Although a project-by-project or a list-of-projects action by the legislature might appear to be more subject to political considerations—as opposed to objective and rational factors—it may, in fact, not be so. Approval of a "blank check" may merely postpone the political trading to a later time, when it is done in secret. Proposing a list of specific projects requires some accountability to the public, including changes made in it. A governor or chief executive may wish to have the flexibility to trade projects for votes needed for some other issue. Granting that this is perhaps inevitable, making revisions to programs public may be the ultimate protection of the people from arbitrary governmental decisions. The Federal-Aid Highway Act of 1973 gives new powers to local governments over the programming of the Federal-Aid Urban System, subject to state concurrence. It will be of interest to see the impact of this broadening of responsibility and the new institutional arrangements that will evolve.

Independent Authorities

As a reaction to the "political influence" on agency decision-making, to bypass assumed deficiencies in executive agencies, and to achieve budgetary freedom, independent authorities have been set up in many cases. These authorities are often regional in character and are usually specific in their modal responsibility, such as toll roads, ports, and public transportation operations. They usually answer for their stewardship of transportation facilities to the bond market and bondholders, not to a legislature.

Clearly, the decision-making process for such authorities has been set outside of government. Although they generally are credited with getting things done, they are also often disliked and feared as being beyond public accountability.

Procedures to open the decision-making process to a wider spectrum of views and participants increasingly are being forced on such authorities. There is a built-in paradox, however; their separation from general governments and general government revenues and the strictures of their bond covenants make it difficult for them to take a comprehensive view and to accept increased project or system costs to achieve environmental, general community, or some minority group benefit.

What can be done to make decisions by such authorities more responsive? Clearly, the single-mode focus can be broadened; proposals are made to make these authorities multimodal, thereby enlarging their responsibility and permitting some reallocation of funds. More important, a multimodal responsibility inevitably brings a broader view of transportation options and potential solutions.

This approach, however, may have its effect delayed until existing bonds with their restrictive covenants are retired. It is also a question as to whether multimodal authorities will be successful in floating new bonds without restrictive, long-term cross-subsidy provisions. As long as the authorities must be responsible to bondholders, they are limited in their response to the general public. On the other hand, to abandon independent financing, the authorities would in effect revert to being agencies of government, again faced with budgetary constraints and perhaps other institutional disabilities.

Comprehensive Planning

The process for cooperative, comprehensive, and continuing transportation planning was mandated by the federal government more than 10 years ago as a new approach to improve the decision-making process for metropolitan areas. In spite of acknowledged inadequacies, the urban transportation study process has been accepted and continually

enlarged. The 1973 highway act provides additional funds for metropolitan transportation study groups to spend or allocate.

Transportation agencies at federal, state, and local levels and comprehensive planning agencies at state, region, county, and city levels are included in the process to facilitate the coordination of transportation plans with other metropolitan plans. In some urban areas, the metropolitan transportation study has been incorporated into a regional comprehensive planning agency or council of governments framework. Usually this broader agency is also the metropolitan clearinghouse of comment on all federally aided projects.

A serious policy question can be posed, however, about the grant to regional agencies of development and review powers for the urban transportation plan. This is precisely the level at which there are no government, no constituency, and no implementation powers. Studies should be undertaken to evaluate whether plans developed and reviewed in such situations are usable and realistic. From the implementing agency's viewpoint, it is important to determine whether such plans reflect program restraints and influences.

Regional agencies are rarely known and, like independent authorities, not directly answerable to the public. What can be done to make such agencies responsible? One direction is illustrated by the sporadic movements toward regional government among local jurisdictions. They have not been widespread, however, except for the transfer of limited municipal activities to an existing inclusive county.

Public Participation

In the 1960s many public programs felt the pressures for increased nongovernmental influence on decision-making. "Maximum feasible participation," a phrase coined for the antipoverty programs, is now being heard in the transportation area. Early steps in this direction were the expansion of the highway planning process to include 2 public hearings and, later, the requirement to prepare environmental impact statements. These measures were clearly intended to open the decision-making process for the earlier and more meaningful inclusion of social and environmental factors, many of which can best or only be judged by local communities or impacted-area residents.

A statewide plan, within federal policy guidelines, can offer significant policy direction to the attempts at expanding participation in decision-making. An environmental action plan is now being developed by every state, pursuant to the Federal Highway Administration's interpretation of the implementation requirements of the National Environmental Policy Act. (The FHWA response to the responsibilities under the act is typical. Although the act gives FHWA the responsibility for an environmental action plan, FHWA has chosen to impose the requirement on the states and has used its funding control to ensure compliance. This could, of course, be interpreted as a federal policy to leave the states free to determine their own environmental policies and plans, i.e., the New Federalism, rather than as agency incompetence or a device for passing the buck.) Environmental action plans will most likely mean new staff with additional skills as well as agreements with other agencies for environmental and social aspects of the plan implementation.

There are serious concerns in the minds of many professionals that the greater weight of subjective and intuitive factors will submerge the consideration and importance of "real" transportation system characteristics and needs. The need to achieve a virtual consensus by bargaining and negotiation before action is the antithesis of a technically objective evaluation. There have been attempts at creating complex frameworks to structure such participatory decision-making. However, there is the real question as to whether these will achieve not the best but rather the minimally acceptable system. Given the apparent irreconcilable conflict between technical efficiency and effectiveness and participatory decision-making, it might be considered that the objectives of the new requirements are not transportation objectives. If good transportation facilities and systems come out of the process, they are only extra benefits of a process intended to accomplish something else. Again, the minimally acceptable

solution may indeed be the "best" solution possible.

Litigation

A further complication is the entry of the courts into transportation decisions. The National Environmental Policy Act appears to provide for judicial review of both the form and the substance of decisions by implementing agencies. Whether a court is the proper forum for such decision-making can be seriously questioned; however, once decisions become adversary procedures, this may become necessary. In any case, the potential of litigation for delay and death of transportation projects is clear.

Pass-Through Funds

An unstated but emerging national policy deals with the decision-making process by bypassing the states to give funds in some cases and decision authority in others directly to localities. General revenue sharing has already been implemented, and there are proposals for transportation revenue sharing as well. It is uncertain how state policies for the emphasis and priorities of transportation needs can be reflected in such circumstances.

The Federal-Aid Highway Act of 1973 provides for appropriate local government to propose a program, which conforms with metropolitan plans and is subject to state concurrence, for expenditure of urban system highway funds. Within federal guidelines, now being determined and promulgated, the state must set a policy and procedure for cooperatively developing metropolitan highway facilities and, since reallocation of highway funds is provided, transit facilities as well.

The need for public and special interest group participation may be even more crucial in program decisions than in project- and system-planning decisions. Methods for meaningful participation beyond the public hearing or unstructured response to draft reports must be sought.

To date, the major area of impact of the participatory policy has been in highway planning and development. It can be argued that, given the extent of existing highway systems, we can afford the time delays and the increased costs of public participation without seriously impeding highway transportation service. Whatever the merits of that argument, in the case of public transportation investment and development, extended delays in the face of a continuing fuel shortage may have too high a price. This is not intended as special pleading for transit; what is intended is a question as to the relative weight of social, economic, and environmental objectives in the decision process under extraordinary conditions.

It is suggested that the absence of a national energy policy has been a significant contributor to the development of the current fuel crisis. The continued absence of coordinated national transportation land use policies will undoubtedly adversely impact state policies and programs as states attempt to deal with these areas in a comprehensive manner.

INTEGRATION OF PRIVATELY PROVIDED PUBLIC TRANSPORTATION INTO THE STATE SYSTEM

As transportation planning has broadened its scope and increased its capacity to include more considerations (transportation and quasi transportation), the area of public transportation has received increasing attention. Central to this attention is the problem of regulation of privately provided transportation services to the public.

Regulation is viewed as an effective tool available to integrate such transportation into a state transportation system, but it presents perhaps some of the most difficult policy questions. Regulation, as a tool, is most attractive when one considers that all rail freight is regulated, as are most air passenger and freight service and the move-

ment of materials through pipelines. Common carrier truck service and some marine facilities and services are regulated. Bus service, where not municipally owned or under the control of public authorities, is subject to regulation, and taxi service is under municipal regulation. With powers to control rates and prescribe service, state regulatory agencies appear to be in a strategic position to effect the integration of the public transportation system into an overall scheme.

Traditional Regulatory Theory

Although efficiency and economy have been guiding principles in transportation planning, the regulation of transportation has not considered these elements to be of prime importance. Historically, transportation regulation has pursued broad social and developmental goals, including the control of monopolies, without any particular concern about efficient transportation.

The regulation of transportation has been more closely tied to public utility regulation than to transportation and takes much of its philosophy from the economic and consumer protection concerns of other public utility regulation. The principal purposes of such regulation include grants of special privileges supporting or strengthening monopoly position, protection of consumers by control of quantity and quality of service, protection of consumers by control of rates charged, and protection of consumers and the general investing public from financial manipulations by "insiders" in public utility holding companies. Given the public acceptance of these purposes, regulators have received sufficient powers to achieve them. Presumably, the same powers could be employed to help achieve desired transportation purposes. To do so raises institutional and policy conflicts.

The regulation of common carrier transportation, dating back to the middle 1880s, has been characterized by pursuit of social and developmental goals. In the late nineteenth century, railroads were the principal movers of freight in the United States and constituted an almost complete monopoly. There was little competition on the inland waterways and, save for local drayage within urban centers, railroads carried the great bulk of goods and commodities. In part to control these monopolies, the Interstate Commerce Commission was created in 1887. More significantly, however, the ICC had a broad socioeconomic purpose or goal to foster the development of the western portions of the country through its regulatory powers.

The principal tool of the commission in pursuit of the development goal was rate regulation. Through a system of internal cross subsidies, the railroads were required to move produce and raw materials (the basis of western economies) at less than compensatory rates. These losses were more than made up by excessively high rates on manufactured goods. As long as the railroads were monopolies and constituted a complete cartel, it was possible to pursue this broad public policy and help bring about the settlement and improvement of the western regions without adversely affecting the financial health of the railroads.

With the advent of the automobile and the truck and the huge public investments in highways, the railroads could no longer monopolize long-haul transportation. The high-rate manufactured goods were diverted to trucking, weakening the railroads' financial position. Yet, railroads were still necessary, and it was still deemed necessary to control them. To effect this control and not leave the railroads open to eventual decline through competition from unregulated truck transportation required that the freight "cartel" be enlarged to include trucking. Thus, in 1938, common carrier motor trucking also fell under ICC control.

The technology and economics of trucking, however, are such that it has not been possible to make the cartel complete, leading to the decline of regulated freight service, whether rail or truck. As freight rates continued to reflect considerations other than the cost of transportation, high-volume shippers, particularly manufacturers of high-rate products, found shipping in their own trucks increasingly desirable and profitable. This free, unregulated choice diverted the high-rate finished goods from common carriage, which was left with the unprofitable bulk movements. Rate adjustments

to help relieve the common carriers resulted in increasing diversion of shipping to private, unregulated carriage. In the meanwhile, common carriage has contracted as a result of railroad bankruptcies and abandonment of service and decline in the number of common-carrier trucking firms.

A comparable, although less discouraging, story can be told for airline service. The regulation of air travel parallels the regulation of freight transportation insofar as mandated service and internal cross subsidy are concerned. As part of the Civil Aeronautics Board certification process, airlines are required to serve lesser centers that cannot offset the costs of the service provided. This policy of serving a broad range of communities irrespective of their ability to meet costs requires that the fare structure recoup losses on some segments with extra returns from densely traveled segments. By and large, this process of cross subsidy has worked better in the airline industry than in surface freight transportation because of the minimal competition offered by private, unregulated air travel. One reason may be the explicit separation of regional airlines serving the smallest communities and their direct subsidy by the federal government.

The measure of the impact of airline cross subsidies is seen in the experience of carriers not regulated by the CAB. In California, for example, the air fare on Pacific Southwest Airlines, an intrastate carrier, for the Los Angeles-San Francisco flight is about half the fare that CAB-regulated carriers are required to charge. As might be expected, PSA's load factors are considerably higher than those of the regulated airlines on this run. Because it is a high-density route, the competition from PSA has a negative impact on the ability of the other lines to absorb losses from their more lightly patronized routes.

These summaries are intended merely to illustrate the basic problem in attempting to account for private transportation in a total transportation planning policy. With narrowly focused objectives, reenforced by institutional separation, there is great difficulty in bringing together the areas of public transportation planning and private transportation regulation in a common program. Although there are compelling reasons why transportation planning has interests in and concern about transportation regulation, the latter has not demonstrated parallel concern about its effects on total transportation systems or about the effects of transportation development policies on its own area of responsibility. With this asymmetrical situation, care should be taken to see that transportation planning policies that involve regulation do not simply reflect planning interests. To completely subvert transportation regulation to current transportation planning concepts may entail the loss of public benefits in other areas of concern. Because these 2 aspects should be joined to effect a total transportation program, transportation planning must extend its scope of attention to include the economic and developmental concerns that lie behind regulation.

Railroad Branch Lines

The experience of New York State may be instructive in this regard since once-independent transportation regulation has been brought into the Department of Transportation and, hence, has made the need to adjust regulatory and facility planning policy more compelling.

For example, the department has addressed itself to the question of rail branch-line abandonments in the context of the rail crisis in the northeast. It has brought together its resources in transportation planning and regulation and in policy development to formulate policy and a program to contribute to a solution. It reflects the needs for area economic development and support in highway facility planning and is equally concerned with rail service. The department sees that giving the common carriers in New York the fullest competitive opportunities so as to reverse the trend toward the dominance of profitable freight markets by private carriers is in the interest of shippers and consumers. Unchecked, this trend will ruin common carriage altogether; the shippers who could not afford to provide their own private carriage would ultimately have no service.

Against this background, preserving the strongest possible system of main-line rail services that private enterprise can provide is first necessary. These high-volume services are those for which there is an overwhelming public need. Loss of these lines would be economically and environmentally unacceptable. Unprofitable branch-line services should be converted into self-sustaining units if they are to survive.

With readjusted regulatory controls to foster opportunity and incentive for common carriers, the department is devising a new program to assist local branch-line interests in making arrangements necessary to secure freight services. This new program bears, for the present, the name "the negotiated solution." This is a mechanism whereby the department can bring together the parties with an interest in the preservation of a particular freight service and enable them to seek ways to ensure that a service covers its operating costs.

The parties to the negotiations include the railroad that, desiring to retain traffic and reduce costs, can examine its rate structure, change service patterns, sell the facility to a local operator at a favorable price, or offer better service or rate at a main-line transfer point; the shippers who, desiring to retain rail service, can agree to a higher rate, make annual traffic guarantees, divert business from a motor carrier, or purchase stock in a new local operation; the community that, desiring to retain an economic base served by rail, can provide property tax incentives to the existing or new operator or assume grade-crossing maintenance responsibilities; and the operating unions that, desiring to retain branch-line jobs, can agree to work-rule changes. In addition to acting as a broker to the interested parties, the department, under this program, provides detailed economic evaluation of branch-line operation and proposed alternative operating proposals.

The negotiated solution is more comprehensive and superior to the existing ICC abandonment procedure that has the character of adversary proceedings. Moreover, the solution works, as indicated by the following:

1. Boston and Maine Ossipee Branch—Here a traffic guarantee and extra per carload payments, coupled with union agreements to reduce crew size, headed off an abandonment;
2. Penn Central Quarryville Branch—Here shipper agreement to the Pre-Paid Revenue Supplement Plan permitted Penn Central to restore service to a flood-damaged line; and
3. Cooperstown and Charlotte Valley—Here a new locally sponsored short line was created to preserve service on a Class I railroad branch line in New York State, and shippers and other local interests purchased stock in the new corporation to cover start-up costs.

There are, of course, other courses of action open and other policies that might be followed, including subsidy payments, government ownership and operation, service contracts, and substitution of truck service for rail service. In each case, rigorous examination must be made of costs and consequences against a background of broad political, economic, social, and developmental policies. All of this requires capability to gather and interpret information on the impact of any given policy approach on rates and service and on local economies and job markets. At the same time, an appreciation for transportation facility and system efficiency and effectiveness must be retained.

CHANGING THE DEMAND FOR TRANSPORTATION FACILITIES AND SERVICES

A group of several issues for statewide transportation planning involves attempts by government to solve or alleviate transportation problems by affecting the demand for transportation, in its magnitude and characteristics. Transportation agencies traditionally have focused on improving transportation facilities—adding to the supply of roads, airports, and transit facilities—as a means of dealing with congestion, accidents,

pollution, and other problems.

There are significant problems and difficulties in the continued addition of new and better transportation facilities and their effectiveness is being questioned more and more. Although the tremendous attention and investment devoted to transportation facilities have yielded an improved transportation system, the problems these improvements were aimed at alleviating often persist because of increased demand. Proposals are now being raised that deal with transportation problems through changes in the nature and amount of transportation demand. The subject of this section is changing demand not through the provision of facilities and services but through policy changes.

Policy changes that can affect transportation demand may be direct or indirect. Changes in the geographic pattern of activities can alter the amount and characteristics of transportation demand indirectly. Policy proposals that may affect directly the peaking characteristics of transportation demand include staggered work hours and car pools. Also being pursued are policies to affect the pollution generated and the accidents caused by transportation through changes in vehicle characteristics and driver behavior. And recently, direct limitations on travel and transportation fuel have been suggested and applied to limit energy consumption. Each of these areas holds questions for transportation policy analysis.

Land Use and Transportation

The first explicit, quantified interrelations between land use and transportation date back a generation to pioneer transportation studies such as those in Detroit and Chicago. They reflected the first efforts at understanding and reflecting this relation in the development of metropolitan-scale transportation plans. By estimating trip generation and linkages between land uses and by assuming current relations and parameters, they estimated transportation demand of a future population and land use pattern to provide the basis for transportation system planning.

Subsequently, attempts were pressed to make this process dynamic and to reflect the impact of proposed transportation service on land development. The method of reflecting the accessibility impacts of transportation on growth patterns is still being refined and requires continued research.

Throughout the evolution of the process development, there has been debate on how much this future land use pattern should be a projection or a plan and whether it should reflect the most likely pattern of land development or rather patterns designed to achieve comprehensive planning goals. In our experience, there is little real difference in these approaches. Most statewide and metropolitan plans are not at variance with basic trends. They propose neither to halt or limit growth nor to divert population to different regions of a state. Regional plans do not propose a radical restructuring of metropolitan patterns. Rather, they aim generally to accomodate expected growth by modifying distributions and densities within quite narrow limits and to coordinate this growth with the provision of public services. Similarly, transportation plans are generally geographically "balanced" with little favoritism for one area or another.

Such planning has been open, however, to the charge that it is mere trend analysis and that, rather than seeking to change the future, it completely accomodates to trends and is, therefore, self-fulfilling in giving more of the same. Although land use, on which much of transportation planning is dependent, has not followed any plan, land use plans seem always to crumble before economic pressure. In a general sense, then, land use is also subject to trend analysis.

The greater error, however, has been the disinclination of comprehensive planners to look at the basic policy planning issues. Planning, by and large, has not engaged in policy formulation or in the iterative process necessary to develop basic policy. Such activity was thought to be political, unprofessional, imprecise, and not technically objective. Besides, transportation planners were not asked to come in. The consequences of this technically oriented, narrow approach are plans that are unlikely to be implemented not only because of nontechnical citizen resistance but also because of technical shortfalls. For example, no transportation or comprehensive plan has

reflected on the energy required to make it go; fuel efficiency was not a parameter. Today, perhaps, we would agree that it should have been.

The results of these land use and transportation trends have been apparent for many years. The low-density, scattered pattern of suburban residential, commercial, and other activities requires a large and increasing amount of travel and, therefore, additional transportation facilities and services to function. The cost of facilities and of operations on this system—in accidents, time, pollution, fuel, and dollars—is seriously questioned. Proposals are continually made to alter the pattern of metropolitan and state land use to reduce travel demands or to make them serviceable by modes other than the automobile. Policies range from (a) using the selected provision of transportation, water supply, sewerage, and other services to alter the character of land development, to (b) changing the development control of government through zoning and subdivision regulations to achieve different patterns, to (c) changing taxation, federal mortgage guarantee policies, floodplain insurance policies, school support programs, user charge, and other policies that encourage the evolution of a desirable pattern.

Selective Provision of Transportation Facilities and Services

That transportation should be used to encourage a desirable community pattern is clearly accepted in principle and reflected in the general goals of a transportation study. But, given limited resources, to invest ahead of growth is to deny transportation improvements and accept congestion and other unpleasant consequences in other areas. Such a policy is equally difficult to apply in the provision of water and sewer facilities, education, and other public services. As has been noted previously, the character of most land use plans is such that rarely have they been heeded. Transportation investments, where they have been linked to land development goals, have been in more clear-cut support of major public and private development or redevelopment projects.

The effectiveness of accessibility improvements or restrictions in changing the rate and pattern of land development, unfortunately, is still unknown despite the many land use impact studies and the major investments made in land development during the past decade. For one thing, new transportation facilities add service to a basic transportation system that is rather well developed already, and increases in accessibility are a matter of degree. It could be predicted that the use of transportation facilities to achieve land use changes, in the absence of a coordinated set of governmental policies and investments, would be resisted by transportation agencies. Such investments are likely to be ineffective and to be in conflict with meeting other transportation needs.

Land use plans heretofore have not aimed consciously at minimizing transportation needs. The clustered suburban center, the high-density corridor alternating with open space areas, and the high-density downtown with concentrated commercial activities are patterns that intuitively were thought would minimize transportation demands and make them easier to serve with bus or rail rapid transit. However, the transportation requirements of such patterns have not been demonstrated explicitly or convincingly to the public. Although the current fuel shortage may quicken the public's interest in such considerations, further research is needed to indicate both the transportation system and service implications and requirements and the change in life-style necessitated by alternative land use patterns.

Changing Government Control of Development

Government has direct powers over the development of land through zoning and subdivision regulation. Based on the police power of government to control nuisances, these capabilities have been expanded considerably. There are limits, however, beyond which application of these regulations becomes a taking of property for which compensation must be granted.

To date, zoning has not been a firm foundation on which to base proposals for signif-

icant change in land use patterns to achieve transportation or other goals. Zoning has proved to be transient and weak when faced with the pressures of commercial and other development. In one area of partial effectiveness, the preservation of neighborhood homogeneity, it is attacked on social grounds. In most states, zoning is the power of the smallest of local governments—cities, towns, and villages. As long as the residents of these areas are affected financially by location decisions of commercial or industrial users, land use planning principles are a weak advocate against financial gain.

There are proposals for enlarging and rearranging the powers of government over land use. Specific controls may be set at the state, regional, or county level; in New York State, the Adirondack Park Agency has been granted broad powers over the character of private land development within a large, designated mountain area. Logically, these powers tend to be general at the higher governmental level, sufficient only to constrain or require local plans to reflect regional goals. A major conflict with the principles of local responsibility and home rule is inherent in this.

Some of the most ambitious powers may be found in, or inferred from, new environmental legislation. The federal coastal zone program and the national land use policy act under consideration by the Congress will require states to set up appropriate means for controlling land development in designated impact areas. Major transportation facilities and major traffic generators, and the travel they generate, are among the types of projects whose impacts must be assessed. The pressures to use these laws to effect major changes in state or local patterns are likely to cause major controversy, especially if the public is not fully aware of, and does not accept, the new patterns and their concomitant changes in life-style.

Changing Government Policies to Affect Land Development

Many present land use pattern trends can be related to governmental tax policies. At the local level, governments are particularly dependent on the property tax as a source of revenue. As has been noted, as long as the property tax remains and the burden of education, welfare, and other significant costs are localized, their pressures will run counter to a rational metropolitan or statewide development concept. Equally, the combination of low taxes on raw land and capital gains tax advantages for its sale will encourage isolated speculative land holding and, consequently, the scatteration of land development. The increased use of agricultural zones may contribute to this problem. Cheapness of transportation and many public and publicly regulated services that are provided on an average-cost basis also contribute to this pattern when they do not truly reflect the cost of providing services in low-density areas.

Land use patterns are intimately connected with the life-styles of individuals and with the operations of businesses, institutions, and other activities. Significant changes in land use to achieve gains alleged for transportation and other public services will have to be demonstrated far more clearly to the public before it will relinquish its habits. Research must be directed at clarifying the actual cost of facilities and services for land use patterns of different densities and shapes. Data explaining more clearly what life-styles will be like are also required. Research must also be directed toward estimating the impact of transportation facilities and services and the susceptibility of area growth rates and patterns to such impacts. These must be explored with varying assumptions of coordinated and, as at present, conflicting policies.

Peaking Characteristics

Congestion concerns not only the number and location of trips but also their temporal pattern. The peaking of travel, caused in large part by work trips beginning and ending within a narrow time period, is a major cause of congestion and the need for more facilities and services. Peaking is particularly difficult for transit services because of the requirement to provide system and service capacity to meet the demands of work travel. Staggered work hours and car pooling to change work-trip automobile oc-

cupancy are changes suggested toward alleviating transportation problems.

Staggered work hours have already shown significant reductions in peaking and in congestion at rapid transit stations in lower Manhattan. Staggered work hours have frequently been used in large buildings and by major employers; what is new are policies and actions to encourage their application in urban centers by diverse establishments. The problems of coordinating within and among establishments are serious, but work has already indicated that by no means are the traditional hours necessarily optimal. In this connection, the 4-day workweek would help in reducing peaking characteristics if a longer workday resulted. This, however, may have undesirable consequences for fixed rail transit where its capacity would be but partly needed during 3 days of the week. The lower total number of trips would mean lower gross transit revenues.

Automobile occupancy is particularly low for the work trip, increasing its impact on metropolitan highway congestion. Policies on parking and the use of streets and toll facilities can encourage car pooling. Such steps have been used already in several instances with good effect. The limits of public acceptability, especially with reverse discrimination against single car occupancy, are not known.

Already matching computer programs are being used to facilitate car pooling, but they were brought on by the immediate energy shortage rather than with an eye to congestion relief. These immediate experiments should be carefully studied for consideration in long-range policy and plan development. As part of these experiments and for long-range application, the individual and community gains that policy changes will achieve should be made known.

Accidents and Pollution

Accidents and pollution are 2 transportation by-products that everyone agrees should be minimized. Transportation agencies claim as benefits for expressway and transit proposals the safer and less polluting travel they divert from streets.

In both of these areas, however, changes to vehicle characteristics through governmental policies, including legislated or promulgated requirements, are alternatives to facility and service provision. Ideally, one would desire a balancing of costs of vehicular changes versus the provision of additional facilities and services, even though the costs of changing the vehicle are borne generally by private individuals. However, major investments for pollution control or safety are apparently easier to make through policies affecting the private sector than by direct government action. To invest $500 million in safety improvements at a cost of $50 × 10 million cars a year—achieved by fiat—is easier administratively than to meet the problems of funding and programming $500 million annually in safety programs for highways.

Perhaps most significant, policies explicitly setting performance standards for vehicles have set them at levels unattainable at present, and the means and cost of attaining these levels are not known. Perhaps only where the objective is clear will the public accept commitments of major magnitude. Compare the relative ease of financial commitment to the Interstate program with other specific government programs and projects that have unclear objectives and consequences.

A third area for seeking accident reduction, other than the vehicle and the facility, is the driver. Policies for higher standards for the qualifications of drivers and for the enforcement of alcohol and other driver regulations have received continuing interest. Little is known, however, about the effectiveness of these actions. Clearly, acceptance of increasingly restrictive policies on automobile drivers will be difficult so long as metropolitan and state land use patterns are so automobile dependent.

Energy and Transportation

Energy for transportation and other activities is now quite limited, and this situation increasingly is being reflected in the availability and cost of fuel. For the long range,

rationing is a poor mechanism for solving basic problems. Energy limitation can and should be reflected in energy costs; predicting the consequent changes in the characteristics of vehicles and travel can be attempted, and the traditional planning process should be able to reflect them properly.

For the short range, critical policy proposals concern dampening the demand for transportation and investing in energy-efficient modes. The impact on the poor and on specific locations of alternative price and priority schemes are being discussed currently and need not be explored here. Priority for public transportation modes, in the absence of sufficient fuel for private transportation, is logical and is readily accepted.

A careful monitoring of these short-range energy policy responses can be of major help in ascertaining what might be effective policies to affect travel. This can help in long-range planning, particularly in the area of fuel price changes, which directly affect the need for an optimum mix of transportation solutions.

Conclusion

Fresh attention is being paid to policy changes that are seen to affect the demand for transportation as an alternative to transportation facility and service investments. Such policies must be considered in statewide planning because of state governments' responsibility for the legislation, authority, and other institutional constraints, powers, and procedures by which the transportation system is provided and functions. The state must also play a strong advocacy role in proposing and then in interpreting and applying national policies. This area has long been neglected on the assumption that current policies and institutions are fixed or inevitably correct. The sacredness of current policies, both explicit and implicit, has been denied, and transportation planning can never be the same.

FUNDS FOR TRANSPORTATION

The financing of transportation facilities has received a great deal of emphasis in the past few years. The recently completed 1972 National Transportation Needs Study indicates that there is a growing gap between the identified transportation needs or plans and the ability to finance these plans. The lack of financial commitments renders the transportation planning process fairly ineffective because the plans must of necessity be based on some estimate of funding, which in turn dictates the desirable level of service. Therefore, some mechanism for determining and ensuring a long-term commitment of funds is extremely desirable from a transportation viewpoint.

Transportation expenditures by states usually do not change radically from year to year in either total amount or modal allocation. Frequently specific revenues are earmarked for transportation, federal and state appropriations for some programs are determined by formula, and the magnitude of program budgets generally changes by small increments. This is good for transportation planning in that some basis is provided for future resource projection, but bad in that the magnitude of the total transportation expenditure and its allocation is difficult to alter. A statewide plan will appropriately contain recommendations for the level of funding both in total and by major program area because funding provides the necessary guidelines to subsequent system and project planning.

Transportation Needs and Plans

A distinction must be made between plans and needs. Transportation needs are determined typically by setting "tolerable" standards, generally physical and geometric; comparing conditions on the existing system with these standards; and estimating the improvements needed to bring deficient segments of the system up to standards and the costs (often "design" standards set above the tolerable standards). Needs are not

usually constrained by funding, nor are environmental, social, and economic factors explicitly included. Since benefits achieved are not explicitly estimated for comparison with costs, there is no way to assess the desirability of alternative standards other than by their cost.

System planning has a broader framework; it evaluates the cost of alternative system solutions against the estimated value of transportation benefits and in some cases other goals as well. Such plans are not usually constrained by available funding, however. A plan to invest up to the desirable rate of return in every transportation problem area may require more in total than is available. The 1972 National Transportation Study showed rapid transit and highway system plans for most urban areas far in excess of any reasonable anticipated funding. These plans are more properly called "needs" also.

Such needs planning is perhaps useful as a first step in an iterative process in justifying and supporting budgets and in funding requests. But a problem may arise for subsequent transportation planning and programming if there is a continued discrepancy. The 1972 National Transportation Study found in total and in most states a large discrepancy between the needs based on current planning and standards and anticipated resources for transportation.

The discrepancy between plans and resources is usually dealt with by the selection of the highest priority or payoff projects each year. The result after several years may be an inconsistently developed system, some elements improved to high standards and improvement to others postponed beyond the planning period. A system half overdeveloped and half underdeveloped is scarcely the wisest expenditure of public funds.

Urgently needed, as soon as a discrepancy is noted, is a serious reconsideration of current standards and plans to make them consistent with future transportation resources. Future transportation resources are not necessarily projections of current revenues, but rather decisions by policy-makers based on service objectives, performance standards, and their view of financial capabilities. Subsequent system and project planning can then be conducted with confidence that the products are achievable. Rigidity of physical and service standards, both federally mandated standards and commonly accepted engineering standards, may be an impediment.

Of particular interest are service standards proposed as a matter of social concern: For example, mobility for the handicapped is an accepted goal of transportation plans; economic development for depressed regions of the nation is also an accepted goal. Usually these goals are met either by allocating a total fund without explicit standards or by setting explicit standards without the total cost being known. In either case, analysis of the standards set, their cost of application, and their effectiveness would greatly improve decision-making.

In many cases, there are alternatives to the provision of transportation to meet these same social needs. Job training and tax relief are viable alternatives to transportation improvements for area economic development, and bringing services to clients by relocation or mobile service centers is an alternative to individual transportation service. Without a careful analysis of the alternatives, including those outside of transportation, there is a potential for waste of resources. Unfortunately there is little knowledge of the effectiveness of investment in transportation or, for that matter, of many of the alternatives to it.

Funding Arrangements

Trust fund financing has been the subject of a great deal of controversy and discussion in the past 2 decades with respect to transportation. The establishment of the Highway Trust Fund in 1956 to provide continuing funding for the Interstate highway program has drawn a great deal of criticism as well as praise from both opponents and proponents of highway construction. The debate has intensified in recent years as the Interstate system nears completion, and the use of the Highway Trust Fund revenues for nonhighway purposes is being suggested.

There is no generally accepted theoretical basis for trust fund financing. In fact, the establishment of a trust fund generally violates pure economic and political theory.

Although there is a general consensus that economic theory requires users to pay the full costs of services in the long run, the theory does not extend to the point of applying these user revenues back to the system that produced them. Economists only recently have been concerned about the economics of public expenditures. Even now, however, economists feel that economic analysis of the efficient allocation of resources can only be an input into the political decision-making process for public expenditure decisions. They feel that the political process should not be artificially constrained by trust funds.

The debate for and against trust funds generally centers around 8 major characteristics of public expenditures.

1. Continuity of funding. Some public expenditures extend over a long period of time or require a long planning and development period and thereby a long-range commitment of funds. Other programs are short-range in nature, and funding decisions can be made on a regular (annual) basis.
2. Political and budgetary review. Changing social priorities or fiscal situations call for the ability of changing funding programs to keep up with these changes. A key responsibility of the political decision-making process is to be able to sense these changes and to assign priorities to those programs that will do the greatest public good. Of course, the discussion under this characteristic assumes a highly capable decision-making process whose sole intent is serving the public good.
3. Impact on other governmental programs. Financing at a higher level of government has strong implications on the financing of programs by lower levels of government. The prime example of this is in the highway program where the Interstate highway program developed at the federal level has had a strong impact on the financing of other highways. Where state funds can be applied in a 90-10 ratio for Interstate highways and a 50-50 ratio for other highways, the construction of non-Interstate highways has lagged far behind the Interstate program for the past 10 to 15 years.
4. Full-cost recognition. Economic theory requires that the full cost of providing services be recognized and charged to the users unless there are some compelling social objectives that require other funding strategies. For example, in transportation the objective of maximizing the use of public transportation for social purposes such as reducing congestion, minimizing pollution, or minimizing noise might require that public transportation be priced below its full cost.
5. Supportive administrative apparatus. Proposed financing mechanisms must have the proper devices for administering the funds in a manner that is consistent with the objectives of the financing program.
6. Equity. Equity characteristics are concerned with the notion of consumer sovereignty, total expenditures, fair-share payments, distribution of direct and indirect benefits and costs, and general welfare criteria.
7. Jurisdictional responsibility. The current disparate pattern of the jurisdiction among national, state, county, and city governments with their overlapping network of functions raises the question of the optimum pattern of jurisdictional responsibility. The establishment of institutional arrangements with appropriate functions, sizes, and incentives is a basic step in implementing social public policy.
8. Funding arrangements. It should be understood that funding arrangements are a major type of "carrot" or incentive influencing the actions of other jurisdictions. The degree of flexibility granted, however, is the degree of freedom to ignore those purposes and policies intended by those providing the funds. It may be, however, that given the condition of state governments, trust funds might be devised that build into the funding mechanism some provisions that would minimize the objections to this type of arrangement. Alternative arrangements for a state transportation fund include the following:

a. Modal trust funds. One alternative funding mechanism that has been proposed in the past is the establishment of modal trust funds. Although this approach has some merit to those who advocate the use of user revenues to be put directly back to the facilities that produce them, it eliminates the flexibility of funding from the state execu-

tive and legislative level. An additional problem that has been recognized at the national level is that, when transit trust funds have been proposed in the past, there were no readily apparent sources of user funds that could be directly dedicated for transit purposes. Placing user taxes on an industry that already has a huge, rapidly growing deficit is extremely difficult. Highway and aviation trust funds appear to have the ability to be self-sustaining. An additional problem is that the concept of a mode is an abstraction. For example, the provision of peripheral parking lots for park-and-ride service is both a highway and a transit facility. Car pooling, dual-mode vehicles, and containerization of freight movement also make detailed determination of modal characteristics extremely difficult.

b. Funds by function. Functional trust funds can be envisioned at 2 levels. At the highest level of aggregation, a functional trust fund might be similar to the President's proposal for restructuring federal government according to function, for example the function of community development or the function of economic affairs. The primary objective, then, for each function is to encourage that function, and the allocation of funds within subprograms is responsive to current issues and long-term goals. A second functional fund structure involves only transportation programs, and functional identification is of 3 major program types: urban passenger programs, intercity passenger programs, and freight programs.

c. State transportation fund. Under this fund, all transportation revenues go into the fund, and all expenditures are paid out of this fund. This setup is similar to the Maryland transportation fund. However, there are many problems inherent in this type of funding mechanism. For one, there are both public and private transportation providers. Therefore, channelization of funds into and out of this trust fund for much of private enterprise would require separate mechanisms. The assignment of resources and responsibilities among the different levels of government would be an extremely difficult situation. Finally, the notion of cross subsidies would be inherent in any such transportation trust fund, for most of the revenues would come from highway and aviation sources and many of the expenditures would be for other programs.

d. Partial state transportation fund. Only the state's share of costs and revenues is involved in this funding mechanism. Here the primary problem is the determination of what the state interest is in transportation, what share of the costs is state responsibility, what revenues are for state use, and what revenues should be turned back to communities.

e. Combination state fund and regional fund. This funding concept combines the previous 2 concepts, the state transportation trust fund and the partial state fund, into a state fund to be used for state purposes and a series of regional funds to be used for those types of projects that have only regional or local significance. The problems inherent in this approach are the problems of intergovernmental programming coordination and the proper allocation of responsibilities and resources among the different levels of government. The degree of state control over the expenditures of the regional funds becomes a primary consideration as does the state authority to shift the funds collected in one region to another region for state purposes.

CHARGING FOR TRANSPORTATION

The various means for collecting and raising funds for public investments in transportation facilities and services are the product of historic evolution rather than of comprehensive consideration. A state department of transportation will be concerned with policies on charging for transportation because the amount and method of collecting money affect the demand for, and use of, transportation facilities and services; and the method and amount of revenues collected set the resources available for transportation, especially for those modes receiving all or part of their costs from fixed or user charges.

Consequently, proposals for charging and pricing policies are frequently suggested as ways to alleviate transportation problems to meet transportation goals. The general goal—equitable distribution of costs and benefits—may be found among the planning goal

pantheon, but takes on most significance in the assessment of policies for transportation charging.

From this perspective, several policy questions typically proposed can be examined: free bus service, greater or lesser use of tolls on facilities, and "raiding" highway trust funds for transit use.

In each case, a policy analysis would be undertaken to ascertain what the demand and usage impact of various modes is, which people or areas are being subsidized and whether they are the ones to whom we wish to transfer public resources, and what the proper geographic or user community or interest is over which costs should be spread, considering external social costs and benefits.

The present hodgepodge of transportation charging policies involves a varying mixture of tolls, gas and tire taxes, fees and special licenses, fares and commodity rates, general income, property, and sales taxes to support public costs of transportation systems. In some modes and in some communities, public facilities are provided for privately operated vehicles; on the other hand, Amtrak provides public service on privately owned and tax-paying facilities. The national (and New York State) waterways systems are probably unique in making no charge for the use of facilities.

There is a continual debate as to whether user charges fully support one or another mode; the questions are difficult to answer because of varying bases of estimating and allocating costs. Our object here is not to settle or even pursue this issue, but rather to consider the need for, or value of, attempting to reach a balance of charges and costs.

From a pure economic viewpoint, users should be charged for the actual costs of facilities and services used. Transportation uses resources that can be applied to other needs and desires of society. Pricing transportation too low will encourage its wasteful use—the use of the wrong mode or simply too much total travel. Pricing transportation too high will again encourage the use of the inappropriate mode in terms of social cost or inhibit the use of transportation where it, rather than other uses, would be a valid and efficient employment of resources. The economic and social development of a state or community can be impeded thereby. Indirect benefactors should be charged only to the degree that costs are or can be passed on by users.

Economists, however, recognize the ability and the responsibility of government, unlike private enterprise, to modify this theoretical balance in the interest of broader concerns such as (a) externality of costs and benefits, (b) equitable transfers of resources among the population, and (c) ease and economy of administration and collection.

A direct charge for the facility or service cannot or would not reflect external costs or benefits. The use or construction of highways has social and environmental costs—air pollution and community disruption—that are not normally met by those who impose such costs. In such cases, it is quite appropriate to increase the user charge over that required to build the facility alone in order to reflect these costs. Ideally, the added revenues can be used for fair compensation if a means of such compensation can be found. At the same time, such a policy decreases the demand for such facilities to more appropriate levels.

An extension of the same concept is justification of investment in public transit on the basis of its external benefits—a reduction in automobile congestion and attendant costs attributable to diversion of some automobile travel. This is counted in a benefit-cost relation and is a proper charge to the automobile user. At the extreme, the preservation of transit is a legitimate cost to be put on automobile drivers if it can be demonstrated that the abandonment of transit would increase their congestion and other costs.

The costs of serving certain segments of the population or areas of the community or state may far exceed typical unit costs, but, as a matter of social justice or equality of opportunity, they are often accepted generally. Transportation for the handicapped and aged is now recognized as a public responsibility. The need for economic viability of depressed regions is also seen as an acceptable social goal whose costs should be borne by the public. These costs are more properly put on the entire community rather than a particular segment.

Sometimes charging true costs is impossible because of the nature of the transportation and the difficulty of identifying users. For the use of many transportation facilities and services, one cannot buy a ticket or pay a toll; the costs of attempting to do so would be impractical.

Frequently, the cost of service varies by time of day, by route, or by subsystem. However, it seems both necessary and convenient to charge a fixed fare or rate. To varying degrees, private enterprise prices its products in this fashion, and such pricing is accepted.

As a result of these policies, cross subsidies are prevalent in transportation. Cross subsidies are transfers between users by inadequate charges on some and excess charges to others. The user who pays more than he should is subsidizing the other, even though the total revenue may balance the costs on a systemwide basis.

Cross subsidization and regulated private transportation has received much study. Since it is under public regulation, it is possible for political and social pressures to favor certain regions, products, lengths of trip, and users. This is not uncommon in the complex set of rates and tariffs. Other cases of cross subsidization arise when unit costs change significantly because of technological and volume changes, but the price structure does not or cannot respond so rapidly. This is acknowledged policy of regulatory agencies: Stronger and more profitable lines and routes are coupled with weaker or losing lines and routes. The policy is possible in cases where a true monopoly or cartel exists. The attempt to continue such a policy where a monopoly no longer exists can be disastrous, as the nation's railroads have found.

(The wisdom of continued cross subsidies in those areas of public service where monopoly does exist can be questioned. Constant charges for electric and telephone service, for mail, and for other public services to dispersed users for whom revenues do not meet costs encourage a pattern of metropolitan sprawl as much as does "free" transportation.)

In the case of highways, the assertion that user charges support highway costs is usually made or challenged on a national or statewide basis. It is rarely considered on a substate or subregional basis. But it can be asserted that the fuel and user taxes obtained from or assigned to many roads contribute revenue for the construction of other roads that may not return their costs. Revenue raised per automobile registration, per operator's license, and per gallon of fuel consumed is not directly related to the use or cost of particular facilities. Since the basic capacity of many highways is sufficient for much of the day, the cost of supplying additional capacity by widening or using parallel facilities to relieve peak-hour congestion should logically be borne by peak-hour users for whom the extra capacity is needed. A constant charge per gallon is an undercharge to these users and encourages an overuse of roads at the peak hour when transit in many cases is a real competitor.

The perverseness of present policy can also be seen in the policy of some toll bridge and tunnel authorities and rail operators in offering discounts to quantity users. The minimum usage is set so as to give advantage primarily to the commuter, the user for whom the most costly peak-hour capacity must be provided.

It is also now proposed that rationing of scarce resources by increased tolls and charges be used to depress demand or to divert portions to public transportation. This is not illogical, although ease and cost of administration and the potential for its enforcement or avoidance must be considered.

Parking policies are another manifestation of cross subsidization. Increasingly, parking is provided by employers, retailers, institutions, and other developers as a matter of course. When charges are made, they are often a fraction of the true cost of construction and maintenance, and the remainder is absorbed as a business or public expense.

The transit rider is rarely offered a similar subsidy. The automobile driver, with high mobility, is free to choose, but the transit rider is "captive" to the transit system and, therefore, bears the full cost of the trip (other than that which general subsidies provide) as well as the costs of the automobile driver's parking, inasmuch as such costs are reflected in the price of goods and services purchased or used.

Given the income characteristics of transit riders, public and private parking sup-

pliers act so as to transfer from the less affluent to the well-to-do. This is hardly in line with general social goals. But charging the true costs of parking would probably disadvantage downtown or central city interests, which are in a poor position to discourage the shopper or employer. The regulation of private company or establishment parking is a new idea, and its acceptability is not yet tested.

The extensive public waterways improvement program has already been noted as an area of subsidy. The report of the National Water Commission recognized the unreasonableness of the free provision of costly waterway improvements to users and its detrimental effect on competing carriers—especially railroads. Many public ports are subsidized by local governments to achieve assumed economic benefits.

Discussion of Resource Paper

Ralph D. Johnson, Roy Jorgensen Associates, Inc.

The main problem in discussing transportation policy planning is that the word "policy" signifies different things to different people. The dictionary definitions of the word are far too general to give it real management sense.

To exemplify, consider 2 places on a map. One represents the place we want to get to, the other represents the place where we are. Now, some people say we can have a policy that we are going to try to get to the other place. Thus, the President enunciates a policy to make the nation self-sufficient in energy production within 10 years or a policy to revitalize railroads and improve the quality of urban transportation. These policies are very much like goals or objectives. In a different manner, some people view policies as a step along the way—a policy to underwrite transit through subsidy grants. Many people have not thought to differentiate between these 2 kinds of policy, and perhaps that is not important.

What is important is the way policy or policies affect us. In fact, policy constitutes the basic framework under which we try to carry out the responsibilities entrusted to us. We are, therefore, concerned as to whether policies are good or poor.

Do we have any influence on whether policies are good or bad? At the state level, policies are made largely by the governor and the legislature; at the national level, by the President and the Congress. How do they derive them? In most cases, policies are recommended by some special advisors employed by them, perhaps consultants; the state transportation agency, or some other state agency or office. Federal agencies that recommend policies to the President and Congress tend to be influenced by what is being done by state and local agencies. State and local transportation agencies, therefore, should try to create—through recommendations—the framework of policy they want to govern their operations.

What is a good policy? Basically, good policy is needed policy. First, we need policy to keep our activities directed toward the goals and objectives the governor and legislature want pursued. Second, we need policy to tell us what the governor and legislature want from us. Third, we need policy to establish courses of action—program action and management action—that we should take in the pursuit of objectives.

Good policy is also worthwhile. We want to get to the other place on the map, and it is worthwhile to get there. That is policy number one. We do not know exactly where the place is, but we think it's northeast. So we decide to take off in a northeasterly direction. That is policy number 2. We have no idea how far it is, but we know we will need a certain amount of money each day and arrange to have that sent. That is policy number 3. We discover the place we are trying to get to is really due north, and, even though we did not get there, we are at least closer than we were before.

How many government policies are formulated in just about that way? If judgment is reasonably good, we will be closer than we were. If judgment is bad, we have wasted

our time and money.

There are many transportation policies, proposed and approved, national and state. A few examples are policies to provide grants to transit for equipment and other capital acquisitions, policies to subsidize transit, policies to complete the Interstate system, policies to distribute discretionary funds to cities, and policies to provide loans to railroads. For how many of these is the accomplishment—the place we are going to get to—clearly established?

It is possible to develop positive plans that will go a long way toward solving urban transportation problems. For example, some European cities control traffic downtown by restricting available parking. What about a plan that would

1. During a period of 5 or 6 years, reduce available parking downtown to the amount that would produce a reasonable traffic load on the streets;
2. During the same period, construct outlying parking lots suitably dispersed around the urban area to provide for the amount of parking eliminated downtown; and
3. As the parking lots are constructed, establish suitable transit service to connect them to the city center?

Of course, details would need to be worked out, and phasing would have to be carefully done. Car pools could be given certain privileges. Bus express lanes and reserved curb lanes could play their part.

If such a plan were adopted, control policies with respect to things such as parking and transit service and fiscal policies would be needed. If it were not adopted, perhaps the environmental impacts would not have been worked out well enough to make a good case to the public. Or perhaps there would have been too much political opposition. Or, more than likely, the situation deserves a better plan.

Although policies for stopgap measures may be necessary before definitive plans are worked out, policies that are not based on definite plans may not be headed in the right direction and may waste money.

Fortunately, despite recent recommendations to the contrary, it is practical for a transportation agency to develop fairly extensive long-range plans and to have them adopted. Such plans should be reasonable, in terms of current fund provisions and the existing tax situation, but not necessarily limited by projected revenues. Not all good plans are adopted. But many that have not been adopted have definite deficiencies. Among these are failure to thoroughly analyze environmental and economic impacts and to justify the plans by anticipated beneficial impacts; failure to detail the plans sufficiently; failure to be realistic in terms of funding possibilities; and failure to be consistent from one presentation to another. Examples of plans that have been accepted and whose target objectives—good or bad—have been largely achieved or are likely to be achieved are the Interstate system, supplemental freeway systems in some states, and rail transit systems in some cities.

The following is a recommended framework as it might be applied to policies on statewide transportation planning.

Basic Policy

Statewide transportation planning will establish long-range systems and corridor development plans that are designed to

1. Serve the states' goals and objectives for economic growth, energy conservation, land use, safety, and preservation, enhancement, and enjoyment of the environment
2. Provide optimization of the service provided by all modes of transportation consistent with efficiency, cost effectiveness, environmental protection, and enhancement of quality of life for all citizens, and
3. Support national transportation goals and objectives

Policy on Systems Planning

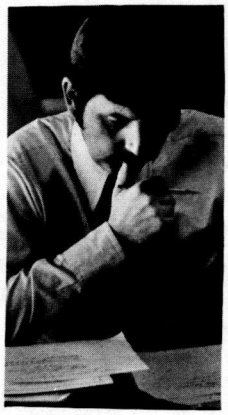
All transportation agencies in the state shall

1. Develop long-range transportation plans for a period of not less than 10 years,
2 Formulate such plans to show the target accomplishments toward which current capital expenditures will be directed,
3. Estimate maintenance and operating expenditure requirements for the proposed period of the plans,
4. Show the relation of recommended expenditure provisions to projections of revenues in accordance with traditional sources and trends,
5 Describe and show values pertaining to the economic and environmental impacts of systems and systems configurations as related to environmental categories and situations that will be affected by the plans or segments of them,
6. Exchange plan outlines so that (a) the state plan is provided to the governor, the legislature, and all counties and cities, (b) the county plans are provided to all cities in the county, the state transportation agency, and adjacent counties, and (c) the city or urban plans are provided to the state and affected counties,
7 Provide for continual dynamic development of the plans with a minimum update of every 2 years,
8 Notify the agencies to whom plans are distributed of changes as these occur or in accordance with the 2-year update schedule, and
9. Recommend priorities for development of the systems

Policy on Corridor or Route Planning

Based on priorities developed in the systems plan, the transportation agencies shall

1 Analyze costs, economic effects, and environmental impacts of alternative service concepts within corridors to the degree necessary to establish a fully supportable corridor plan from the standpoint of costs, benefits, and environmental impacts,
2 Compare concepts utilizing other corridors or no corridors where applicable,
3. Select and fully document corridor plans from the standpoints of service effectiveness, social benefits, cost-effectiveness, economic impacts, and other environmental impacts,
4. Consult, during the analytical phases, with government and private agencies having responsibilities related to the potential impacts of the corridor development,
5. Conduct meetings at appropriate stages in the development of corridor plans with local officials, special interest groups, and the affected public, and
6. Develop environmental impact statements on the basis of documented decisions arrived at during the corridor planning process.



OBJECTIVES

To identify and evaluate current techniques being used to develop statewide multimodal transportation plans, priorities, and programs for both person and goods movement.

To recommend improvements in planning methodology including data and management elements necessary to ensure a continuous and viable process.

To develop a recommended program of research in statewide multimodal transportation planning methodology.

ISSUES

What are the essential data requirements for the preparation of comprehensive multimodal transportation plans, priorities, and programs for person travel?

What are the current techniques for collection of data on person travel within states? Are sources adequate?

What techniques are available to forecast statewide person travel by mode?

What techniques are currently available to develop and evaluate transportation plan alternatives? Can alternative systems be developed at the state level?

Are composite regional transportation plans building blocks for statewide plans?

What special studies and analyses are required to develop plans for the various modes?

How do procedures and methodology for analysis, forecasting, evaluation, and plan preparation differ for various modes?

What techniques are currently being used to evaluate social, environmental, and economic impacts? Are they adequate?

What procedures and techniques are available to respond to new and emerging issues such as energy?

What techniques are used to reevaluate plans, priorities, and programs on a continuing basis?

What techniques are used to provide opportunities for input to the transportation planning process by citizens, elected officials, interest groups, and others?

What techniques are used to integrate and coordinate transportation planning with land use and other functional planning activities?

Are the data collection and analytical techniques developed for urban transportation planning appropriate for statewide planning purposes? Can statewide planning techniques be used for urban transportation planning?

What techniques are used to establish prorities both within modes and between modes?

What techniques are used to develop programs for high-capital and low-capital programs?

WORKSHOP 3A: SYSTEMS PLANNING AND PROGRAMMING METHODOLOGY—PASSENGER TRAVEL

David Aggerholm, David Alschuler, Bert Arrillaga, Paul Bay, Philip Hazen, Jack Housworth, Thomas F. Humphrey, Ian Kingham, R. C. Lockwood, Wayne M. Pecknold, Paul Shuldiner, Robert E. Spicher, Max R. Sproles, Carl Swerdloff, Edgar Williams

Report

Thomas F. Humphrey, Massachusetts Department of Public Works, chairman

This report contains the summary of findings of Workshop 3A and the reports of the 3 groups into which the workshop was divided. The first group addressed the issues involved in, and reasons for, statewide planning and programming: Why do we need statewide planning and programming, and what does it involve? The second group focused on the available methodologies that are useful for statewide systems planning and programming and the desirable characteristics of those methodologies. Out of these

initial discussions came a strong consensus on the research needs for the methodological improvements required to improve the effectiveness of systems planning and programming and 3 high-priority areas where research is required. This was the task of the third group.

SUMMARY OF FINDINGS

Existing Methodology

Methodologies available and necessary for statewide systems planning and programming are grouped into 5 broad categories:

1. Travel demand, simulation, and impact prediction;
2. Econometric, land use, activity allocation, and simulation;
3. Resource allocation, fiscal policy, and programming;
4. Comparison and evaluation; and
5. Surveillance (data collection and monitoring).

Within each category, the techniques available to statewide planning vary widely as to cost, accuracy, and current degree of development. In addition to the traditional approaches or models for system planning that fall in each of these categories, methodologies are required at the policy level in order to test a broad range of statewide policies and their implications on issues such as energy shortages and environmental concerns.

The most important question addressed by Workshop 3A participants focused on the appropriateness of existing methodology (both urban and regional) for statewide systems planning and programming. An overwhelming consensus was that the value of the available methodologies, especially those developed during the 1950s and 1960s during urban transportation studies and generally referred to as the Urban Transportation Planning Process, is seriously doubted unless some significant changes and adaptations occur in these methods. An even stronger consensus, however, was that the scope of the traditional modeling techniques in their present form is limited; i.e., there has been a significant overemphasis to date on traffic and network simulation procedures by statewide planners (although this is changing rapidly in some states).

Transportation planning has had to broaden its scope and objectives in the past few years in response to changes in technology, changes in institutional structure, and changes in attitudes and values. It is now, more than ever, a multimodal process; it must recognize short-run, low-capital options as well as the more traditional capital-intensive fixed investments; it must also address uncertainties in funding sources and constraints; and it must involve the public at all levels of decision-making. In fact, the group concluded that transportation planning has become so much more complex and encompassing in the recent past that a fresh look must be taken at the requirements of methodologies for accomplishing statewide planning. Clearly, the process must become much more flexible than the urban procedures now are and be much broader than a set of techniques to produce traffic volumes and turning movements for project location staff and designers. It is, therefore, imperative for statewide systems planning to go beyond the traditional approaches and explore and develop new techniques for predicting a wide range of impacts, including environmental, social, and economic impacts; evaluating trade-offs among modes and multilevel objectives; programming and fiscal planning that can respond to uncertainties; and recognizing a variety of political and institutional constraints. These new techniques should augment and, in some cases, supplant the more traditional network simulation and traffic models.

Policy Analysis Tools

A second major finding of the workshop was that the present system of models, even given the adaptations and extensions required for addressing the statewide problems that are described in the resource paper, is overly cumbersome and far too expensive to be used to address the wide range of policy questions now facing states. Existing network simulation and related techniques do have a role in statewide and regional planning; however, there is an immediate need for a set of techniques to be used by statewide system planners as policy-sensitive analysis tools, similar to simple sketch-planning tools now being developed at the urban level.

These policy-sensitive models are analytical procedures that would be useful to address a broad range of policy-oriented questions such as pricing schemes, subsidies, equity issues, alternative allocation formulas, and modal trade-offs, but are not necessarily so elaborate as the network simulation models. These models would be used to support positions on state policy and provide preliminary results prior to more detailed and comprehensive analysis. These methods must be policy-responsive, they must have fast turn-around time, and they must be inexpensive to run if a large number of policies are to be tested. Existing network simulation and related techniques are too cumbersome and expensive to operate in exploring the large number of options currently facing states. A number of these policy-level techniques have been developed at the urban and national levels in a specific problem context. Some of these can be adapted for statewide planning, but research is needed into the exact structure and nature of a number of new procedures required for addressing problems such as energy, environmental, and subsidy issues now facing states.

Interface Between Statewide Planning and Programming

A third major finding of the workshop concerned the current lack of effective ties between planning and programming. That lack has hampered decision-making at the urban area level and will most certainly continue if unchanged at the state level. Currently, system planning has very little impact on what actually gets programmed in a state. Program decisions are driven more by funding sources and constraints (total budget, area minimums, functional classification minimums) and what can get built than by what is desirable from economic, community, and social-value points of view. One way to improve the process is, first, to begin to develop system plans as time-staged investment sequences in which long-range system plans are related to short-term programs and, second, to recognize budget constraints and uncertainty explicitly and early in the process. In addition, the plans and program packages must be multimodal, and they must include long-run capital improvements as well as shorter run low-capital options such as pricing and operating policies for rail and transit. Research is needed on the structure of the process required to improve this interface, including information flows and institutional structure and responsibility, as well as on the technical and nontechnical criteria that reflect the economic, social, and community values in determining priorities for investment. Immediate research should be undertaken to determine the nature and role of "needs" studies in a multimodal environment: How can functional classification and needs studies (and should they) be expanded to include multiple modes and to address economic, social, environmental, and travel needs in a positive way? There was also serious concern expressed for a general lack of evaluation tools and techniques for making comparisons and trade-offs between and among modes at the corridor, regional, and state levels.

Incremental and Immediate Improvements

The workshop generally concluded that there are a great many immediate improvements that can be made to incrementally adapt and adjust existing methods so that states can immediately address a number of the more pressing issues. Some of these adaptations

will produce techniques that can be used as policy-sensitive analysis tools described in the earlier section and as behavioral models for the traditional network simulation techniques. These improvements include adapting stochastic disaggregate demand models to statewide travel, incorporating on-the-shelf existing environmental air-quality models and multimodal models, and using existing evidence on the elasticity and cross elasticities of travel patterns for alternative modes from a number of sources. These are summarized in more detail in the resource paper and the summary discussions to follow.

System simulation models themselves must become much more flexible in nature and be able to aggregate or disaggregate networks easily and effectively because of the immense cost involved in running these models. The workshop recognized that the appropriateness of this methodology for particular states obviously depends on the nature of that state and the kinds of problems it must address. Clearly, there is a need for the network simulation methodology to be able to address the complex network interdependencies that exist. The workshop felt that network simulation methodology is useful at the corridor, subregional, and regional levels for predicting travel flows, but there was concern over the usefulness of these techniques at the statewide level. It was recommended that research be undertaken to evaluate the effectiveness of network simulation techniques at the statewide level and to determine the appropriate area and zone size, time frame, and accuracy of these procedures required. It was also recommended that this should be strongly related to the freight-flow prediction problem.

Dissemination of Information on Statewide Methodology and Process

The workshop concluded that there is a pressing need for continued dissemination of information by and for states on available methodologies, including their costs, accuracy, biases, data requirements, and problem context. A considerable number of techniques now available in some states could be transferred to others very readily. Similarly, a number of policy-oriented models available in urban areas and in other related transportation areas, such as port and airport planning, could be effectively utilized by state agencies.

In addition to a better dissemination of information on existing techniques and procedures, there is a need for a number of tutorial manuals on ways of applying these techniques. It was suggested that these not be manuals in the sense of a rote, mechanistic set of rules to follow in the application of a technique. Rather they should be designed in a tutorial sense as a flexible and educational set of case studies that allow each state the ability to adapt and adjust these procedures to its own specific problems and requirements.

NEED FOR STATEWIDE PLANNING AND PROGRAMMING

Changing values in society concerning the environment, energy, and even life-style raise serious questions about the traditional approaches to transportation planning. Questions were raised early in the discussions by some members of Workshop 3A as to whether the problems of transportation were becoming so broad, the events of the future were becoming so uncertain, and planning is being attempted at the lowest possible local level that statewide planning is not necessarily so important as it was a few years ago. One or two people even questioned whether it was needed at all. The consensus of the group however was that, more than ever, it is an essential part of a state agency's responsibility for the reasons described below.

Why Statewide Systems Planning and Programming Are Required

There are 3 basic reasons why methodologies are required to support systems planning and programming at the state level.

1. To provide the information needed to formulate regional and state policy in those areas that either are currently the responsibility of state transportation agencies or at least should be in the future. There are 5 broad areas: (a) to determine the level of funding for transportation and the trade-offs between transportation programs and nontransportation programs such as health, education, recreation, and water resource programs at the federal, state and local levels; (b) to help direct state policy toward issues such as land use development policy, recreational development opportunities and objectives of the state, interagency cooperation with regional and local interests, and water and natural resource conservation; (c) to interface effectively transport investment decisions with regulatory decisions by the transportation regulatory agencies on issues such as price regulation and entry and exit to markets; (d) to effectively integrate public policy decisions with decisions being made in the private sectors on locational choices, development schemes, and economic growth; and (e) to effectively integrate decisions affecting the movement of both freight and passengers.
2. To define and effectively allocate resources among and within the various transport modes. Statewide planning is required to predict funding sources, whether federal, state, or local; the degree of uncertainty about those sources; and mechanisms for transferring or generating additional funds and identifying modal budget constraints and area minimums. It is also required to effectively settle priorities for investment programs and determine the appropriate modal trade-offs of alternative programs.
3. To ensure equity in providing transportation services throughout the state. This involves making service-level trade-offs for geographical areas, e.g., rural versus urban, and interpersonal trade-offs for users and nonusers of the transportation system, including the poor, the aged, the handicapped, and those with less than average mobility.

Structure and Content of Statewide Transportation Planning

The group agreed that statewide transportation planning (STP) involves more than the traditional approaches to urban area planning and existing approaches of states to statewide planning. It should involve more than merely the modeling methodologies of network simulation procedures and urban transportation planning (UTP) techniques. To support the 3 functions of a state organization described in the previous section, statewide system planning should consist of a set of techniques that can both predict and evaluate a wide range of transportation and transportation-related impacts, including social, environmental, economic, and general land use impacts.

In addition, the prediction techniques must be capable of capturing intertemporal effects, i.e., predicting impacts recursively over multiple time periods if an effective interface is going to occur between planning and programming. Very little research on these techniques either has been undertaken or is directly applicable to the statewide problem.

The second conclusion of the group concerning the structure and content of statewide planning and programming is that the models and methodology developed should be flexibly structured as a hierarchical set of tools to address the 3 functions of level of funding, allocation of funds, and equity.

Although members of the group agreed on the need for network simulation and related techniques for resolving issues at the state, regional, and corridor levels (although some people had difficulty justifying the use of these techniques at the state level without major changes in the way they now operate and in their cost of operation), they suggested that these tools should be much more flexible in their operation and able to operate at many different levels of analysis (regional, corridor, subregional) without significant additional data collection efforts and recoding of network structure.

In addition to flexible network simulation techniques, a set of policy analysis tools is needed that operates on a much simpler conceptual level than the network simulation and related methodology. These analysis procedures must be behavioral, yet be simple to understand, relatively inexpensive to operate, and capable of discrimination among alternative policies. Therefore, they cannot be so elaborate as the network

simulation methodology. These techniques could be used both as an aid to determining state policy on transportation and transportation-related issues and as preliminary sketch-planning tools for exploring a wide variety of specific network and technology-related issues.

Obviously, the distinction between the hierarchical structure of policy analysis tools and network-related simulation models becomes blurry when one begins to use network simulation techniques as aggregate, sketch-planning tools. Both are needed, however, to investigate the implications of new technology, such as demand-responsive buses, personal rapid transit, and dual mode, as well as more conventional alternatives, such as rail and air passenger services. In some of these cases, network structure and network interdependencies will be important. In other cases, for example, state policy toward rail or transit subsidies, these factors will be unimportant or of secondary importance to the overall impact on state objectives and policy to achieve those objectives. Only through considerable research effort on both policy analysis tools and network simulation methodology will the differences, similarities, and overlap become apparent.

Sketch-planning tools that have some of these features are now under development for urban area problems. Research should be carried out on the requirements for statewide planning methodology to determine whether the current developments in the methods of sketch planning for urban areas can be transferred to the statewide problems and, if not, to determine what the structure and content of a methodology of statewide travel should be.

A third point on the structure and content of statewide planning and programming is that it is also more than a methodology or set of techniques for predicting and evaluating impacts. The methodology must recognize the institutional and organizational context within which the methodology will be utilized. The organization and use of technical planning activities and information should reflect the requirements of the implementation and decision-making process. For example, technical tools, the impacts predicted with these tools, and the priorities that are set must be integrated with the political planning process associated with local, regional, and statewide interests. The methodology must recognize the cyclical and iterative nature of the process as well as the diverse set of evaluation criteria imposed on it. In other words, the methodology cannot be simply a technique; it must not be divorced from the process within which it will be used. The methodology is, in fact, the technique and the process (or context) within which it will be used.

The final issue discussed by the group dealt with the concept that statewide planning and programming should be a process that is anticipatory rather than reactive in nature. That is, it should be a process that attempts to anticipate future actions, potential policies, and the state's posture toward these policies rather than be a process that simply reacts to current short-run problems and crisis. It is first and most important a process that must provide a definition to transportation needs, clarify problems and issues, and give assistance in predicting the impacts of alternative policies.

Most participants agreed that the whole issue of "needs" studies, including the definition and use of a needs methodology, requires basic research, which should be undertaken to determine its appropriateness for statewide planning studies. The group was unanimous in its opinion that any needs methodology certainly should be broadened from the current narrow definition of highway needs, which focus on a specified level of service that must be achieved for a particular functional class of highway. Because there are scarce economic resources that exist in all sectors of the economy, it makes no sense to determine a need without evaluating alternatives that must be foregone in order to satisfy those needs. Needs studies, therefore, should also be broadened to recognize that investment decisions should be based on community and environmental objectives, on alternatives both within and among modes, and on realistic budget constraints.

Summarizing these points, the group felt that the statewide planning and programming process should embody the following characteristics:

1. The actions in statewide planning must involve alternative time-phased courses

of action and include short-run as well as long-run options;

2. The process should evaluate alternative strategies and provide state policy planners with statements of the impacts of policy on goals and objectives for different state programs (in fact, the primary purpose of the process is to evaluate the impacts of specific policies, such as subsidies and investments, which are intended to achieve certain broad statewide objectives);
3. The process should provide the information necessary to establish priorities and recommend transportation programs;
4. It should provide a mechanism for monitoring system performance over time and for suggesting changes in policies; and
5. It should provide the interface for planning among different agencies, including the relations between federal, state, regional, and urban planning activities.

METHODOLOGIES

Some time was spent evaluating the existing methodologies by discussing the desirable and undesirable features of each approach. Out of this discussion came agreement and some general conclusions on existing methodologies, a taxonomy of required methodologies, and a list of criteria or desirable characteristics that a methodology must inherently possess if it is to be credible and effective.

Existing Methodologies

The following general conclusions were formed with regard to existing methodologies:

1. The procedure and methodology developed and applied for the UTP process is not necessarily adequate or acceptable for application at the statewide level (in fact, given the present state of the art, caution must be used in considering the use of the UTP models at all on the statewide level unless major modifications to the models are undertaken as outlined in the resource paper);
2. The geographic and time scales that are addressed as part of the STP process are so diverse that a variety of methodologies that are tailored to best fit the scale of the problem being addressed should be developed;
3. The methodology for STP must be oriented to address the questions of the economic and land use impacts of transportation alternatives as well as the more traditional user-oriented impacts;
4. Methodology is needed for integrating the private transportation sector into public planning and evaluation methodology, and procedures are needed that will evaluate regulatory, operational, and low- and non-capital alternatives as complements to or substitutes for capital investments; and
5. Existing methodology does not adequately integrate transportation planning options with comprehensive planning and policy options.

Out of these general findings on the failure of existing techniques and procedures as applied to statewide planning and the need for other methodologies over and above the network simulation procedures came the consensus that there is a need for 5 basic methodologies for statewide planning:

1. Travel demand, simulation, and impact prediction;
2. Econometric, land use, activity allocation, and simulation;
3. Resource allocation, fiscal policy, and programming;
4. Comparison and evaluation; and
5. Surveillance (data collection and monitoring).

The resource paper and the following sections summarize the research needs for each of these methodologies.

Desirable Characteristics

For the 5 broad methodological areas, it was concluded that each should have the following characteristics:

1. It must be policy sensitive and capable of evaluating alternative policies in combination with transportation system components of physical networks, vehicles, and operating policies;
2. The cost (manpower and money) to apply the methodology and the time needed for application must be compatible with the time and funds available to solve a particular problem;
3. It must be capable of providing information for multiple time horizons, i.e., short-term and long-term periods;
4. It must produce credible results for professionals, politicians, and citizens and at appropriate levels of detail for state, regional, and corridor levels;
5. It must be flexible enought to predict the impact of alternatives for changing conditions, for example, the fuel shortage, as well as for multiple objectives and interest groups;
6. It must have the ability to consider uncertainty, i.e., the probabilities of events that may or may not occur, and the impact of that uncertainty on the transportation decisions;
7. It must provide the appropriate linkages among systems planning, priority identification, and programming and recognize the institutional and organizational constraints on the process; and
8. It must be able to identify intermodal, geographic, and equity relations implicit in alternate programming decisions.

RESEARCH NEEDS FOR IMPROVING METHODOLOGY

For each methodology, a set of high-priority research needs that were felt to be essential for a statewide planning and programming process was developed for both the short and long run.

Travel Demand, Simulation, and Impact-Prediction Methodology

Short Run

1. Study of the incremental adjustments required of existing demand models, designed to achieve internal consistency and models that are more behavioral and policy sensitive.
2. Study of the impact-prediction techniques related to travel, designed as a study and selection of models and tools for the prediction of environmental and community-related impacts that provide a level of results consistent with level of input efforts.
3. Prototype study of on-the-shelf multimodal network analysis models for statewide application (or regional application as input to the statewide process), designed to test the feasibility of applying existing multimodal models.
4. Development of specialized models for single-purpose modes and for modal interface problems, such as air travel, major terminal submodal split, port models, and rail travel, designed to survey existing methodologies and adapt or develop models for specialized problems.
5. Development of stochastic disaggregate behavioral demand models for a single statewide travel purpose, such as recreation, designed to test the feasibility, costs, and transferability of results of stochastic disaggregate approaches for the statewide problems.
6. Evaluation of the UTP methodology and its applicability to statewide planning, designed to explore the feasibility of application of the UTP procedure, changes re-

quired, and most desirable mode of operation.

7. Comparison of statewide multimodal demand model approaches such as UTP, direct, and stochastic disaggregate, designed to produce a statewide travel demand model (or models) that is policy-responsive and useful for a network simulation procedure and as a policy analysis tool.

8. Techniques to evaluate travel behavior impacts of operational and policy changes, low-capital investments, and pricing policies, designed to provide immediate tools useful for evaluating short-run changes.

Long Run

1. Technical consistency between travel demand models and land use-econometric models, designed to study the interface between the travel demand methodology and long-run land use and econometric models.

2. Behavioral aspects of demand, designed to determine behavioral variables of importance for statewide travel for various trip purposes.

Econometric, Land Use, Activity Allocation, and Simulation Methodology

Short Run

1. Methods of forecasting and distributing economic growth, designed to survey methods available for forecasting and distributing economic growth, including a comparison of costs, accuracy, inputs required, and interface with travel demand models, and to emphasize procedures to be used at the state, regional, and corridor levels.

2. Relations between accessibility and regional population growth, designed to define accessibility for different socioeconomic groups and its relation to population growth.

3. Factors affecting industrial location choices, designed to study behavioral factors affecting industrial location choices and their relation to transportation decisions.

4. Survey and comparison of existing land use models and their application at the statewide level, designed to survey existing methods (EMPIRIC, PLUM, NBER), to carry out a comparative analysis to determine the appropriateness of each model for state, regional, and local applications, and to emphasize the behavioral nature of the models and its interface with transport decisions.

5. Survey of economic and employment impact-prediction techniques, designed to survey the field for economic and employment impact-prediction techniques, evaluating alternative techniques, their cost to construct and run, accuracy, biases, limitations; and to determine which impact-prediction techniques are available and useful for statewide planning and programming, what their deficiencies are, and what research is required to develop these techniques; and to emphasize the comparison of different levels of existing models, their requirements and accuracy (for example, economic activity models should include economic base, input-output models, highway usage indicators, econometric models, and business displacement studies).

Long Run

1. Development of statewide economic input-output model, designed to predict economic growth and relation of critical industries to transport sector and intended to interface with transport simulation model.

2. Development of simplified econometric model for determining effective investment levels, designed to develop a simpler model than the input-output model to be used at policy analysis level.

3. Development of behavioral, land use model, based on research in the short run on existing techniques and their deficiencies, designed to develop a reasonable model

for predicting land use changes over time and their interaction with the transport sector and for recognizing the scale (corridor, region, state) at which it is appropriate and the cost of collecting data and running it.

Resource Allocation, Fiscal Policy, and Programming Methodology

Short Run

1. Revenue projection techniques.
2. Analysis of modal operating subsidies.
3. Allocation of transportation funds by mode, by geographical area, by level of government, by capital costs versus operations and maintenance costs, and by regional "tranline" facilities versus local service facilities (functional classification).
4. Interface between system planning and programming.
5. Priority-setting process and procedures.

Long Run

1. Equity considerations, assignment of costs and benefits, transportation for disadvantaged, tax policy implications.
2. Tools to evaluate private sector changes, regulatory effects, pricing mechanisms.
3. Techniques for determining impacts of resource allocation to transportation and to other sectors.
4. Techniques for handling uncertainty in resource allocation.

Comparison and Evaluation Methodology

Short Run

1. Techniques for comparing and evaluating multimodal systems.
2. Cost-effectiveness techniques for capital versus operating decisions, project scale trade-offs, low-capital projects.
3. Investigation of concept of functional classification and levels of service for other modes.
4. Development of revised needs criteria for relative comparisons of multimodal systems.
5. Development of standardized criteria for economic analysis.
6. Techniques for making systematic trade-offs among impacts.

Long Run

Techniques for handling uncertainty and risk in evaluation.

Surveillance Methodology

Short Run

1. Collection of data on intercity bus passenger travel.
2. Collection of freight origin-destination data on shipper-receiver sources and on carrier sources.

3. Vehicle-counting techniques (including vehicle occupancy).
4. Transit-usage counting or monitoring techniques.
5. Collection procedures for air origin-destination data.
6. Collection procedures for rail origin-destination data.
7. Study on the continuing data collection process.

Long Run

1. Environmental monitoring.
2. Travel behavior monitoring, including origin-destination updates, trip generation changes, trip purpose splits, modal choice, and peaking characteristics.
3. Monitoring of relation changes between urban development and transportation policies.
4. Traffic and physical system inventory by satellite.

Resource Paper

Wayne M. Pecknold, Massachusetts Institute of Technology

The movement of goods and the provision of services by the transportation sector typically account for approximately 20 percent of the gross national product of this country each year. Problems in the transportation sector, such as a lack of facilities (for example, railroad cars) or of power (for example, crude oil and gasoline), will usually have serious repercussions throughout the economy. In the case of a lack of rail cars, the effect is relatively localized and the impact is limited to a small part of the economy; there is enough flexibility in the total transportation infrastructure to permit shifts to occur. The consequences of such facility shortages may be a difference of only a few cents in the cost of some goods. In the case of a lack of basic energy to drive the transport sector, it is clear that we are only just beginning to realize the implications for the economy and our way of life.

Partially in recognition of transport's importance to the economy and the interdependence of the modes of transport, modal agencies in many states have begun to shift to departments of transportation charged with a responsibility to plan for the total transport needs of the state. (By August 1973, 20 states had created departments of transportation, and 12 others were studying legislation to enhance the state's role in multimodal transportation.) Other factors have prompted this shift in responsibility and structure as well: changes in the values of the users of transport services and recognition that, although highways can provide extremely good service for most travelers, they can seriously disrupt urban areas and impose social costs that may well outweigh the benefits. Many states are, in fact, having considerable difficulty constructing any new highways, both in urban and rural areas, primarily because of environmental and social concerns. These problems will most certainly be compounded by fuel shortages.

Because of all these factors as well as the problems and the recent changes in institutional structure and funding, state transportation agencies must now consider a whole new set of options in maintaining and improving transportation services. The Environmental Protection Agency has proposed an impressive list of options as alternative ways to meet environmental standards in urban areas (3). These options range all the way from improved traffic flow programs through pricing and regulation to a restructuring of public transit services. Although not designed as such, they may turn out to be viable alternatives for easing the current energy crisis as well. Those options, listed below, are arranged in 3 groups according to the primary purpose intended to be achieved.

I Reduce motor vehicle-miles of travel
  A Transit operations
    1 Bus lanes on city streets
    2 Bus lanes on freeways
    3. One-way streets with two-way buses
    4 Park-ride, kiss-ride (A situation in which a passenger is driven to a public transportation terminal and dropped off has come to be called a kiss-ride)
    5 Service improvements and cost reductions
  B Regulation
    1. Parking bans
    2 Automobile-free zones
    3 Gasoline rationing
    4 Four-day, 40-hour week
    5 Congestion passes
  C Pricing policy
    1 Parking tax
    2 Road-user tax
    3 Gasoline tax
    4 Car pool incentives
II Increase efficiency of traffic flow
  A Freeways
    1. Reverse-lane operations
    2 Driver advisory displays
    3 Ramp control
    4. Interchange design
  B. Arterials
    1 Alignment
    2 Intersection widening
    3 Parking restrictions
    4 Signal progression
    5 Reversible lanes
    6 Reversible one-way streets
    7. Helicopter reports
  C Traffic improvements
    1 Traffic-responsive control
    2. One-way street operations
    3 Loading regulations
    4 Pedestrian control
    5 Traffic Operations Program to Increase Capacity and Safety (TOPICS)
  D Staggered work hours
III. Apply supplementary motor vehicle emission controls
  A Inspection and maintenance
  B. Idling restrictions
  C Retrofit of emission control devices
  D Conversion of gaseous fuels

As a first and continuing step in helping transportation planning to cope with the multitude of factors facing it, the Transportation Research Board (through NCHRP) and the U.S. Department of Transportation have sponsored a number of research projects that are designed to produce new multimodal planning techniques and procedures. They have also sponsored a number of conferences intended to summarize the state of the art and to produce recommendations for future research. Most of these conferences have been oriented to urban methodology and issues to date. The most recent were conferences on urban travel demand forecasting and citizen participation in transportation planning and air quality. In addition, one conference on state transportation issues in the seventies addressed the organizational and financial issues of states. This present conference is the first one aimed directly at discussing the full range of critical issues in statewide transportation planning.

The primary focus of this paper, which was prepared as a resource paper for Workshop 3A, is on passenger travel demand forecasting methodology, but it is obvious that priority programming, citizen participation, and a whole host of other issues strongly related to statewide transportation planning must be interrelated with the

methodological issues of passenger travel forecasting. It should also be obvious that the list of issues for Workshop 3A is far too broad and far too encompassing to be addressed adequately by a single resource paper.

The purpose of this paper, therefore, is to present a brief survey of existing state methodologies, to discuss the desirable attributes of a statewide passenger planning and programming methodology, to outline a program of long-range research, and to identify what can be done immediately to improve the existing methodology available to state transportation agencies.

This paper has 5 major sections: (a) emerging issues facing statewide planning as background for methodology for statewide planning and programming; (b) existing methodology for statewide planning and programming; (c) proposed improvements to statewide planning and programming methodology; (d) continuing statewide planning process; and (e) summary and conclusions.

EMERGING ISSUES FOR STATEWIDE PLANNING

In response to changes in technology, demand, and most notably, societal attitudes and values, transportation planning has had to undergo during the past few years significant adjustment in the institutional structure and in the process and procedures used in planning. For example, many changes are now occurring in metropolitan transportation studies through the establishment of regional planning agencies (RPA), such as increased public participation and an emphasis on planning being done at the lowest possible local level. Massachusetts (5) is one example of an urbanized state where RPAs bear the major responsibility for preparing plans and setting priorities. California is also relying heavily on its 41 RPAs to produce the transportation plans that will be the basis for the 1976 state transportation plan; West Virginia, a predominately rural state, is also emphasizing regional agencies.

At the national level, federal funding procedures appear to be heading eventually toward multimodal funding, and there are new legal requirements for the consideration of social, economic, and environmental factors. Many states are in the process of preparing state multimodal transportation plans and developing state planning methodologies. [NCHRP Synthesis 15 (6) provides an overview of the methodologies used by various states up to 1972.]

Not surprising, there is a general feeling that the issues emerging at the state level are of an order of magnitude more complex than urban, regional, or perhaps even national issues. Based on the previously mentioned conferences, reports, and personal discussions with perople responsible for state planning, it appears that there will be considerable controversy over the appropriate methodology for statewide transportation planning simply because of the small amount of previous effort in this area and the paucity of data at the state level.

There are, however, additional reasons for the complexity that exists at the state level. The report of an earlier conference (4) summarized what that conference considered to be the major issues facing state transportation agencies in the next decade.

1. Organizational Issues Should a state organize functionally or modally? What is the role of commissions? Who has the responsibility for planning, for construction?
2. Intergovernmental Relations in Transportation How can problems with the U S Department of Transportation be resolved? What should be the relationship of states to local government?
3. State Regulation of Transportation Should the regulatory and planning functions be integrated? If not, how should they be coordinated?
4. State Financial Issues How are revenues to be raised? Should there be general or modal funds? How active a role should states have in mass transit?
5. Aviation What is the role of the state in financing, planning, and constructing airports and upgrading the overall air system and its access modes?
6. Highway Issues Who decides the role of highways in the seventies? How is coordination with other modes assured? How are they to be financed? How are

environmental concerns coped with?

7 Railroads How much role should states play in planning rail improvements? What about the issues of rail safety enforcement and rail-highway grade crossings, relationship with Amtrak, and the states' role in abandonment and relocation?

8 Multimodal Planning How is multimodal planning carried out? How is it different in a rural state versus an urban one? What is the effect of lack of multimodal funding?

Although these issues are significant and must be resolved, they are also fairly broad and encompassing. Some will be many years in debate; some may never be fully resolved. There are a number of methodological issues, however, that must be handled in the immediate future regardless of the resolution of the broader issues described above. Moreover, these are issues that can be addressed effectively and, if resolved, will support an agency's ability to deal with more complex policy level and organizational issues in a flexible manner.

The position of this paper is that there are 4 major emerging issues with which any methodology for statewide planning must deal. These are discussed in the remainder of this section.

Changing State Role in Transportation Decision-Making

Many states are beginning to identify a wide range of state interests that complement (and, in some cases, conflict with) previously established transportation interests. These include interests in land use, economic development, air quality, and energy conservation. For example, significant questions are now being raised by segments of the public and government concerning environmental quality and development patterns for the state as a whole. California (7) recently instituted a Coastal Zone Policy and is reconsidering the question of highway investments in general in its coastal area because of environmental concerns. Should the state initiate overall state goals as to environmental objectives and their relation to state transportation investment policy, or should it merely respond to crisis? Obviously, the state must take a much more active role in statewide land use (as well as transportation) planning and policy formulation if the critical environmental and developmental issues now being recognized are to be carefully considered. Although they are able to articulate statewide goals and objectives in general terms, the states must now move to define them operationally so as to identify and resolve conflicts. [Many states have defined their objectives in a simple and straightforward manner similar to the way in which urban studies defined their objectives in the early 1960s. Many others recognize the difficulties with such an approach and are attempting to define statewide objectives more flexibly (8).]

The changing role of transportation agencies will also involve the interaction, coordination, and resolution of conflicts among different functional planning agencies of the state. Departments of recreation, economic development, health, education, welfare, and even agriculture have significant stakes in the development patterns that will occur and the transportation investments that lead and in some cases follow those patterns. In some states, interaction and cooperation have already begun. In others, the state transportation department is aware of the organizations that exist, but understanding their functions, the available data sources, and how to coordinate them is only in a preliminary stage.

Furthermore, in many states the emergence of distinct regional variations in objectives has resulted in conflicts between state and region and among regions. For example, rural regions now want to control growth in some areas while urban regions still want access to rural areas in order to improve recreational opportunities. This requires a state transportation planning framework that recognizes the conflicts in goals and provides the process for resolving them. Moreover, it requires a process that recognizes the competition among regions, between regions and the state, and, in some cases, even between states for a limited set of resources.

Competition Among Modes

Modal competition exists in some form or other in all states. Even in the more rural states where the primary mode of passenger travel is by automobile, rail and trucks are in direct competition for goods movement. Because trucks must share the existing highway facilities and rely on the mobility provided by the highway network, ignoring this competition in planning facilities in terms of scale, location, and design standards leads to inefficient investments and perhaps even distortions in the transport sector.

In the more urbanized sections of the country, this competition is even more dramatic and is certain to be accentuated by environmental issues and fuel shortages. The issue is how to resolve the trade-offs that exist among modes. Given that some broad consensus can be reached in development objectives and that conflicts among regions and between regions and the state can be resolved, how should investments be made to effectively reinforce state and regional policy? What are the most efficient investment levels for each mode given an investment picture involving both public and private interests? What is the methodology required to help make those trade-offs?

Citizen and Community Participation

Citizen participation, community interaction, and public involvement are all synonymous with a much more participatory, grass-roots level of interaction between the public and the technical and political interests involved in making public investment decisions. A number of experiences in citizen participation at the local level have been extremely successful while others have not. [The Boston Transportation Planning Review (9) is one of the most elaborate and successful studies involving community participation to date. Atlanta (10) and New York City (11) have also had considerable success with citizen participation.]

At the state level, however, it is difficult to tie the effects of the issues being discussed to the interests of particular individuals or groups. Often the discussion of long-range resource allocations and policies is so abstract that many interest groups cannot understand why they should be concerned. [New York State (12) undertook a series of community interaction meetings that were thought to be extremely successful in getting both involvement and agreement.] As a result, major issues that might block the actual implementation of a project or program do not emerge until planning has progressed well beyond the state level. The challenge, therefore, is to develop a participatory and iterative process that can identify the critical statewide issues (e.g., land use control, economic development, and transportation level of service) that must be resolved in statewide planning and to actively stimulate the participation of interest groups in discussion of these issues (i.e., by making the effects of such policies as explicit as possible). Although implementation can never be fully assured at the state level, only through more effective participation can higher quality, responsive state policies emerge. The methodologies for statewide planning must recognize and encourage this kind of participation.

Equity

The final issue to be addressed by any statewide methodology is the equity and the distributional effects of investments. No longer can we evaluate alternatives in terms of "benefits to whomsoever they may accrue." [This was the general phrase used in federal legislation in the 1950s and incorporated in the traditional highway benefit-cost analysis procedures (13).] The distributional impacts do matter and will become increasingly important—truck versus rail interests, agricultural regions versus urban areas. (To date, most of the equity issues of regional significance have been ad hoc. For example, many states have handled regional equity problems by mandating that certain minimums be spent in each county or district whether or not there are projects

high enough on the state priority list.) Different income groups within and between different geographical areas will become interested and want to know how their interests are being reflected. Moreover, the demands for statewide services will be different for different groups. What most certainly cannot be accomplished, which some have alluded to, is to construct a welfare function that collapses the values of these different groups and makes interpersonal aggregations. On the other hand, it is possible to develop a statewide technical planning and programming process that recognizes these equity issues and provides the political and policy level people and the affected public with enough information on distributional effects to enable them to make trade-offs and resolve conflicts. The issue of equity has considerable implications for the methodologies and models used for predicting demands, evaluating alternatives, and making programming decisions.

In addition to the 4 major issues cited above, a number of problems of a more procedural or mechanical nature must also be resolved before there can be an effective statewide planning process.

1. Should statewide planning focus on the long run and only concern itself with horizon or target-year plans some 20 to 30 years in the future? Or, to have credibility, must it be integrated with shorter run plans and actual programming decisions in a time-staged, sequential investment sense? There are significant trade-offs to consider in terms of cost and time of analysis versus relevance of the planning and programming process.
2. What is the appropriate level of detail required in the statewide planning effort? How does a statewide plan match the regional plan projections? How effective is a spider network at a relative abstract level of detail? How many zones should be used? A number of states are using 2 zone systems, one on the order of 1000 to 2000 zones and another on the order of 100 to 500 zones.
3. How is the overall state plan developed, and what is its relation to urban, regional, and corridor studies? Is the state plan merely a composite aggregate of regional plans?
4. What are the data requirements for statewide planning? What new types of data are required for the new models for predicting travel and economic and environmental impacts? What sample size is required for surveys? What mixture of screen-line counts, origin and destination surveys, and license plate surveys should be used?
5. What new tools are required for statewide analysis? What new tools are required to address the multimodal issues emerging at the state level? Where and when should we be using specialized, single-mode models? Should we have alternative levels of models for addressing different problem types?

Conclusions

The tentative conclusion one reaches from considering all of these issues and how they have been handled to date is that considerable research, development, and implementation need to occur in a wide variety of areas of statewide planning. And even then there will be mistakes and we will have to revise and adapt our methods and techniques. For example, it is becoming clear to many states that existing UTP procedures are not sufficient, and perhaps not even appropriate in their present form, for statewide multimodal planning. It is also clear that the present interface between planning and programming is extremely weak. A set of criteria is needed, broader than the present set, to be used in determining multimodal needs and performing evaluation if statewide planning is to be effective. Overall, the information flow among state agencies on statewide planning has been extremely limited. Much better dissemination is needed of information about ongoing research and practical methods of citizen participation; economic, environmental, and travel prediction techniques; methods for integrating state and regional plans; and so on.

What Can Be Done?

The previous sections have painted a rather bleak picture of the existing situation faced by statewide planning organizations. The situation is not hopeless, however. A number of techniques that are or soon will be available at the urban level can be adapted to statewide planning. Fairly elaborate and useful new packages of systems planning tools in a number of states are already available for use by other states. The first requirement for state transportation agencies, therefore, is the development of a careful and deliberate strategy of improvements, both short and long run, that (a) integrates the methodology that can be adapted, (b) develops the research required to produce techniques and tools in the areas needing them, and (c) evolves a coordinated statewide modeling and analysis system useful for evaluating the transportation investment decisions facing us in the next few years. Moreover, what is required is a process that brings out the issues described above—modal trade-offs, spatial and interpersonal equity considerations, ecological and environmental impacts, and intersectoral trade-offs such as the effectiveness of transportation investment relative to health, education, welfare, recreation, and housing.

The presentation in this paper will outline the initial and immediate steps required to develop and implement the models and methodology necessary to support the identification and resolution of these issues.

EXISTING METHODOLOGY FOR STATEWIDE PLANNING AND PROGRAMMING

The previous section outlined what appear to be the major emerging problem areas at the statewide level from a very broad perspective. The intent of this section is to present a brief survey of the methodology currently used by states in resolving some of these issues, analyzing how successful it has been, and presenting the major deficiencies with this methodology. In part, the survey has focused on the methodology used by highway agencies, not by design but because multimodal concerns have only recently been incorporated in newly formed departments of transportation. Where possible, this section also reviews methodology that has been developed for multimodal analysis and could be used at the statewide level. The following section will then discuss revisions to this methodology to overcome these deficiencies, building on the framework that exists in many states and the techniques currently available. In all cases, the revisions are intended to allow the process to become more credible and policy-oriented by becoming a multimodal process.

Overview of the Planning and Programming Process

The following description is paraphrased from a report by Krecji (14, pp. 16-25). It is only a general summary of the components of and interface between planning and programming. A more detailed discussion of a particular state's planning and programming process and the interface and flow of information are given by Neumann (15).

Although each state has its own unique approach to planning and programming, there are some basic similarities and some major differences in how these functions are defined and how they are carried out. We will define these functions to be sure terms are understood, to specify the interface between them, and to serve as a background for the problems presented in the following sections.

Capital investment planning is one of a number of responsibilities of most transportation agencies. Its purpose is to determine desirable improvements to the existing transportation system. This includes improvements such as major capital additions to the existing network (safety improvements, new construction, operational improvements), maintenance improvements (resurfacing, continuing maintenance, spot improvements), and, in some instances, provision of assistance to other agencies (TOPICS, rail crossings, county assistance).

Investment planning, perhaps the most important function of a state transportation

agency, generally consists of 6 major activities: fiscal planning, system planning studies, programming, budgeting, scheduling, and project development phases.

Fiscal planning is a broad term meant to include several subactivities: It involves forecasting of revenues and analyzing of alternative financing methods such as bonding or pay-as-you-go financing for highway improvements. As part of fiscal planning, the allocation of the burden (i.e., who pays the taxes among the users or nonusers) is determined. For example, among users, how much should truck travel pay compared to passenger automobile travel? Fiscal planning, also as defined here, must be concerned with the allocation of revenues. After revenues are collected, the decision must be made of how they are allocated both among different districts and among different functional classification systems such as a primary, secondary, or Interstate system. Fiscal planning, in addition, provides information and necessary input for the programming activity.

The second major activity of the investment process is referred to as systems planning or preliminary studies. This involves the generation or conception of projects and the collection of information on the impacts, uncertainties, relative community acceptance, and interdependencies of different candidate projects. It includes many of the more familiar activities that lead to the proposal of any project; needs studies, land use, economic activity shift, traffic flow modeling and simulation techniques, master plan development, urban planning recommendations, field inspections and inventories, and political suggestions. All these sources of projects are input to, and part of, system planning studies.

Programming then begins with a review of the information that has been prepared by fiscal planning and system planning. These basic data are used to prepare alternative programs of projects. (A program, as used here, is a collection of nonmutually-exclusive projects. Sometimes programs are divided into subgroups, each called a program, such as a construction program or a safety program. The word program as used here refers to the entire collection, i.e., the total investment program.) The emphasis is on programs because the purpose of programming is to oversee and plan for the entire spectrum of investment decisions made by the state transportation agency.

Once alternative programs are developed, they are evaluated as to their impacts and their relative desirability based on different priority criteria; generally indexes such as volume capacity ratios, safety rates, and sufficiency ratings are used. Programming is not completed, however, until the final priority of alternative projects is established; account is taken of not just project and network impact data (including community and environmental concerns) but also the distribution of projects over geographic areas and over time.

Programming also is involved with monitoring and updating a selected program while implementation proceeds until the next major programming cycle is reached.

The scheduling of projects occurs once a program has been adopted. After programming identifies in a normative fashion what, when, and where project development actions are to occur, scheduling determines whether it is actually possible to perform these actions in their relative priority order and within detailed constraints on money and manpower and suggests whether small changes are necessary to account for the manpower and work-load considerations. Scheduling is also responsible for developing time and manpower standards; it balances the work-load by developing a precise short-term timetable of subtasks for carrying out the adopted program.

Budgeting is similar to scheduling, but is concerned with the financial aspects. It includes financial accounting, preparing cost histories, and performing fiscal planning on a very short-term scale. Budgeting is also concerned with monitoring budget performance.

The activity called project development phases is the aggregation of the more familiar terms of project planning, such as location studies, environmental impact studies, design, right-of-way acquisition, and construction. Project development phases are obviously subsequent to scheduling and budgeting, for it is through these activities that the necessary resources, tentatively assigned to a particular project during programming, are actually allocated.

The relation between each of these 6 major activities of the investment process is shown in Figure 1 (14). The major sequences between the activities are indicated by the

heavy lines and the feedback loops or iterations among the activities by the light lines.

The investment planning process shown in Figure 1 must be a continuous, iterative, and cyclical process, with each of the activities recurring at regular intervals. For example, needs studies occur every 2 to 4 years, traffic flow modeling is perhaps continuous, and the programming decision may occur every $1\frac{1}{2}$ to 2 years. There are a number of institutional responsibilities for various elements of this overall process. For example, the state headquarters of a highway department or transportation agency is generally responsible for fiscal planning; district offices, for community interaction procedures; and either the district offices or headquarters, for conducting preliminary system planning studies such as needs studies and corridor and network analysis. The exact responsibilities and the methods and techniques used to carry out these functions will differ from state to state. No matter how the function is defined in any particular state, the process implies the need for a significant amount of information flow and participation. In many states the institutional structure and the flow of information have become even more complex, and the responsibilities have not yet been clearly articulated. For example, RPAs are now heavily involved in most if not all of these functions of planning and programming, which should reinforce (and may replace in some cases) the state's activities in these areas.

Because of their importance to the overall development of investment patterns, we have chosen to focus this paper on 2 key elements of the 6 activities: the system planning studies and the programming process. These 2 components are most strongly related (or should be) and have the most impact on the projects that actually get constructed.

Although the system planning studies and programming functions have not been entirely divorced from each other in state transportation agencies, their interface has been something less than desirable to date. As Neumann et al. state (16), "System plans have specified the total list of projects which could be considered without providing strong guidance for the scheduling and implementation of specific projects (i.e., priority setting and programming) with some disastrous results in implementation delays and revisions." In other words, these 2 functions should strongly reinforce each other and traditionally they have not. Therefore, although all 6 activities are obviously important to the investment planning process and all are strongly interrelated, we feel that the primary deficiencies (and the most promising areas for improvement) fall in the areas of system planning, the programming process, and the interface between them, as we will describe in the following sections.

Survey of the Existing System Planning Methodology

Relative to urban and regional studies, little concern has been devoted to statewide transportation studies and a smaller effort yet devoted to the documentation and dissemination of the studies that have been done. Some recent reports, however, have surveyed a number of studies and in some cases developed study designs of their own. Along with material collected by the author through correspondence and personal contact with a number of states, these serve as the major source for this section.

The 3 major sources of the methodology used by various states are a report by Hazen (17), a Carnegie-Mellon University and Pennsylvania State University (CM/PS) study (18), and an NCHRP report (6). An additional excellent reference on the techniques used by various states is a recent FHWA publication (19). In addition, material was obtained on Massachusetts, Michigan, Connecticut, New York, and California through other sources. The purpose of this section is not to repeat these surveys but to give a fairly broad categorization of the study methodologies. Readers are referred to each study for a more detailed comparison of approaches.

Existing statewide system planning studies (with an emphasis on passenger movements) can be classified into 4 basic categories: (a) no statewide model (traffic estimated by trends or growth factors); (b) statewide network simulation traffic models, including highway models only, modal models not integrated, and integrated multimodal models; (c) statewide travel model integrated with environmental impact (air

quality, noise) models; and (d) statewide travel model integrated with land use, economic, and other impact models.

No Statewide Model

In a large number of states, "statewide" studies are confined to traditional surveys on a link-by-link basis in order to establish a need for improvements. [An excellent summary description of this process is contained in the CM/PS study (18).] Surveys include highway inventories, road-life studies, traffic surveys, highway classification studies, motor vehicle use studies, and fiscal studies. Data obtained from these surveys and projections of traffic flows are used in a continuing study of highway needs, which identifies and evaluates future projects of highest priority (18, p. 93).

The most obvious and major problems with this approach, aside from the lack of a similar methodology for other modes, are that (a) links are not considered as part of an interconnected network and (b) needs are determined in terms of user consequences only (usually a level-of-service condition or safety deficiency) and without regard to budget constraints for the network as a whole or for regions. (More will be said about this deficiency in the section on programming.)

Statewide Network Simulation Traffic Model

A great many states have converted or are in the process of converting from the preceding category to this category. Within this category, there are 3 types of approaches.

Highway Simulation Model

This approach is most typically used by highway departments that have attempted to adapt the traditional UTP sequential procedure of trip generation, distribution, modal split, and assignment to a statewide level. (For purposes of this paper, we assume that the reader has some familiarity with these procedures and their differences.) Although each of the approaches in this category have similarities, there are some significant differences in terms of number of trip purposes, type of model (for example, trip distribution might use either a gravity model or the Fratar method), calibration method type of base-year trip table, assignment method, and so on. Both the CM/PS studies (18) and the NCHRP study (6) contain more elaborate discussions of these approaches. Table 1, which is taken from the NCHRP report (6), gives a summary of the methods employed by 8 of 10 states contacted in 1972.

The major points to emphasize concerning these studies are that (a) they are not multimodal; (b) they are used as long-range forecasting techniques (15 to 30 years in general); and (c) historically, they have had little impact on actual programming decisions of which links get built when.

It is interesting to note that a recurring problem for a great many, if not all of these studies, is the trouble encountered in trying to reproduce statewide flows by matching screen-line counts or trying to match counts produced by regional studies. The magnitude of this problem depends, of course, on the level of aggregation in terms of number of zones and its effect on numbers of intercity versus intracity trips, the degree of disaggregation in terms of number of trip purposes, and so on. Table 2 gives some additional comparative information on the differences among the simulation approaches taken in a number of states.

Modal Models Not Integrated

A limited number of states have, or are planning to have, simulation models for modes other than highways. Michigan expects to have statewide models operational

Figure 1. Transportation investment planning process.

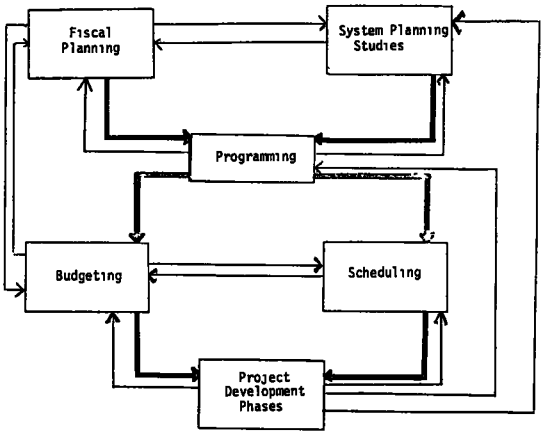


Table 1. Statewide transportation simulation models.

State	Simulate Trips Over Statewide Network	Base-Year Trip Table	Future Trip Table: Trip-End Generation	Future Trip Table: Trip Distribution	Assignment to Statewide Network: Spider	Free	Capacitated	Multimodal
Rhode Island	Yes	O and D	Regression equations	Gravity		X		No
California		O and D and synthesis	Regression	Gravity		X		No
New York	No	Combined O and D and synthesis	Regression (population and employment)	Gravity or opportunity			X	No
Pennsylvania	Yes	Screen line and synthesis	Growth factors	Fratar		X		No
Iowa	Yes	Screen line	Population	Fratar		X		No
Wisconsin	Yes	Screen line and synthesis	Growth factors	Fratar		X		No
Minnesota	Yes	Screen line	Regression on population	Fratar	X	X		No
Connecticut	Yes	1 percent O and D	Regression	Gravity				
New Jersey								
Florida								No
Washington	No	—	—	—	—	—	—	No
Wyoming	No	?	?	Fratar	?	?	?	No

Table 2. Statewide planning models.

State	Date	Population	Number of Zones in Model System	Number of Miles of Highway	Area (square miles)	Cost (dollars)
Connecticut	1963	2,500,000 (in 1960)	1,177 856	9,100	5,009	1 million
California	1968	18,602,000	1,450	14,215 + feeder roads	158,693	
Massachusetts	1973	5,348,000	Not available		8,257	
Pennsylvania	1971	11,520,000	163 passenger 15 to 40 freight		45,333	
Rhode Island		920,000	550	1,600	1,214	1 million
Michigan	1973	8,218,000	2,300 547		58,216	
Wisconsin	1964-1967	4,144,000	643	14,484	56,154	

for a number of different modes by the middle of 1974, but there is limited documentation for these models as yet. California, in addition to its 2-level statewide highway model, has an air travel simulation model. Connecticut has developed goods movement models for railroad and truck as well as special recreational travel demand models (17).

Integrated Multimodal Models

To the best of our knowledge, no state has as yet developed or used an integrated multimodal model for statewide planning. However, a number of states have carried out multimodal study designs [California (20) and Pennsylvania (18) are examples], and California is currently considering utilizing one or more of a number of on-the-shelf multimodal computer packages including DODOTRANS (21) and STAR systems (22).

DODOTRANS, developed during the Northeast Corridor study (23) in the late 1960s, can incorporate multiple modes and integrated direct demand functions (simultaneously predicting generation, distribution, and mode split). The STAR system, first developed for studies in California, also has multimodal capabilities, has been tested extensively, and will soon be available for distribution through the Transportation Systems Center of the U.S. Department of Transportation. Both will be described further in the following section on proposed improvements to planning procedures at the statewide level.

Statewide Travel Model Integrated With Environmental Impact Models

Most states have begun to develop environmental impact models in conjunction with a network simulation model. The emphasis to date has been on the development of air quality and noise impact models because of the legal requirements for meeting environmental standards. The most obvious problem with most of these approaches is the previous lack of work in these areas. This is extremely virgin territory compared to the travel forecasting methods available, and how accurate these techniques are is not yet clear. An interesting question being raised by some state agencies is, What good are air quality impact models (even at the state level) if we are concerned with reducing truck volumes from 6.5 to 4.5 percent to achieve air quality standards when the forecasting methods for truck volumes are producing forecasts on the order of 10 percent of passenger volume with an error of at least ±50 percent?

Nonetheless, Michigan (24), California, and a number of other states have developed both air quality and noise models that should be useful at least for order-of-magnitude estimates. Clearly, our knowledge in these areas can only be termed elementary at best, and the accuracy of the methods is subject to question.

One interesting set of models, which was developed for FHWA by Harvard University and is called the TASSIM model (25), has incorporated the FHWA travel prediction package (including a multipath assignment technique), fairly simple moving and point source emission models, and a simple dispersion model to predict the impacts of various air quality policies. (The model to date has been developed by using a spider network on a 122-zone system in the Boston region.) The interesting feature about this study is that the research team compared a variety of emission and dispersion models currently available for predicting air quality before deciding on the basic features of their approach. They concluded that, in general, the simpler models available give results at least as good as those of the more complex methods and are significantly easier to calibrate and use. [A second study by Darling (26) also contains a general state-of-the art survey on computer models for transportation-generated air pollution.]

Statewide Travel Model Integrated With Land Use, Economic, and Other Impact Models

Few states have attempted to integrate travel forecasting methodology with more comprehensive land use and economic impact models. Connecticut is one state that has developed operational models and used them in a statewide study; Pennsylvania and California have developed elaborate study designs but as yet have not begun to make these studies operational.

Connecticut

The Connecticut Interregional Planning Program (CIPP) is a unique study, having developed and used a number of economic and land use models in conjunction with a traditional set of transport simulation models (17, 18, 27). It is also unique because 2 state agencies, the highway department and the state development commission (already in the midst of a land use study), cooperated and developed an integrated transport recreational and land use plan. (The cost of the study was $1 million over a period of 3 years. This cost was much less than it otherwise might have been because existing data were available. The study also was apparently extended in 1971.)

The model system, shown in Figure 2, consists of (a) an economic base model, which produced an industrial accounts model for determining employment in basic industry and dependent employment in related service industries; (b) a land use distribution model, which takes the aggregate of population and employment predicted by the economic base model and disaggregates these by subareas (in addition, a simultaneous equation system allocates land uses by the 4 sectors of manufacturing, service, unique location, and population); (c) recreational activities and recreational travel models, which respectively describe the per capita demand for outdoor recreation by 5 categories in the state and by towns and predict the manner in which this demand would be allocated between towns and outdoor recreational locations; and (d) transport submodels of the traditional 4-step UTP approach for both passenger and freight.

California

In 1965, the California Division of Highways had a study performed (20) that describes a series of transportation demand, population, economic input-output, land use, and evaluation submodels that operate over time and permit feedback between the transport sector and other sectors of the economy. The estimated cost for development and implementation was $6 to $9 million over a period of approximately 4½ years. To date, however, the model system has not been implemented. The California Division of Highways has, however, recently developed a highway simulation model, as described earlier, based on the traditional UTP process.

Pennsylvania

Pennsylvania had a study performed (18) that also laid out a comprehensive framework for planning multimodal transportation systems. This study is also unique in a number of respects. First, the study design proposed to develop a comprehensive data collection effort and modeling framework consisting of 4 major submodels, as shown in Figure 3 (18). The model is multimodal, however, only in terms of different modes (automobile, truck, bus) that use the highway system. No attempt is made to model the rail mode and its flows because of (a) the interstate nature of the flows that extend beyond Pennsylvania's boundaries and (b) a basic lack of data. The model system consists of a passenger demand model for one purpose, used with an adapted FHWA assignment procedure operating on an abstract network. According to the report (18, p. 370), "The three distinct modes of auto, truck and bus are assigned separately, although the route choice patterns of the latter two modes depend upon the route patterns determined

Figure 2. Phases and model system of the Connecticut Interregional Planning Program.

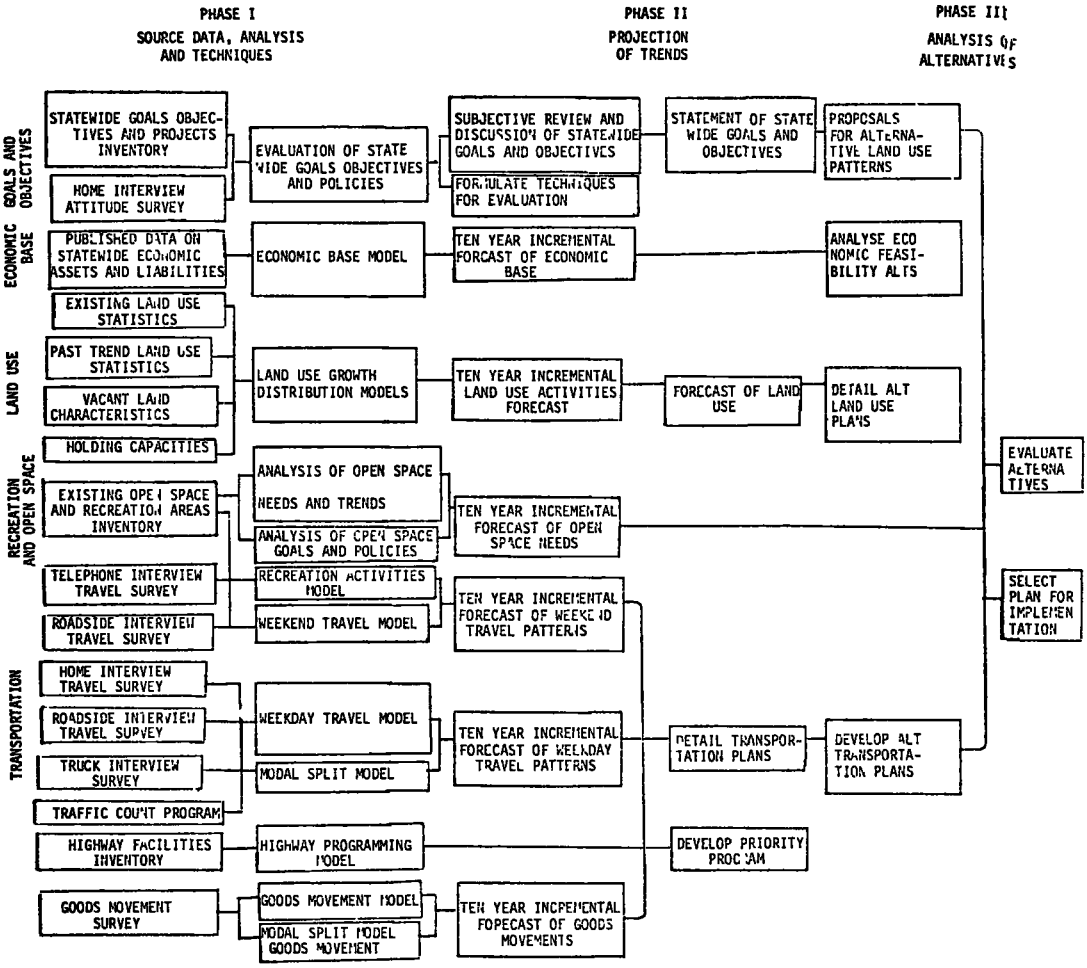
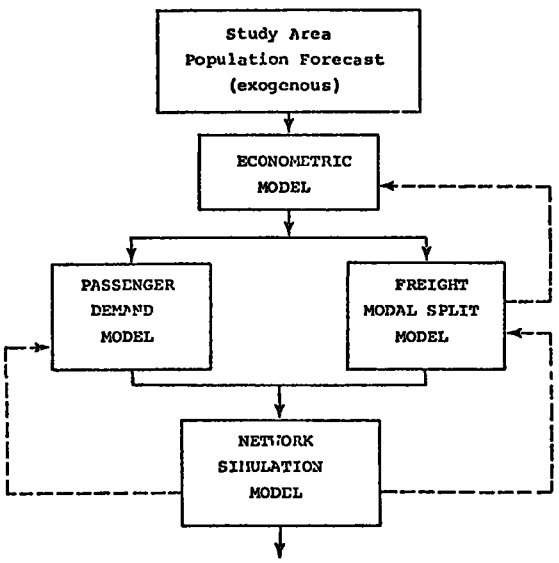


Figure 3. Forecasting model system.



for the auto mode." [An abstract mode or Baumol-Quandt model (28) similar to one conceived during the Northeast Corridor study is proposed as the basic demand model for both freight and passenger flows. It has the advantages of requiring limited data and being able to predict the demand for new modes. However, a number of studies have shown the model to possess some undesirable features in certain instances (29). It most certainly will have biased estimates if developed for only 1 trip purpose as proposed. The study recognizes the need for a more disaggregate model, but rejects the approach because of the lack of availability of substantial passenger flow data. A later section in this paper discusses data requirements for stochastic disaggregate models that may help to eliminate this problem.]

The freight modal-split model is also based on the abstract-mode model approach, but incorporates different variables and a revised procedure for applying it to the regions under study. It has the same advantages as the passenger model in terms of computational use and calibration, but it has the major disadvantage of being unable to differentiate the effects of commodity type on the modal-split decision.

Finally, the econometric model is a fairly complex input-output model of an interindustry, interregional type that captures the flows of commodities between regions and sectors and is sensitive to transport policy.

The passenger model is proposed to operate at the 163-zone level; the freight model, limited by data availability and the economic input-output model, will operate at the 15- to 40-zone level. Freight demands and supplies will require further disaggregation by subzones before assignment can occur.

The major advantages of the techniques proposed by this study design over those of the Connecticut study are that (a) it has recognized the multimodal nature of demands and is using the direct demand approach; (b) it also recognizes that passenger and freight traffic use the same facilities and is, in effect, a multimodal assignment process (although capacity restraint is not proposed); and (c) it has included an economic input-output model in order to predict the interzonal interindustry flow of goods by commodity class.

Its major disadvantages are that (a) it uses an aggregate passenger demand model with only 1 trip purpose; (b) it is oriented solely to some future target-year system and endorses the master plan concept (therefore, it is not recursive in nature and cannot capture intertemporal effects); and (c) it estimates the cost of development of the modal system, including data collection at $7.2 million over a period of 5 years.

Other Studies

In addition to the previous studies and study designs, there are several studies worthy of mention, which, although not designed to be used at the statewide level, are somewhat unique in the transport field and have resulted in a number of spin-offs and developments in research that may in fact change our ability to predict by at least an order of magnitude.

The first study is the Northeast Corridor study (23), conducted during the 1963-1968 period. Out of this study came almost all of the current direct demand modeling efforts, including the SARC-Kraft model (30), the Baumol-Quandt model (28), and the McLynn model (31). In addition, a number of multimodal model systems were developed such as the Mitre multimodal transportation model (32), the STAR system (22), and the DODOTRANS system (21). The study even took some preliminary steps toward incorporating stochastic disaggregate approaches (33).

The second study worthy of discussion is generally referred to as the Harvard-Brookings study (34), developed in the 1964-1968 period for a cost of approximately $0.5 million. It consists of (a) a macroeconomic model, which models industries, government, and private investments and commodity flows over time, and (b) a transport model or submodels of rail, highway, water, and pipeline. It operates recursively over yearly periods; the transport model possesses the ability to be disaggregated by seasons if necessary to capture seasonal effects.

Although the original Harvard-Brookings model was the first of its kind to integrate

economic input-output models with a transport model, as well as passenger and freight models for modal split and assignment, it still had some shortcomings (for example, links were not capacity restrained). Recent improvements to the transport model have eliminated most of these shortcomings, and the whole study stands as a classic in the field of transportation planning because of its interaction and feedback with the economy as a whole (35).

Problems With the Existing System Planning Methodology

The discussion in preceding sections leads to the identification of some fairly obvious but critical problems with the current methodology. Some less obvious problems are even more critical if we are to successfully develop, implement, and use statewide models. These problems fall into 5 major categories (in no particular order): traditional UTP-related process, behavioral demand prediction models, long-range planning and its relevance to programming, activity-shift models, and existing data.

Traditional UTP Process

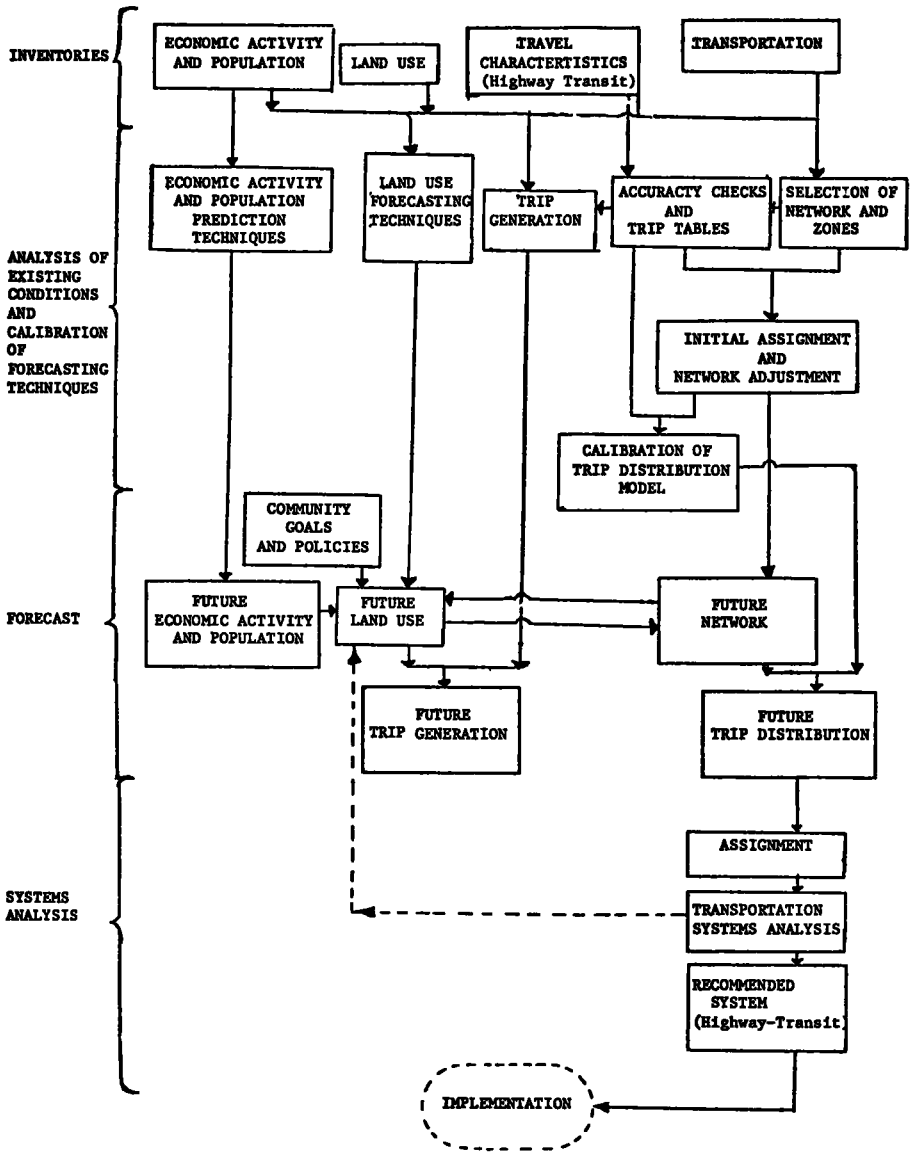
One of the most frequently asked questions concerning statewide modeling is whether the UTP methodology is appropriate. Can we simply adapt existing techniques that have been so extensively used in so many urban and metropolitan studies (and apparently not very successfully)? Before answering this question, however, we must first ask how effective the UTP approach has been for urban studies. What are its critical shortcomings? If it has some, and they can be improved, can it then be applied at the statewide level?

Criticism of the current methodology has been well documented. Roberts (36), Manheim (37), Domencich (38), Boyce, Day, and McDonald (39), and others have all presented succinct and effective discussions of the weaknesses of the current set of models. In the past, to criticize the present set of models has been far easier than to offer constructive proposals for improvement. To make a significant improvement in existing techniques and their ability to make short-run forecasts now appears to be possible by implementing a number of research advances that have occurred during the past few years. (This is discussed further in a later section on proposed improvements.) In addition, the UTP process can be changed to make it more consistent with behavioral theory. [In fact, the suggestion has been made that the UTP process is just a special case of a more general process and that it can be useful for special problems (37). In addition, UMTAs new multimodal package, soon to be available, provides the option of using the traditional sequential approach or a more direct approach (40).] An alternative methodology for demand modeling is now gaining wide acceptance and is certainly worth considering as a statewide modeling tool, given the track record of the existing UTP process.

The following general summary of the UTP process, shown in Figure 4, is taken from the paper by Roberts (36):

> Although the diagram [in Figure 4] cannot be considered to be a complete statement of the details of the UTP process, I think it is fairly representative of the basic thinking underlying the process The four basic steps, trip generation, trip distribution, modal split, and traffic assignment, are shown Economic activity and land use are essentially projected into the future without feedback from the transportation system though feedback to future land use is shown here with a dotted line, indicating that "though we now know there should be interconnections they have not been routinely implemented to date " Trips are "generated" without concern for the supply of transportation or its effect on the level of service offered Trip distribution is typically constrained by its "calibration" to maintain the existing trip length distribution whether or not the network can support it or the land uses have changed to accomodate it And, neither generation nor distribution is typically brought into the equilibration process with network flows Finally, the "future system" or target year approach is indicated as the recommended approach

Figure 4. Urban travel forecasting process.



These general shortcomings described by Roberts can be elaborated on (we should stress the fact that most of these criticisms also apply to those existing statewide models that have been implemented and were described in the previous section).

1. The level-of-service attributes used should be as complete as necessary to adequately predict traveler behavior. For example, in addition to travel time, variables such as cost, frequency of service, time reliability, number of transfers, and privacy should be included if empirical evidence or theory or both indicate that these are important determinants of trip-making behavior. Recent studies have indicated that there is a wide range of service attributes that are important in both the urban and intercity case (42, 43). The CM/PS (18) and California study designs (20) described earlier also reflect this approach.

2. Each level-of-service variable should enter into every step, including trip generation. This is axiomatic unless there is an indication in a specific situation that some step is, in fact, independent of level of service for all market segments. For example, the generation of work trips may be relatively independent of the level of service provided. For most trips, this will not be true. For example, it is hard to believe that recreational travel at the state level is insensitive to the level of service provided. In terms of fuel shortages, there is no way to accurately reflect the effect of changes in gasoline prices on recreational trips during the summer because cost (as a level-of-service variable) is not incorporated in most trip generation equations (for example, those for recreational travel equations). In addition, the same attributes of service level should influence each step. For example, rail fares, automobile parking charges, and service frequencies should influence not only modal split but also assignment, generation, and distribution.

3. The level-of-service variables must be disaggregated into their component elements by trip segment. A level-of-service variable has components that are experienced and perceived differently over different segments of a trip. Recent studies, for example, have shown that trip-makers value time at 25 to 60 percent of their wage rate and wait time as much as 3 times more heavily than they do travel time (44, 45). Although to disaggregate travel time into walk time, wait time, line-haul time, transfer time, parking time, time variability, interarrival time, and schedule delay may not be necessary in all cases (as some studies have done), to consider level-of-service variables at a disaggregate enough level to capture those aspects of trip-making behavior that are important at the statewide level is nonetheless important.

4. The process should calculate a valid equilibrium of supply and demand. In practice, there is almost no feedback in the present system of models. For example, the travel times that are used as inputs for modal split, distribution, and even generation should be the same as those that are output as results from assignment. If necessary, iteration from assignment back to generation, distribution, and so on should be carried out to obtain this equilibrium. A number of states still have not recognized that in the assignment phase capacities are limited and that, in the real world, there is a certain equalization of impedances over alternative paths in a network. We recognize that, for most statewide systems, capacity will not prove to be a problem. But without capacity restraint, the few bottlenecks that do exist in the system and the way in which travelers react to them will not be clearly articulated. Moreover, if networks are to be compared in any way, generally some improved network in the future is compared with the existing system loaded with future travelers. The existing system loaded with future travelers may well show many links in the system with some congestion problems, but only if link supply is represented as having some finite capacity.

5. The levels of service of all modes should influence demand for any given mode. Changes in the level of service of a given mode (e.g., a change in the congestion on highway or rail networks or a change in fares) should, in general, affect not only the demand for that mode but also the demand for other modes. That is, there should be provision for explicit cross elasticities of demand with respect to level of service on competing modes. Recent evidence has shown this to be true at the urban area level (42), at the intercity level in the Northeast Corridor (43, 46), and at the state level in California (28). Therefore, when we change the magnitude of a level-of-service variable, say, cost (for example, in terms of price of gasoline), not only would we expect automobile travel to decrease but also we would expect the demand for competing modes to increase.

6. The estimation procedures should be statistically valid and reproducible. The use of regression for generating trips and matching trip length frequency distributions for trip distribution may produce "best fits" for generation equations and, in terms of matching trip length frequency distributions, for trip distribution models. However, there are serious doubts as to whether we are actually reproducing (or simulating) real world flows, as some statewide planners have recognized (47).

Careful examination of the traditional approach indicates it violates each of these conditions. As a consequence, serious questions can be raised about the biases and

limitations of the flow predictions resulting from use of the models in their traditional forms at both the urban and statewide levels.

Thus, although there are some counterarguments for the value of the current approach, enough empirical evidence is apparently available from recent studies to indicate that there are serious problems with the process at the urban level and this holds true for most, if not all, statewide approaches as well.

Behavioral Demand Prediction Models

In his paper on travel demand forecasting, Roberts (36, p. 58) states:

> The most obvious problem with the models is that they are not policy responsive That is, they are not designed to answer the questions posed by a particular agency or to understand the response of the system to particular controls held by that agency The urban transportation system in a large metropolitan area is rarely under the control of a single authority but is typically jointly controlled by a variety of transportation agencies and an equally larger number of non-transportation agencies One cannot overly criticize the designers of the models for failing to identify a particular decision-maker The major problem here, however, is that the current model design does not properly reflect the trip making response of the system to changes made in the system itself As [Domencich (38)] points out, the models are non behavioral and noncausal as well.

Roberts indicates that the most important change to the UTP procedures, certainly more important than incorporating level of service at every step or having feedback between every step of the process, is the fact that the models should be based on a theory of how consumers react behaviorally to a changed set of conditions. There are 2 aspects to the behavioral nature of models.

Causal Versus Correlative Models

The most important characteristic that a demand model should have is that it be causal rather than correlative. Causal models are based on a theory of observed behavior and can be used to predict changes in one variable (demand) if another variable changes (for example, level of service). In this case $D = f(L)$ can be said to be a causal model (although perhaps not correctly specified). Correlative models may be of the form $D = f(L)$ as well, but do not necessarily describe a causal effect. A simple example in transportation is the trip generation models that hypothesize trips generated in the following form:

$$T_i = f(AO_i, P_i, DCBD_i, \ldots)$$

where

T_i = trips generated in zone i,
AO_i = automobile ownership in zone i,
P_i = population in zone i, and
$DCBD_i$ = distance from the CBD to zone i.

Obviously, automobile ownership levels will influence trip generation—the more automobiles owned, the more trips expected. Similar arguments hold for population and other variables. On the other hand, although trips are generally correlated with distance from the CBD, no one can argue that distance from the CBD influences the rate of trip generation. Some other factor—income, life-style, stage in life cycle—that influences both location choice and trip generation is responsible for the correlation between trip generation and distance from the CBD. It is important to emphasize the relation between causality and usefulness for predicting the effect of policy changes. Correlative models cannot capture the response to policy change, whereas causal models are structured to do so.

In transportation, the wide variety of models fall into these 2 classifications, and it is difficult to determine when a model is causal and when it is simply correlative. In general, the traditional UTP approach has tended more toward the correlative end of the spectrum, and the direct and disaggregate stochastic models (discussed in the next section) generally tend toward the causal end. [Most UTP approaches use some causal, some correlative variables in trip generation, only travel time in trip distribution, and a number of variables in modal split, and, again, only travel time in the assignment process. Thus, they generally ignore out-of-pocket cost, safety, reliability, comfort, and convenience, which can be considered to be behaviorally related to trip generation, distribution, modal split, and assignment (48).]

Aggregate Versus Disaggregate Models

The second important characteristic of a demand model concerns whether it is based on aggregate or disaggregate data. [Fleet and Robertson (49) show that using aggregate data only captures 20 percent of the variation (between zones) in trip making; 80 percent of the variation that occurs within zones is lost. This is one of the major reasons models cannot be transferred from one geographical area to another: The model is zone-size dependent, and different areas have different zonal breakdowns.] Aggregate models are calibrated on zonal averages (average zonal income, average interzonal trip time). Disaggregate models are based on individual data items (i.e., the demand for travel for each individual is a function of that individual's or household's income, age, sex, stage in life cycle, and automobile ownership level). The traditional UTP approach has by and large used aggregate models.

Long-Range Planning and Its Relevance to Programming

The third major shortcoming of the traditional planning methodology and perhaps the most important for statewide planning is the extremely weak ties that have existed with the programming process. The existing planning techniques are generally used only to provide volume estimates for the location or design engineer. In only a relatively few cases have systems planning techniques been considered a vital part of determining priorities and the programming process. (More will be said on this in the next section.)

Activity Shift Models

The fourth major shortcoming of the traditional approaches at the state level has been an inability to develop acceptable longer run activity shift models—models that predict economic activities such as manufacturing, retail sales, and wholesale trade as well as population and land use shifts over longer periods of time. These models are essential for successfully testing alternative transport policies and their impact on the economy. There are a few notable exceptions, however, but these models are generally correlative in nature and are unlikely to be useful in testing the implications of policy decisions. Recent efforts (50) with disaggregate techniques have incorporated automobile ownership as a dependent variable (as opposed to an exogenous prediction) in a series of simultaneous equations that predict automobile ownership, generation, and modal split. There is also a strong possibility that these techniques can be extended to include the residential location decision as well (51).

Clearly, the development of activity shift models is an area to which significant effort was devoted in the 1960s for metropolitan studies with little success. However, without these kinds of models (economic input-output models, population projection techniques), the usefulness of our basic transport models will be severely questioned. It is time for serious effort to be devoted to collecting the data required and testing alternative models.

Existing Data

And, finally, one of the major problems of all studies—urban, regional, and statewide—is the lack of an appropriate data base for calibrating models. A number of studies have apparently made the mistake of almost exclusively relying on previously collected data. In many cases, data bases have been constructed without fully knowing what models those data were intended for. In urban studies, fully 60 percent of the cost of a study can usually be attributed to data collection and processing costs. It is in this area that careful design and collection can afford high savings. In addition, as will be described subsequently, the stochastic disaggregate models have the potential for reducing these costs significantly while providing a greater probability of transferability of results.

There is no way around the effort required for data collection, however; we cannot construct models of behavior without having an adequate data base. NCHRP Synthesis 15 (6) discusses the data problems connected with statewide studies (screen line versus home interview, origin-destination versus license-plate surveys), and that discussion will not be repeated here.

As discussed in the CM/PS study (18), one of the major problems in data collection is that of obtaining freight flow and activity system data. These problems almost dwarf the existing passenger data needs.

Existing Programming Methodology

The techniques for statewide programming and determination of priorities employed by the states do not have as much variation from state to state as the modeling and forecasting techniques described in the previous sections, although the overall process of programming does have some differences. Programming is an extremely complicated process that involves more than simply assigning priorities to improvement projects. According to Krecji (14), the term programming refers to "the process of integrating project priorities with fiscal plans to develop a strategy of project development sequences to be tentatively performed with a certain future time period." Programming, therefore, is the conversion of long-term general transportation system improvement plans into realistic short-term work programs. To be effective, it must be capable of addressing 5 major issues.

1. Multiple and conflicting policy objectives. There are usually different objectives at state, regional, and local levels. Even at one level there exists a diversity of interest groups with varying objectives. The role of planning and programming is to articulate the trade-offs among conflicting objectives. In addition, it should be capable of addressing the distributional elements of a program in terms of equity—among regions and among socioeconomic groups.
2. Multiple impacts. Related to the issue of multiple and conflicting objectives is the fact that programs and individual projects have multiple attributes or impacts involving economic, environmental, and social concerns. The programming process must be capable of coping with a multitude of impacts—some quantifiable, some qualitative—in determining desirable programs.
3. Interdependencies among projects. The programming process should also be able to account for project interdependencies. Project dependency implies that building one project requires, or eliminates, the need for another. Network dependencies arise from the interconnectedness of links in a network. Budget interdependencies exist simply because a dollar spent on one project means less resources available for other projects.
4. A complex organizational structure and a broader, more participatory decision process. The fourth factor that influences programming is the organizational structure of the state and the fact that many people will be involved in helping determine priorities through a participatory process. In addition, the planning and implementation (programming) functions are often the responsibility of different agencies. Program-

ming, therefore, must be structured and yet be flexible enough to allow many iterations and to integrate comments from people both within and outside the agency. It must be designed to be a cyclical, iterative, and participatory process.

5. A dynamic and uncertain environment. Programming decisions must recognize the inherent uncertainties associated with impact assessments. Changes occur in technology, in community values and social concerns, and in funding. In light of these uncertainties, programs must be flexible enough to respond to changing conditions without massive recycling of all projects and planning efforts.

The programming methodology currently available for handling these 5 factors is in an extremely embryonic stage. Most procedures to account for these factors are either subjective or nonexistent. To date, most states have based highway improvement priorities on the traditional sufficiency rating method and have ignored most of these basic factors except in an ad hoc manner. [According to surveys by General Analytics, Inc., and Comsis Corporation (52), Krecji (14), and the author, General Analytics and Comsis Corporation actually categorize the priority setting procedures into 4 major categories: sufficiency ratings, quasi-economic analysis, benefit-cost, and macro or micro economic theories. To this list should be added a fifth category, best called the pure judgment approach in which decisions have been made on a periodic basis by a group of highly knowledgeable staff who have little quantitative input, except funding constraints and what is in the pipeline and can be built.]

The sufficiency rating scheme has evolved from procedures first proposed in 1939. It is a numerical procedure that assigns points to various road attributes (such as road condition, safety, and service) according to their comparison with a standard. Although the variables and point-weighting scheme may vary from state to state, the procedure is essentially the same.

There are some exceptions, however. A few states are studying ways of including social and environmental factors. California has incorporated this approach, and uses in addition a weighted sum of the 3 direct measures of safety benefits, capacity adequacy, and time-delay savings index. Pennsylvania apparently is the only state using a strict benefit-cost analysis. Massachusetts is in the process of implementing a similar benefit-cost procedure using the Highway User Investment Study (53), a computer package developed at the federal level for estimating benefit measures, and a simplified programming procedure that accounts for different functional class budget limits, geographical area minimums, and overall total budget minimums. It is currently being tested statewide and in a selected RPA for its usefulness in a participatory framework.

California is beginning to incorporate budget constraints and multiple alternatives (as will be described subsequently) and, in a few instances, has developed alternative contingency programs for a district as a hedge against the possibility that a key project in one program would not be approved.

Problems With the Existing Programming Procedures and Processes

There are a number of problems evident from a survey of the existing programming procedures and of the programming process itself. The most obvious symptom that a problem exists is that the process is simply not working, based on the huge backlog of proposed highway improvements in each of the several highway systems in most states. The process just has not been able to effectively address the 5 factors described above. The second is that environmental impact statements are taking excessively long periods of time and costing enormous amounts of money to develop; but, more important, they are probably occurring too late in the process. The result is that programming does not have much relevance to what is getting built. These problems can be attributed to the following factors:

1. Budget constraints have not been recognized early enough in the process. Developing "needs" lists and then, after each district has submitted a needs list, apply-

ing a cutoff budget level result in too many facilities with excess capacity that may not actually be required for years and, most important, may never get built. As will be described subsequently, California planners have recognized this and are rescaling (or, in their terms, rescoping) their programs with the budget constraint in mind, trading off level of service on specific links for network connectivity and accessibility. In other words, they are opting for a smaller scale, a more integrated network than for larger, unconnected facilities with no hope for completion. In most cases, they are also discovering that the smaller scale facility is beneficial from a benefit-cost as well as an environmental point of view.

2. Multiple (mutually exclusive) alternatives have not been incorporated into the tentative programs. This is closely related to the first problem area. If only because of the budget constraint (54), there are dependencies among projects because a dollar spent on one project cannot be spent elsewhere. In addition, the existence of project or network dependencies means that adoption of one program may preclude others and make feasible others. The traditional approach of deciding early in the process the size or scale of a project based on level-of-service standards precludes the development of smaller facilities that may have other attributes that are more important (environmental impacts, for example) in terms of acceptance by the community. California again is also now considering alternative scales and stagings of projects that allow greater flexibility in selection and that can provide needed service now while freeing up scarce resources for projects elsewhere.

3. An emphasis has been placed on user benefit measures, with political, environmental, and social concerns incorporated as an after-the-fact ad hoc adjustment to the program. Most states have focused on safety, service, maintenance, and capacity adequacy factors as the primary determinants of a highway's need and its ranking in a program. The traditional concept of "needs" must be reevaluated and broadened to include nonuser impacts such as the community and social need for transportation service. Moreover, the needs concept must be expanded to include other modes of transportation.

4. Uncertainty has been ignored. Priorities and programs have been determined in many cases without effectively incorporating factors of uncertainty. In cases where it has been included, it has been unstructured and ad hoc. We cannot eliminate uncertainty, but we can learn to recognize it and plan our alternatives more flexibly and in a more adaptive manner to cope with it.

5. The process has not been a flexible, iterative, participatory process. The typical programming process of most highway or state transportation agencies during the past several years can be characterized by 3 factors: (a) leaning toward fairly precise, definable indexes or priority measures of improvement; (b) priority measures oriented toward the highway user; and (c) extremely low participation and understanding by the public as to the priority setting process.

In addition, one of the purposes of programming has been to maximize the use of available funds within a specified time period, to put down as many miles of highway as possible. The pressure in some cases has been to favor quick and easy-to-finish projects over alternatives that may be more desirable but are more complex and require more time and effort to complete. [Neumann and Pecknold (55) developed a case study that shows that projects selected in one region of a state had very low benefit-cost ratios because of the difficulty in getting a major freeway design accepted by the community.]

Most important, however, what has been missing from the programming process are the necessary ties to the planning process itself. Clearly, both functional areas are to blame; but, with new techniques becoming available in both areas to make each more credible, the next step is the integration and coordination to provide a more effective statewide planning and programming process.

PROPOSED IMPROVEMENTS TO STATEWIDE PLANNING AND PROGRAMMING METHODOLOGY

Although a comprehensive methodology for statewide planning and programming will require considerable time and effort to develop and implement, there are a number of areas where improvements can be made relatively quickly and easily that will enable us to respond immediately to the emerging multimodal investment, environmental, and energy issues. In addition, there are areas of research of a longer range nature that should be undertaken now to ensure the continuation of improvements in the future. These short- and long-run areas of improvement are divided below into improvements to the planning methodology and improvements to the overall programming process.

The first section on improvements to analysis systems emphasizes short-range incremental modifications to existing systems. It would be incomplete if it did not point out the limitations of this approach.

At the time most currently used systems were created, there was no way to anticipate either future developments in analysis techniques or future demands that would be placed on analysis systems. In software, as well as in transportation systems, there is a trade-off between efficiency and flexibility, and because the need for analysis flexibility was not foreseen, the systems were designed for maximum efficiency at the expense of flexibility. This means that there is some point beyond which it becomes impossible or highly cost-ineffective to incrementally change existing systems.

When this happens, states are inevitably going to have to obtain new analysis systems if they wish to remain abreast of the latest transportation planning procedures. And when new systems are being considered, states would do well to reevaluate the efficiency and flexibility trade-off. Systems that maximize efficiency at the expense of flexibility perform limited analyses (cheaply) and are difficult to upgrade. Systems that sacrifice some efficiency for increased flexibility may be slightly more expensive to run, but they can perform much better analyses and are much easier to upgrade when this becomes necessary. We are learning some of the costs of ignoring flexibility when we design transportation systems; identical lessons hold in the case of analysis systems.

Improvements to Travel Forecasting and Impact-Prediction Techniques

Improvements to planning techniques can be subdivided into short-range and long-range work areas. The priority, time, and costs are given in Table 3.

Short-Range Improvements

The 6 specific areas of improvement of a short-range nature are (a) incrementally adjust existing network equilibrium model systems to be internally consistent, (b) begin the development of simplified policy-sensitive (behavioral) analysis tools, (c) begin the development of specialized disaggregate (stochastic) demand models, (d) incorporate on-the-shelf (environmental, economic, and other) impact-prediction techniques, (e) employ one of the available on-the-shelf multimodal model systems and initiate prototype studies on a subregional or substate scale, and (f) initiate research on other specialized modal problems.

1. Incrementally adjust existing model systems to be internally consistent.

In recent years, transportation research has made great advances in the area of travel forecasting. A number of new techniques and variations on old techniques have been developed, many of which should be added to the repertoire of state planning agencies. However, to incorporate all these new methods at once would require a large-scale software development effort, something which because of high cost and risk, states are better off avoiding at the present time. Instead, a set of changes can be identified that, when incrementally added to existing state modeling packages, will

Table 3. Priority, time, and cost of proposed improvement to methodology.

Improvement	Priority	Time (months)	Cost (dollars)
Short range			
Incrementally adjust existing model systems to be internally consistent	High	12 to 36	75,000 to 150,000
Begin development of simplified policy-sensitive (behavioral) analysis tasks	High	12 to 18	50,000 to 150,000
Begin development of specialized disaggregate (stochastic) demand models*	High	6 to 12	50,000 to 100,000
Incorporate on-the-shelf (environmental, economic, and other) impact-prediction techniques			
Employ available on-the-shelf multimodal model system and initiate prototype studies on subregional or substate level	High	12 to 24	50,000 to 150,000
Initiate research on other specialized modal problems	Low	6 to 12	25,000 to 50,000
Long range			
Conduct study to determine states' overall modeling requirements	High	12 to 36	500,000 to 2,000,000
Develop long-run activity-system models to predict economic impacts, land use distribution, and other impacts	Medium to high	24 to 36	Variable

Note: All of these estimates are extremely preliminary. They are intended as an order of magnitude comparison of tasks. The actual time and costs will depend on the current system in use and the abilities of the professionals performing the work. They are also in terms of in house dollars at a state agency valued at $50,000 per man year, including direct and overhead charges.

*This approach has a very high potential for application in different parts of a state, reducing the costs of data collection and calibration even further.

result in an internally consistent flow-prediction methodology at low cost and risk.

The set of changes required can be divided into changes to demand modeling methodology, changes to supply modeling methodology, and changes to equilibration methodology.

Manheim (37) has shown the formal equivalence of internally consistent sequential aggregate UTP type of demand models with simultaneous aggregate models such as those of Baumol-Quandt and SARC-Kraft, when the latter are used in a 1-step approach to equilibrium. However, most UTP models used in practice can be shown to be internally inconsistent, which means in effect that planners are postulating that trip-makers use totally different criteria at different stages in their trip-making decisions. We can, therefore, maintain the sequential form of our models, but must make them internally consistent by (a) including the same level-of-service variables at each step in the process (unless it can definitely be shown that some variables are not considered by trip-makers at a given step) and (b) iterating the models so that all steps use the same level-of-service values. In many systems, for example, the travel-time value used to perform trip distribution is totally different from the value used for traffic assignment. Such a situation can never result in a valid equilibrium.

As a first step in modifying the supply modeling capabilities of current planning packages, networks should be coded as 1-way links having generalized supply functions that can capture the degradations in level-of-service due to high traffic volumes. This will allow the assignment phase to more realistically model congestion and directional effects. Although most of the network at the statewide level will not be congested, there will be portions that can be classed as bottlenecks. Assignment without capacity restraint only points up a few of these sections, whereas use of capacity restraint will ensure that all bottlenecks are identified (and correctly) and will more realistically simulate the way in which traffic distributes itself over the network. If capacity is not important, the assignment process with capacity restraint will take only slightly longer than it now does without it.

No amount of improvement to the demand and supply modeling capabilities of an analysis system will result in computation of a valid equilibrium if the equilibration technique itself is inconsistent. Deep understanding of equilibration techniques has come only recently, however (56), and few systems have valid equilibration routines. The next few years will probably see more of these developed. In view of this, it seems most reasonable to wait until such routines are more widely available, but to explicitly plan now for a future changeover to a valid equilibration technique. (In fact, the problems with such a changeover will probably be less substantial than the problems incurred in simply changing to consistent demand model formulations.)

2. Begin the development of simplified policy-sensitive (behavioral) analysis tools.

A system that computes a valid equilibrium of supply and demand may be of no use to planners if it does not permit them to investigate a broad range of policy options, including low-capital and institutional alternatives. For example, what would be the effect on statewide transportation of staggered work hours and a 4-day work week? What would be the effect of changing regulations on motor carrier and rail movements? Although considerable resources would be required to develop a network equilibrium system that could tackle such broad questions efficiently, it is possible to begin addressing these questions immediately by making some modifications to existing systems and to use them as policy analysis tools.

It is not clear, in fact, that a sophisticated network supply-demand-equilibrium system is the most appropriate tool for evaluating broad policy questions as described above. Certainly, policy-sensitive network equilibrium procedures will be required for answering many questions about the impacts of specific investments, for exploring regional and state equity issues, and for determining actual program priorities. But many questions of a broad policy nature simply do not require the full-blown network equilibrium procedures.

Simplified policy-sensitive analysis tools have been used effectively in a number of studies in urban areas and promise to be useful at the statewide level as well. For example, the original SARC-Kraft model (43), developed to predict intercity flows, was adopted to the urban situation and used in a simplified manner to predict the impact of a city-specific and nationwide free-fare transit policy (57). The original model formulation was adapted to the urban area problems; Boston data were used. For example, the original level-of-service variables of time and cost were disaggregated into line-haul and access times for both the transit and auto demand functions. This permitted an investigation of the impact of improvements to the access segment of the transit system as an alternative to a free-fare policy.

A second example of the development of simplified, policy-sensitive analysis tools is contained in a report (58) of a study that involved the development of a simplified methodology called a pivot-point analysis procedure. This procedure is used to predict the impact on revenues of service modifications to a fixed-route, local bus system that is experiencing serious deficits. The term pivot-point refers to the procedure of using existing empirically derived elasticities and "pivoting" about these elasticities to determine the change in demand for small changes in services. The procedure includes simplified policy-sensitive service-reduction and service-elimination models that were applied to several case studies in a large metropolitan area.

The advantages of both these studies (and of simplified policy tools in general) are that (a) they do not rely on a large, cumbersome, and expensive model system to evaluate policies, (b) they are relatively easy to operate and understand (moreover, a large number of variations in policy can be tested very quickly), and (c) they are valuable in giving insights into how the large-scale network equilibrium procedures should be modified to become more policy sensitive as well. [In the free transit study (57), the demand model was developed as a simplified policy analysis tool but could also be used directly as the demand model in a network equilibrium package. In the local bus service modification procedures (58), the procedures were developed primarily as policy analysis tools to test a wide range of service changes and their impact on the overall system in a preliminary way.]

Simplified policy-sensitive analysis tools of this type are also required for statewide-level planning and should have high priority for development.

3. Begin the development of specialized disaggregate (stochastic) demand models.

The third major improvement to planning methods (which appears to be extremely applicable to statewide problems) is the area of stochastic disaggregate demand models. There is evidence that the use of disaggregate data can reduce the aggregation bias present in most traditional aggregate models as described earlier. Calibrating models on aggregated data results in biased parameter estimates, misleading goodness-of-fit measures, and tremendous loss of information about travel behavior.

There have been significant advances made in the state of the art of travel fore-

casting in the area of stochastic disaggregate behavioral models in the past few years. [A recent HRB report (1) presents an excellent summary of the state of the art and problems facing demand modeling efforts. Lave (59) has developed a simple binary-choice modal-split model. Charles River Associates (60) and Ben-Akiva (61) have shown how to extend this to include generation, distribution, and modal split as well as the time of day.]

First, these models are stochastic because they give a probability of an individual's choosing one alternative from among several available alternatives. This is represented by $P_i(a/A)$, the probability that individual i will select alternative a from the set of alternatives A. This has been recently extended from simple modal-split models to cover all aspects of the travel decision (including choice of frequency, choice of mode, choice of destination, and choice of route) represented by the probability that individual i will take one or more trips, mode m, destination d, and route r or $P_i(f, m, d, r)$. [Because of the large number of possible combinations of choices in a simultaneous mode of this type, the number of variables and the number of interactions among variables become complex. This can be resolved by reducing the attributes a traveler is assumed to consider and by reducing the destinations to reasonable numbers. An alternative method would be to calibrate a series of sequential models much like the UTP process (but internally consistent with the L vector in every step), which would then have the form of a series of conditional, sequential, probability models:

$$P_i(f) \cdot P_i(d|f) \cdot p(m|f, d) \cdot P_i(r|f, d, m)$$

This requires a stronger assumption about how a traveler makes his decision, however. If this decision is unknown a priori, the simultaneous model is the most unbiased method to employ.

Second, the models are disaggregate because they use disaggregate (individual or household) data and predict an individual's trip-making behavior.

The advantages of developing stochastic disaggregate methods appear to be significant if we can accept existing evidence to date.

a. They are more behavioral in nature because demand is now based on individual data. Variables such as age, sex, stage in life cycle, income, and number of automobiles, are included for each individual or household and not on a zonal aggregate basis, where variables such as the average stage in life cycle are not meaningful.

b. They have the potential for reducing data collection costs significantly because we now only require a very limited sample (relative to the data requirements of aggregate models). Preliminary estimates by disaggregate demand modeling experts are that, of the current data set of 25,000 households collected for a traditional urban study, a maximum of only 5,000 household observations are needed for calibration. This represents a reduction factor of 4 or 5 in sample size requirements. The reason for this reduction is that we are now working with individuals at a more detailed behavioral level. Therefore, fewer data are needed to capture the essential differences among travelers. Even given that the cost per sample may increase from the current value of $20 to $30 per household (a factor of 2 to 3 is estimated) because of increased information requirements, the savings in collection and processing costs can be fairly significant. (Additional information is required on variables such as sex and age, and for each individual on the values of the level-of-service vector for competing modes.) Attributing this increase in cost to the model approach is somewhat misleading because the model is a multimodal model and is designed to predict all demand interactions simultaneously, similar to the aggregate direct demand models, such as the SARC-Kraft, Baumol-Quandt, and McLynn models. A fairer comparison would be between data requirements for aggregate and disaggregate multimodal demand models.

c. The model parameters (which show the sensitivity of demand to changes in the socioeconomic characteristics of the trip-maker, the attractiveness of the possible destinations, and the level-of-service variables) have a much higher likelihood of transferability from one geographical area to another. The underlying hypothesis, for which there is some (as yet inconclusive) evidence is that individuals with the

same traits, i.e., same economic background, same age, same sex, same income level, same stage in family cycle, same number of cars, and so on, will react in a similar manner. In other words, most of the problems with transferring aggregate models (such as the UTP models) from one region to another have to do with problems caused by different zonal aggregations and the inherent biases associated with them. If this proves to be correct, the costs of data collection will be reduced even further because data sets need not be collected in total for every new problem area.

The only major problem apparent with disaggregate models has been the problem that arises when one wants to use them for prediction. The independent variables must be forecast before the dependent variable (demand) can be predicted. In aggregate models, this implies forecasting future average zonal variables, such as income. In the disaggregate case, to forecast each individual change in the independent variables will be virtually impossible. This, therefore, requires the development of an aggregate model based on the disaggregate model. In the short run, a number of heuristic techniques can be employed, such as use of Monte Carlo techniques or stratification. Research is currently under way on the most practical methods for solving the aggregation problem (62).

One additional advantage of collecting information and calibrating disaggregate models at the individual or household level is that, once calibrated, the model is independent of the size of the zonal system used for forecasting. In other words, the disaggregate model can be used for any size zone system by aggregating to that level, whereas an aggregate model is limited to the same level (or higher) zone size that it was calibrated on.

The problems with this task of developing stochastic disaggregate models for state travel will be primarily with designing the data collection effort. The calibration method used most frequently is the maximum likelihood procedure for a multimodal logit model (63). This package exists and is operational in California, at M.I.T., and at a number of other places. In addition, some states may already have usable data sets. California, for example, appears to have 1 or 2 potentially good data sets available already from other sources and is considering developing this type of modeling approach for recreational travel. As a first step, the state should develop a disaggregate stochastic model for a specific kind of trip purpose, perhaps the recreational trip, if data are available or can be collected easily enough. From there, once the initial steps have been worked out, the model can be extended to other trip purposes and market segments for analyzing statewide travel, either for the policy-sensitive analysis tools or for use in network equilibrium procedures.

4. Incorporate on-the-shelf (environmental, economic, and other) impact-prediction techniques.

In addition to improvements in the travel forecasting methodology, there are a variety of techniques that have become available in the past few years (and in some cases, just the past few months) that can be useful as immediate procedures for predicting impacts at the statewide level. Two of the most important areas of impact prediction appear to be air quality and noise pollution models for urbanized states. An HRB report (3) describes the general problem and available techniques up to 1972. Since that time, many states have incorporated air-pollutant emission and dispersion models and in some cases noise pollution models. California (64) is such a state. Michigan currently has air and noise models operating in conjunction with travel simulation models only at the large zone (547) level but hopes to expand this system to the small zone (2300) level some time in the near future (24).

Two model systems worthy of consideration (described earlier) are the ones developed by Ingram (25) in 1972 as a response to a need for models to predict air and noise pollution in conjunction with a travel simulation system and the STAR system (22).

This area of modeling is changing so rapidly and there has been so little investigation relative to the traffic flow modeling procedures that it is difficult to summarize exactly the accomplishments of each state or to propose a comprehensive set of improve-

ments in this area. In addition, a wide variety of other impact models are also required, and the extent of their usefulness in the statewide modeling effort would be just conjecture at this point, although it is fairly certain that some models will be extremely useful. Economic development and social-impact prediction techniques are 2 areas that would seem to be high priority areas for research and development.

A recent study (65) contains a fairly comprehensive first attempt at a survey and evaluation of available impact-prediction techniques. The study has also attempted to classify these techniques with respect to their usefulness at the system, corridor, and project levels as well as to estimate their relative costs of use. The impact prediction (or resource) models cataloged in this study include models to predict impacts such as direct cost and revenues; noise, air, water, and visual pollution; energy requirements; system changes; community disruption; and other important effects. The total list of potential impact prediction models is given in Table 4. This study further describes the details of existing impact models, and it and NCHRP Report 133 (66) are recommended for a review of specific techniques. The selection of specific techniques for each impact type will have to be based on each state's specific requirements and available resources. Obviously, the priority placed on impact techniques will vary from state to state. In addition, as in the demand modeling efforts described in earlier paragraphs, there may be a need for a variety of techniques for any one impact type, some simplified procedures for analyzing broad policy-oriented issues, and some for detailed, network-oriented models to be used in conjunction with the network simulation methods.

Clearly, much further work needs to be done in the whole impact-prediction area before the appropriate models for statewide modeling can be determined. In addition to the basic research required in each of the areas of impact prediction, there should be some effort directed toward determining the appropriate level of detail for each specific model. Many impact-prediction models now require detailed inputs that are simply not available at the planning or programming stages.

In the short run, existing procedures [e.g., SRI method under development in California (64) and Darling (26)] should be compared for their effectiveness and cost and a decision made as to the most appropriate technique for each state. A reasonable strategy to follow in the development of all of these methods in order to reduce the risk and cost involved would be the testing of the selected procedures in terms of data requirements, cost of operation, effectiveness, and so on on a substate level before they are fully developed at the state level.

5. Employ one of the available on-the-shelf multimodal model systems and initiate prototype studies on a subregional or substate scale.

In parallel with steps 1 through 4, states can immediately upgrade their multimodal analysis capabilities by obtaining one (or more) of the existing multimodal analysis packages currently available. The STAR system (22) developed by the Rand Corporation has been tested extensively by the Transportation Systems Center of the U.S. Department of Transportation and will be available soon on request. It was designed for use as an intercity multimodal model and used for a California corridor. The package is based on models and programs developed during the original Northeast Corridor study. In addition to having demand and network simulation models, the system has models for the prediction of other impacts, such as energy requirements, emission levels, ground-mode noise, air noise, and costs.

The DODOTRANS system (21), also developed during the Northeast Corridor study, is a multimodal analysis and evaluation package that has a considerable amount of flexibility. (In addition, ongoing research at M.I.T. will produce a first version of an updated system during 1974 that is designed to add a significant number of capabilities.) DODOTRANS (a) allows alternative demand and modal-split formulations of the direct demand model type; (b) has an assignment phase that can be used in an all-or-nothing assignment mode without capacity restraint or in an incremental (equilibrium) mode with demands competing over all links and all modes simultaneously; (c) is designed originally as an evaluation tool to allow comparison of alternative

Table 4. Impact prediction techniques.

Technique	Level of Planning[a]			Usage Costs		
	System	Corridor	Project	Low	Moderate	High
Environmental and conservation						
Air pollution						
Emission factor models	X	X			X	
Dispersion models	X	X	X		X	
APRAC-1A diffusion model	X	X	O			X
Rollback model	X	X		X		
Box model	X	X		X		
Noise pollution						
Comparative studies			X		X	
Estimating equations		O	X		X	
Computer models			X			X
Noise-land use surveys	X	X	X		X	
Physical models			X			X
Nomographs		O	X	X		
Ecosystem						
Natural resource inventory	X	X	O	—[b]	—[b]	—[b]
Bioassays		O	X		X	
Ecological relations	O	O	X		X	
Ecological models	X	X	X			X
Aesthetics						
Index of visual intrusion			X		X	
Photographic studies			X		X	
Physical models			X		X	
Vibration						
Comparative studies			X		X	
Water resources						
Chloride estimates			X	X		
Comparative studies		O	X		X	
Meteorological dispersion models		X	X		X	
Historic preservation						
Historic resource inventory	X	X	X	—[b]	—[b]	—[b]
Induced economic						
Employment and economic activity						
Economic base studies	X	X	O			X
Correlative studies	X	X			X	
Input-output models	X					X
Highway usage indicators	X	X		X		
Econometric models	X	X			X	
Business dislocation studies			X		X	
Simulation models	X	O	O			X
Tax base change						
Right-of-way assessment	X	X	X		X	
Community						
Housing displacement						
Residential density method	X	X		X		
Housing studies	X	X	X	—[b]	—[b]	—[b]
Environmental capacity						
Annoyance index	O	O	X		X	
Community disruption						
Neighborhood social interaction index		X	X		X	
Residential linkages		X	X			X
Mobility index		X	X		X	
Social capacity indicators		X			X	
Transportation service						
Accessibility						
Accessibility indexes	X	X	O		X	
Accessibility graphs	X	X	O		X	
Isochronal maps	X	X	X		X	
Mobility for special groups	—[c]	—[c]	—[c]	—[c]	—[c]	—[c]
Pedestrian mobility	—[c]	—[c]	—[c]	—[c]	—[c]	—[c]
Exposure to CO						
CO model	O	O	X		X	
View from the road						
Land		O	X		X	
Visual values		X	X			X
Activity distribution						
Land use						
Correlative studies	X	X	X		X	
Index of development pressure	X	X	X		X	
Urban development models	X	X	O			X
Population						
Econometric models	X	X			X	
Urban development models	X	X	O			X
Direct costs						
Right-of-way						
Rules of thumb for right-of-way	X	X	O	X		
RMC model	X	X	O	X		
Construction costs						
Cost models	X	X		X		
Operating costs	X	X	X		X	

[a]X = best level of planning for using technique, and O = other levels of planning for which technique is applicable
[b]Depends on level of detail
[c]No specific techniques exist

networks with alternative measures of performance as specified by the user; and (d) is based on a problem-oriented free format language that is extremely user-oriented and easily learned.

In addition, there are a number of other candidates for use as on-the-shelf computer packages for statewide planning. A computer package developed by the Aerospace Corporation for intercity multimodal travel simulation and evaluation is proprietary but available (67, 68). UMTA is developing a multimodal system that is oriented to the urban scene, but may be useful for statewide modeling. Its capabilities are being greatly expanded as part of a 3-year effort that has been under way for 2 years (40).

It is strongly recommended that states that do not have a statewide model now consider going directly to one of these packages, or packages available from other states, and evaluate each in terms such as data requirements, modes considered, and effectiveness. This evaluation should then lead to a test of one or more packages on a substate, regional, or corridor problem. States that already have developed statewide (unimodal) models may want to explore the possibilities of these packages on a small-scale study as well, while adapting their existing packages as suggested in task 1 of this section. Many of the components of the existing packages can be used in a modular fashion. Therefore, what may occur is a merging of approaches rather than complete abandonment of one system in favor of another.

6. Initiate research on other specialized modal problems.

Some effort should be devoted to specialized modal problems, such as air and ports, that will require models not included in the existing packages. For example, California's air simulation model that focuses on airport access and location is not suitable for incorporation in some of the packages, but still may be a useful model in some instances. There are also a number of port simulation models (69) that could be used by those states concerned with port development and its impact on the rest of the transportation system.

Long-Range Improvements

Some long-range improvement efforts are appropriate at the federal level, and other research may be done by one or more of the large states or through joint studies between the states. These are clearly long-range only in terms of the amount of money and time involved in developing the procedures and in implementing a workable system—not in terms of the need for the research. Some states may consider themselves advanced enough to implement these recommendations much sooner.

This need for long-run research is divided into 2 parts. The first recommendation is for a study at the federal level of the overall requirements for states in terms of modeling methodologies. The second is for development of specialized models and procedures to be used in conjunction with the short-run changes described above.

7. Conduct a study to determine the states' overall modeling requirements.

A comprehensive study should be carried out at the federal level, much like the studies performed for Pennsylvania (18) and for California (20), that determine existing capabilities for a wide variety of states, requirements for planning and programming methodologies, and a staged strategy of improvements and a program of research. This study should focus on the methodology required for the 6 major areas given in Table 4. Some of the requirements in these categories will be fairly straightforward to satisfy. Most of the discussion in this paper has been primarily about transportation service.

Other areas have not been emphasized in this paper and will require considerable long-run research before techniques can be developed. The purpose of this study would be to identify the models and methodology available (in much more detail than was possible in this paper), the costs and accuracy of each, and how they should inter-

face with the overall programming process.

In addition to being a long-run program of research, the study should identify the most immediate improvements for states with quite different geographical and institutional structure. Hazen (17) summarized 4 typical studies that have already been undertaken; their characteristics and costs are given in Table 5. The output of the study proposed here would be similar to Hazen's summary but would also include a study design for each type of state and emphasize models to be used for its particular problems.

8. Develop long-run activity-system models to predict economic impacts, land use distribution, and other impacts.

Specialized research needs to be undertaken immediately that focuses on implementing modeling methodologies that currently exist. The purpose of this research would be to focus on existing techniques in specific areas [for example, existing land use methods such as EMPIRIC (70), PLUM (71), and NBER (72)] and to identify the strengths and weaknesses of each approach, the costs to implement and run, and the specific situations in which the models would be useful. Clearly, this research would overlap somewhat with recommendation 7, but it is intended to be complementary to it and to focus on improvements using existing methodologies rather than on development of new techniques.

These techniques have been alluded to previously and have been discussed in part by the resource paper on goods movement in this report. They are essential to both passenger and goods movement methodology if any significant changes are proposed for any state. They include the areas mentioned in the previous recommendation and given in detail in Table 4. The areas that could be adapted most quickly and appear significant to statewide planning are economic models (economic base techniques, input-output models, regional econometric multiplier studies), population models (econometric, urban development models), and urban land use models (activity simulation models, econometric models).

The costs for developing or adapting these models will vary in each state because of size, availability of data, and so on and by the amount of effort devoted to each technique. For example, as Schiff (66) points out, simple economic base models will cost a lot less than a complete macroeconomic input-output model, but may be a first and reasonable step for a state to take.

Improvements to Programming Methodology

Although historically there has been some research on technical programming procedures, until recently there has been very little on the process of programming and the inclusion of nontechnical or nonquantifiable factors (52, 53). Certainly programming has received far less attention than the demand modeling tools and techniques, but there is some evidence of a growing interest in this area. [California has recently implemented a planning, programming, and budgeting system (73) and has recently explored an approach to include nonquantifiable factors as well.]

By and large, a study is significantly needed into both the procedures and the process to be used for matching proposed projects with available resources. Most important, much of the awareness of social values and environmental concerns must be incorporated in the overall programming activity. In fact, the recent FHWA guidelines (implicitly) require this approach (74).

Five general proposed improvements to the methodology of programming of transportation improvements correspond roughly to the problem areas identified in an earlier section. Although some of these will require considerable research before they can be effectively implemented, they must be recognized and introduced into the process immediately.

1. Introduce a realistic budget constraint early in the process.

This should reduce the number of projects being studied in great detail and put each link in perspective with other parts of the system. Introducing budget constraints early in the process will let systems studies focus on realistic networks that are interconnected and provide a reasonable level of service during the planning period. Moreover, this will allow RPAs to understand what is reasonable to expect from the state in terms of funding and to make their priority decisions and trade-offs accordingly. To develop plans in the absence of budget constraints and then to proceed down a list of projects that have been ranked until the budget is exhausted will result in projects that are too large, unconnected, and cost-ineffective.

The priority is high. (These tasks do not lend themselves to cost estimates or time-frame estimates as the planning models do.)

2. Incorporate multiple (mutually exclusive) alternatives with a range of impacts.

In conjunction with the previous recommendation, alternatives should be broadened to include multiple scales (2, 4, 6 lanes with provision for staging) that have a range of economic, community, and environmental impacts.

Multiple alternatives will allow decision-makers to have a more flexible set of alternatives and, therefore, to broaden their choices. An example of the advantages of this procedure recently occurred in Massachusetts. A particular region, completely opposed to a previously proposed highway alternative, reversed its position after observing the impacts of alternatives and the results that would occur if the improvements took place. Developing multiple alternatives allowed the state to gain credibility and acceptance of a need for transportation service.

More important, developing mutually exclusive alternatives is essential for the programming process if constraints on the overall budget are to be effectively considered. The program selected without recognition being given to budget constraints or the inclusion of mutually exclusive alternatives will, in general, be completely different and less effective than one that does. [Juster (54) recently demonstrated the importance of incorporating budget constraints, mutually exclusive alternatives, and a whole host of other constraints in a state's programming process.]

The priority is medium to high.

3. Expand the criteria for determining priorities to include social and environmental concerns.

Currently the criteria have been limited to user measures in either a sufficiency rating or economic analysis scheme. Although there has been some preliminary work done in some states on other measures, there is a significant need for research into specific criteria for the programming process.

A recent NCHRP study (75) established a framework to permit simultaneous evaluation of highway and transit improvements, with interchangeable measures of benefits and costs. This study is an important first step in performing multimodal analysis and, eventually, programming of investments on a multimodal basis with a reasonable and comparable set of criteria.

The priority is high.

4. Incorporate factors of uncertainty.

The first step, of course, is to recognize uncertainty and learn to live with it—uncertainty in demand, in technology, and in community values. The second step is to try to account for uncertainty in a more analytic and systematic way. Recent case studies in California (55) and Mexico (76) have demonstrated 2 time-staging approaches to handling uncertainty. The California Division of Highways has in the past developed 2 contingency plans for one district just in case the preferred program was halted.

The priority is medium to high.

5. Develop a flexible, interactive, and participatory programming process.

Research is needed into the overall programming process itself. Besides the analytic techniques for developing economic, environmental, and social criteria, the process of programming must be viewed as cyclical, iterative, and participatory with many different interest groups being involved in making up actual investment programs.

Thus, research is required on the actual decision-making process and structure: Who are the relevant decision-makers, and how should their views be accounted for when projects are selected for funding? How workable are the procedures? How understandable are they to laymen? How should information flow among various levels of interest groups? This problem is a result of the increased reliance on the UTP process, inputs from RPAs without a well-defined programming process, regulations in the Federal-Aid Highway Act of 1973, and EPA guidelines. The problem now manifests itself in connection with projects that are generally considered to be advanced enough to be out of the systems planning phase. But this is just a transitory situation while the new guidelines and regulations are taking effect, with pipeline projects caught in the middle. Eventually the systems planning phase will bear the greatest responsibility for meeting the new decision-making regulations. The research needed is in the development of the overall process, with the key decision points, the decision-makers, and their level of interaction identified at each point. This research should produce primarily a document that interprets the morass of regulations that have hit the states. It should collect all the new regulations from federal and state agencies and show where they overlap or conflict and where ambiguities need to be worked out. In addition, it should produce a much-needed framework to encompass the remaining research needs.

This research should be a first step before the more theoretical issues in systems planning and programming are considered because there is a need to show where, within a defined and accepted programming framework, the specific evaluation criteria, techniques, and processes fit in. Moreover, this research should go a long way in helping to define the problem of evaluation for alternative programs and clarify the situation so that research into the other areas is simpler and easier to define. Discussing an accepted programming framework, no matter how flexible or rigid, as long as decision points and decision-makers are explicitly defined, will make the remaining research less ambiguous and more relevant to state transportation planners and also to researchers. Currently, some states are faced with the problem of wanting to open up the programming process to all interested groups but are simply unsure of how to meet all the regulations in a coordinated and manageable process.

The priority is high.

CONTINUING STATEWIDE PLANNING PROCESS

The preceding sections have described the existing methodology of statewide planning and programming and have proposed incremental improvements to this methodology. That discussion has been primarily from a modeling or technique point of view—what models and techniques are in use or are needed to predict travel, economic, environmental, and social impacts. The purpose of this section is to discuss what are felt to be extremely important additional methodological issues—how the tools and techniques will be used. This will be explored from the following 2 points of view: (a) master planning versus the strategic, time-staged investment approach and (b) citizen participation at the statewide level.

Master Planning Versus the Strategic, Time-Staged Investment Approach

Nearly all urban, regional, and statewide system planning studies can be characterized as concerned with the development of long-range (15 to 30 years) plans with little or no emphasis on implementation strategies; i.e., given a long-range master plan, little effort is generally devoted to the question of how do we get from here to there. To a large degree, this lack of relevance to short-run programming decisions has

been the single most impressive failure of the traditional studies. The legislatively mandated long-run state master plans for highways have produced an impressive system of interstate and state highway systems unparalleled in the world. In many states, however, many parts of the state system are experiencing serious setbacks, and there is a real question whether the system will ever be completed. (Boston's inner belt is one example; components of the Los Angeles system of highways are another.)

The reasons for these setbacks are fairly obvious and well-known: environmental and ecological concerns, spiraling costs, lack of funds, and so on. Most of the parts of state and interstate systems were constructed to fairly elaborate standards, in some cases with capacity that will not be needed for as many as 10 or 15 years. In addition, they were constructed around bottleneck situations in response to existing congestion problems. It is probably safe to say that system planning in general has played little part (other than providing design volumes) in determining which parts of the system were needed most and when they were needed; most of the decisions have been made without a consideration of network connectivity, accessibility to different geographical areas, and overall system effects of networks.

In what may turn out to be a classic study in the highway field, California has just recently completed a pilot project in the San Francisco region (and is planning to extend this to other regions in the near future) that has recognized that the regional plan will not be completed for the reasons cited above, but primarily because of reasons of negative environmental impacts and a limited budget. Besides considering traditional user benefit measures, volume-capacity ratios, and safety benefits as criteria for improvement, planners also evaluated connectivity, mobility, and flexibility of network structure, as alluded to in earlier sections. In addition, they are reevaluating all components of the system including the scale of projects (4, 6, and 8 lanes), time-staging of links (building 4 now and adding 2 later), and procuring right-of-way ahead of time in what they term a "rescoping" process. Not surprising, they are finding that many projects, from a benefit-cost ratio viewpoint, were entirely overdesigned; i.e., the smaller projects are most cost effective. Moreover, by also considering a more realistic funding picture for highways in the next few years, they are able to determine a good network plan from many possible alternative plans, one that has a reasonable chance of getting built (each scale of project has a different level of environmental and community impact) and is reasonable from an integrated highway network service point of view. This is the beginning step of the philosophy of planning we are advocating here that considers implementation strategies, time-staging, and integration of long-range master plans with short-term immediate investments.

The CM/PS study (18, p. 165) also addresses the issue of master planning versus a time-staged planning approach and, although recognizing the problems with the master plan concept, advocates its use on the grounds that

> 1 They are after a broadly defined, long-run sketch solution to the statewide problem upon which lower echelons of decision-making can amplify.
> 2. Interspatial interactions are much more important at the statewide level than intertemporal interactions between components of the transportation system Practically all urban, regional, and state transportation planning efforts have been predicated on this assumption Not only have past planning efforts deemed it infeasible to consider the time dimension simultaneously with the analysis of spatial interactions, but the few attempts at developing a meaningful model of the staging problem itself have proved infeasible

We agree in part with the first reason: Long-run sketch planning (and the accompanying methodology) is useful to make trade-offs and preliminary decisions as to scale of systems or mode and so on. But this is only a part of the statewide planning methodology. Therefore, we do not agree that it should be left for others to amplify or that a time-staged strategic approach is infeasible. [The Harvard-Brookings model (34), for example, was applied effectively to an area with approximately the same population but 3 times the size of California with both a macroeconomic (input-output) model and multimodal transport model. It was able to develop and test alternative staging strategies very effectively. The need for the Boston Transportation Plan-

ning Review (BTPR) is a classic example of what is wrong with the master plan concept. The BTPR represents a reasonable, practical attempt to evaluate staging strategies at the ubran area level, although the staff perhaps was limited by time and money in what it could accomplish. In fact, it attempted to resolve the problems of a master plan approach that has left part of the system unbuilt.]

The advantages of the "traditional" master plan are obvious.

1. It is a broad, encompassing plan that is easy to understand and to visually display. It also allows trade-offs to be made and decisions on technologies that have long-term implications.
2. It is required by law to obtain funding.
3. It provides (or should do so at least) for the consideration of network interactions and for the development of an integrated coordinated network in the long run.
4. Most important, it theoretically allows other sectors of the economy and the public to make their locational and investment decisions with a degree of certainty, both in the private and public sectors.

But there are a number of disadvantages as well.

1. Although system plans are useful for determining the implications of complex systems, they have had little, if any, relevance to actual short-term programming decisions. Links are conceived at the project level and "aggregated" into networks to be tested. There has been little emphasis on network connectivity.
2. They generally fail to recognize realistic budget constraints. This has resulted in fairly large systems that, in general, are never completed.
3. Because of the long-range nature of the master plan, they cannot effectively cope with the uncertainty that exists in the future with respect to demands, technology, or even goals, objectives, and community values. How can we possibly say what is a desirable plan 20 to 30 years from now?

In fact, reliance on the master plan and the emphasis on long-range planning is exactly what has caused urban planning efforts to lose their credibility. It is imperative, therefore, that the planning groups, be they statewide, urban, or regional, recognize the intertemporal nature of investments and integrate their time-staged plans more effectively with the actual programming process if we are to have an impact on transportation investments at a state level.

Neumann and Pecknold (77, ch. 2) have proposed a strategic, time-staged approach to statewide planning. The following discussion is based on that work.

The change in approach for statewide planning is not proposed as a hard-and-fast, well-developed methodology to be followed but rather more of a change in the philosophy of planning. Activities of statewide systems and project planning should not be considered as sequential activities. Statewide system planning should not precede project planning, but provide a framework within which project decisions can be made. It serves to mediate between and coordinate ongoing project studies. Statewide system planning, therefore, would assign resources and priorities periodically among the ongoing subarea or regional studies and project planning processes. Project planning results would influence decisions about the overall system, not just vice versa. And because project studies influence system planning, they must be carefully coordinated with system planning in a cyclical, continuing manner.

The time-staged, strategic approach explicitly recognizes that transportation plans are not implemented instantaneously as a "one-shot" system, but rather in a series of stages in which benefits and costs are quite different at each stage. At each stage, demands and activities in terms of locational decisions of industry and population can change. The "plans" to be evaluated now become alternative strategies of investment over time. For example, the 20-year time horizon might be divided into 5-year stages. Each stage of a particular implementation strategy might include construction of a number of highway links or rail options, operating and policy changes, and different

Table 5. Classes of statewide transportation studies.

Characteristics	Purpose	Procedures
Statewide traffic model $100,000 or less 6 to 18 months	To do system simulation by using the computer in order to better understand how the system operates, and to undertake functional classification and general planning purposes	Zones and network are selected and coded by using standard procedures Models for trip generation and distribution are kept simple Usually, there is no trip purpose breakdown, 1 but no more than 3 independent socioeconomic variables and minimum O-D data are utilized
Statewide highway transportation study $100,000 to $500,000 (usually over $200,000) 15 to 30 months 6 to 12 people	To develop an intermediate priced traffic model based on C-D sample design, to obtain information on trip generation and trip length, to evaluate alternative highway networks, to develop a state highway plan	O-D sampling for internal trips is accomplished by multiple screen-line roadside interviewing, stratified cluster sample of homes, telephone interviewing, or some comparable procedure Models are developed by trip purpose, usually 3 to 5 for automobiles and 1 to 2 for trucks Comparisons and calibration are made against ADT volumes Development of alternatives includes functional classification, scheme development, and testing
Comprehensive statewide transportation study $500,000 to $1,500,000 24 to 48 months 10 to 25 people	To develop on a statewide or regional basis the comprehensive transportation planning process, to simulate person movements by mode of transportation, to evaluate alternate modes and networks, to develop a state transportation plan	Elements and procedures are similar to those of the comprehensive urban transportation studies Interviews are sufficient to develop a trip table of interzonal person movements Studies include an economic base model and land use model Within budget limitations, goods movement is obtained and projected
Integrated statewide transportation study Over $1,500,000 36 to 60 months 15 to 50 people	To apply the latest techniques in systems analysis and operations research to statewide transportation planning, to study the complete system of person and goods movement from origin to destination, to evaluate alternate sets of policies in regard to the transportation system, to develop a state transportation program	The procedures incorporate the latest techniques in systems analysis and operations research - Detailed person and goods movement from origin to destination is studied, emphasis is on transfer and terminal points The models are iterative with a feedback to account for results of different transportation policies

Figure 5. Implementation strategy approach to system planning.

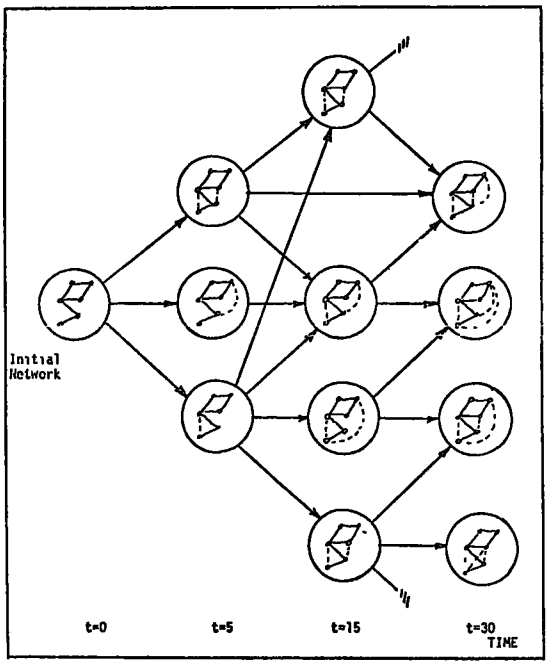


Table 6. Community interaction techniques.

Information Gathering	Information Distribution	Interaction	Special Purpose
Existing sources Compiled statistics Descriptive information Working with local officials Monitoring new developments Analyzing plans, programs, and reports Monitoring mass media Newspapers Radio and television Other Field work Surveys	Announcements and study information Posters, billboards, and signs Mail notices Newspapers Legal notices Advertisements News articles Feature columns and articles News releases Letters to the editor Radio and television Announcements News coverage Talk shows and community-oriented programs Documentaries Private media Displays, maps, models	Small group meetings Working meetings Workshops Hearings and other large public meetings Field offices Public information centers Advisory committees, steering committees, other groups	Referenda Technical assistance Mediation and arbitration Ombudsman Charette

studies. No particular "end state" need be identified initially as a target system. The benefits of such an approach are that, during implementation of the first stage, the subsequent stages in a strategy could be revised or updated in light of new information or changes that have occurred (Fig. 5).

One of the primary benefits of this approach is that it recognizes that many significant decisions affecting a system plan are in reality going to be postponed until project environmental impact and corridor and initial route studies are under way or completed. The mode, scale, specific alignment, and indeed even the existence of a particular facility may therefore be determined in later phases of planning. System plans can account for the possibility of a number of possible outcomes from these later studies.

Developing different sequences of actions on facility improvements places emphasis on what choices are available during the planning time in the future. The different sequences can also explicitly recognize uncertainty regarding a number of factors by evaluating the impacts of a number of potential outcomes from project negotiations or impact studies. Thus, implementation strategies provide a convenient framework for relating statewide system and project planning and programming by focusing on both short-term programming decisions and longer range plans.

Although the resources available for system planning will restrict the number of sequences and uncertainties that can be considered, attention need not be limited to one sequence over time. Implementation strategies most certainly cannot be developed for every possible event that may occur in the future, but they can represent what appear today to be the major choices facing the decision-making process.

The role of statewide system planning in the context of alternative implementation programs is to carefully anticipate the choice issues that must be resolved as planning continues and devise tentative sequences of improvements based on the potential outcomes from these choices. As new information is gathered, new options will be added while others will be dropped from consideration. In some cases, the uncertainty may be so great that one will need demonstration programs to test the response to new systems.

In summary, statewide system and project planning and programming must be integrated so that the "go—no go" decision to implement a project or a particular design will not disrupt the ability to allocate funds smoothly to other high priority projects. Focusing on implementation strategies will allow and encourage a state transportation agency to anticipate modifications so that, when they occur, they do not result in lost time.

Obviously, both the master plan and a plan based on time-staged strategies can be altered in future periods in response to changes. Neither irrevocably commits a region to one sequence of implementations over time. The 2 essential differences between the approaches lie in how initial decisions are made and in the flexibility provided to revise the plan over time. Initial decisions with the master plan aim at 1 target-year system. Although the master plan can be revised, many alternatives are foreclosed prematurely when 1 target network is focused on. The time-staged strategic approach, on the other hand, considers a number of improvement sequences as initial decisions are being made and is able to address questions of uncertainty explicitly. By anticipating the changes that may occur and a range of the choices available in the future, this approach explicitly requires periodic evaluations and revisions and ongoing coordination with project studies. The cost for such an approach may be higher than straightforward master planning, but the precedent has been set (34); and the chances of being able to implement realistic transportation investment programs will be considerably greater.

Citizen and Community Participation at the State Level

A second failure of the traditional UTP studies has been the lack of effective community involvement. Certainly, the most significant change to occur in the past 20 years in the transportation field is the factor of citizen or community participation. The public is demanding a more active role in planning and decision-making at all levels.

It has received the most attention in urban areas, and participatory planning is now required by law. Any conclusions concerning the kind of impact that community involvement has had on transportation decisions, however, can only be tentative at the current time. It certainly has worked effectively in some, but not all, cases. Community interaction is a communication and participation process involving information flow between the transportation agency and other agencies, officials, interest groups, and the general public. Its success has been limited where the information flow did not occur or was not sufficient or involved the wrong groups. To be sure, the techniques and procedures for effective community participation have still to be refined and, in some cases, are still to be developed. Nonetheless, changing attitudes have made it essential that the choices represented by transportation investment decisions be understood by all groups affected by those choices.

The NCHRP study (77) has produced a guide to effective community interaction for transportation investment decisions. It has also identified some 34 techniques to help in carrying out effective community interaction (Table 6).

The NCHRP report also points out that participation must take place in an environment of community and technical interaction. The community can aid in (a) determining goals and objectives, (b) identifying alternative transportation policies and projects, (c) identifying the impacts of concern to them, and (d) evaluating the impacts of the various alternatives. The technical team provides expertise in alternative development and impact prediction within the constraints of its limited planning resources. Through an iterative process of alternative development, evaluation, and refinement, key choices for decision-makers are identified and presented as a means of ensuring well-informed, responsive decisions. Clearly, this kind of involvement will significantly affect the methodology required for both planning and programming.

Both the NCHRP study (77) and the HRB report (2) articulate the objectives, the current approaches, and the effectiveness of citizen participation. To summarize effectively all of the information contained in these 2 documents would be difficult. However, 3 major points from these studies have a major impact on the methodology of statewide planning and programming and reinforce what we have been advocating in earlier sections.

> The transportation process is not now designed to answer questions that citizens often ask The participants in the process identify and examine all reasonable alternatives and their consequences to assist the appropriate decision-makers in choosing the course that they believe to be needed and that they feel will best serve the needs and objectives of the community

This implies the need for a planning and programming process that can identify and quickly evaluate many different transport options, focusing on not just a level-of-service need but on socioeconomic, environmental, and transportation service needs. It also implies a process that is open, flexible, and easy to use and has credibility with the public. (Although we do not expect laymen to fully understand technical procedures, they should be aware of the assumptions, biases, and limitations of the procedures. Certainly, local transportation people in RPAs and even politicians will be more than ever questioning the procedures in use in the future.)

> The most common impediment to citizens' involvement at the (statewide) systems stage is that it deals with problems that will occur too far in the future and citizens do not see how their own current interests are affected

One approach to increasing this involvement will be to relate long-range state plans to shorter range programming decisions through the time-staging approach and to apply realistic budget constraints described in the previous section.

> Criteria for evaluation should include efficiency, equity, service, environmental protection, policy compatibility, future options, legality, and community goals and values [Citizens should] also be involved in determining priorities in implementation schedules and have op-

portunity each year to assist in reviewing these priorities

This reemphasizes the continuing role of citizen participation and statewide planning, the need for ties between longer range plans and programs, and the necessity of broadening the criteria for determining priorities.

One good example of the relation between citizen participation and the technical tools used to evaluate alternatives is the Boston Transportation Planning Review (9). The major accomplishments of this very elaborate effort at citizen participation are fairly well-known and are soon to be published (2). But one shortcoming not documented, aside from the fact that the study was too short and had too little money for what it was trying to accomplish, was that the technical tools of the study were not entirely adequate. The forecasting tools were based on traditional UTP techniques and were not capable of responding to the many unique multimodal alternatives suggested by citizen groups themselves. Nor was the study able to respond as quickly as it would have liked. This example is not unique to the BTPR study. This fact and the objectives laid out by Gakenheimer (79) and summarized here have methodological implications for the overall analysis environment provided to carry out statewide planning and programming alluded to throughout this paper. Improving the procedures of both planning and programming should lead both to more effective community participation and to more effective transportation decisions.

SUMMARY AND CONCLUSIONS

The proposed methodology for statewide planning and programming described in this paper will not be easy to develop. It will require a significant amount of research, the testing of hypotheses, and the collection of new kinds and types of data. In some cases, it will also require a period of exploratory testing of new and as yet unproven techniques and methods. For example, economic activity simulation models (such as input-output techniques) and land use models have been used in only a small number of instances with only limited success (for a variety of understandable reasons) and in fewer instances yet in connection with a transport model. Nonetheless, to avoid developing these procedures is to ignore the interactions of the many different sectors of the economy and its influence on the flow of goods and location of population and employment.

Although the amount of needed research is substantial, this area of investigation represents a fascinating challenge to professionals interested and involved in transportation planning. In the short run, there is a significant amount that can be done to improve the methodology of statewide planning and programming. Existing procedures can be adapted from urban and regional studies. For example, although stochastic disaggregate demand models for short-run forecasting have still not been incorporated in the traditional urban studies, they have been used in many special studies in urban areas and, at least in one case, in an intercity study. They appear to be a significant improvement over the traditional methods of the UTP techniques in terms of (a) their behavioral nature and relevance to policy changes, (b) the costs of data collection, and (c) their potential for transferability of results from one state to another.

In many cases, we will not have the right kinds or amounts of data for these models. Fortunately, there is a growing body of evidence on elasticities in urban areas, and the beginnings of that kind of evidence at the state level as well. These results can be used in many studies involving incremental changes (such as the pivot-point analysis technique described earlier) while the newer and more elaborate techniques are being developed. In other cases, we will simply have to carry out the studies by collecting new data and constructing the models.

We are not recommending that those states with a significant amount invested in the traditional methods immediately switch to a whole new methodology. The proposed approach is a phased strategy of incremental improvements to the existing procedures. At the same time, states should seek, first, to improve the overall multimodal capability using existing packages and, second, to develop the longer run, more complex

activity shift methods needed to properly evaluate the many different transport investment alternatives at the state level.

Moreover, not all states will require as elaborate a methodology as the large states with significant multimodal concerns. Each state will have to evolve its own set of procedures and ways of performing multimodal analysis. Cooperation among states has been extremely good in the past, and some already have indicated a willingness to make programs and models available to other states. It would probably be extremely beneficial to develop a pilot study in one or more different kinds of states in order to actually determine the methodology and data required to do effective statewide planning.

In summary, the recommendation of this paper is the development of a flexible analysis environment for each state and a variety of multimodal modeling tools, some general, others specialized, that have the capacity to predict travel, environmental and economic impacts, and trade-offs and equity issues for a wide variety of spatially and temporally different investment programs. These investment programs must include short-run, low-capital highway options (such as those shown in Fig. 1), low-capital transit or para-transit alternatives, and the more traditional longer range capital-intensive investments. In addition, we are also recommending a more strategic planning approach than has been used in the past; staging strategies are to be evaluated not only for economic and environmental impacts but also for the flexibility to adapt to a wide variety of conditions that may evolve in the future. This approach then should provide for a more positive influence in the actual programming and implementation process inherent in statewide planning. It also will allow for flexibility to interact with regional plans in an interactive, participatory, and iterative manner.

The effort required to develop and implement much of this statewide multimodal methodology will not be inconsequential. However, the potential payoffs from more efficient, well-planned, and integrated transportation systems are enormous, given the amounts of money we have been spending on transportation to date.

ACKNOWLEDGMENTS

Many people have contributed to the contents of this paper. My colleagues Marvin L. Manheim, Moshe Ben-Akiva, Frank Koppelman, Lance Neumann, Paul Roberts, Earl Ruiter, and John Suhrbier deserve special mention, for they contributed significantly to the area of methodology for transportation planning in general. Many of the ideas have arisen from research we have been jointly working on in the past few years. In addition, Jim Kneafsey, Dan Greenbaum, Jon Bottom, and a number of others reviewed the paper and suggested a number of useful changes that were incorporated.

Many people in the states as well deserve my appreciation for their helpfulness in providing information and their willingness to discuss and try out new ideas: Larry Wieman, Bob Adams, Chuck Whitmarsh, and Ray Lynch in California; Richard Esch in Michigan; and Tom Humphrey, Tom Richardson, and Mark Pendrock in Massachusetts. Although I would like to have contacted more states personally, time prevented me from doing so. I did, however, receive from a number of states reports that were helpful for this paper.

I also want to extend my appreciation to those members of Workshop 3A, with whom I worked so closely for 3 days, who were instrumental in putting together the contents of our recommendations.

In many places I have tried to summarize material developed elsewhere through other research projects and existing methodology in use, and I hope they are fully acknowledged in the references.

REFERENCES

1. Brand, D., and Manheim, M. L., Ed. Urban Travel Demand Forecasting. HRB Spec. Rept. 143, 1973.
2. Citizen Participation in Transportation Planning. HRB Spec. Rept. 142, 1973.

3. Highways and Air Quality. HRB Spec. Rept. 141, 1973.
4. State Transportation Issues in the Seventies. Council of State Governments and U.S. Department of Transportation, 1973.
5. Massachusetts Action Plan. Massachusetts Department of Public Works, Boston, 1973.
6. Statewide Transportation Planning: Needs and Requirements. NCHRP Synthesis 15, 1972.
7. California Coastal Zone Policy. California Department of Transportation, Sacramento, 1973.
8. Fairman, G. California State Transportation Board Criteria for Determining Local Versus Regional Versus Statewide Significance in Transportation. California Department of Transportation, Sacramento, unpublished paper, Oct. 1973.
9. Lockwood, S. The Boston Transportation Planning Review: A Case study in Community/Technical Interaction. AIP Planners Notebook, Vol. 2., No. 4, Aug. 1973.
10. Westside Transportation Evaluation Background Information. Urban Systems Lab., M.I.T., Transportation and Community Values Project Memo, April 1973.
11. Westside Highway Project: Preliminary Analysis of Alternatives. System Design Concepts, New York, Project Staff Report, Spring 1973.
12. Shiatte, K. W. Organization for Statewide Transportation Planning. Highway Research Record 264, 1969, pp. 3-9.
13. Road-User Benefit Analyses for Highway Improvements: Part 1—Passenger Cars in Rural Areas. American Association of State Highway Officials, Washington, D.C., 1960.
14. Krecji, M. Programming of Transportation Investments: An Analysis for a State Transportation Agency. M.I.T., Cambridge, SM thesis, 1973.
15. Neumann, L. A Time-Staged Strategic Approach to Transportation Systems Planning. M.I.T., Cambridge, SM thesis, 1972.
16. Neumann, L. A., Pecknold, W. M., Reno, A. T., and Manheim, M. L. Integrating System and Project Planning for the Effective Programming of Transportation Investments. Transportation Research Record 499, 1974.
17. Hazen, P. I. A Comparative Analysis of Statewide Transportation Studies. Highway Research Record 401, 1972, pp. 39-55.
18. Methodological Framework for Comprehensive Transportation Planning. Transportation Research Institute at Carnegie-Mellon University and Pennsylvania Transportation and Traffic Safety Center at Pennsylvania State University, undated.
19. Statewide Travel Demand Forecasting. Federal Highway Administration, Nov. 1973.
20. California Integrated Transportation Study. North American Aviation, Inc., Los Angeles, Sept. 1965.
21. Manheim, M. L., and Ruiter, E. R. DODOTRANS I: A Decision-Oriented Computer Language for Analysis of Multimode Transportation Systems. Highway Research Record 314, 1970, pp. 135-163.
22. Goeller, B. F., et al. The STAR Study: Impacts of Alternative Intercity Short-Haul Transportation Systems on the California Corridor. Rand Corp., Santa Monica, Calif., Sept. 1971.
23. Northeast Corridor Transportation Project Report. U.S. Department of Transportation, NECTP 209, 1970.
24. Michigan's Statewide Traffic Forecasting Model, Volume I-F, Air and Noise Pollution System Analysis Model. Michigan Department of State Highways, Lansing, July 1973.
25. Ingram, G., and Farth, G. TASSIM: Transportation and Air Shed Simulation Model. Prepared for Office of the Secretary, U.S. Department of Transportation, March 1974.
26. Darling, E. M., Jr. Computer Modeling of Transportation-Generated Air Pollution: A State-of-the-Art Survey. Systems Development and Technology, Washington, D.C., June 1972.
27. Coleman, L E., and Barnes, C. L., Jr. Connecticut Inter-Regional Planning Program. Paper presented at Yale Bureau of Highway Traffic, New Haven, Conn., undated.

28. Quandt, R. E., and Baumol, W. J. Abstract Mode Model: Theory and Measurement. Jour. of Regional Science, Vol. 6, No. 2. 1966.
29. Manheim, M. L. Fundamentals of Transportation Systems Analysis. M.I.T., Cambridge, 1974.
30. Kraft, G., and Wohl, M. Special Survey Paper: New Directions for Passenger Demand Analysis and Forecasting. Transportation Research, Vol. 1, No. 3, Nov. 1967.
31. McLynn, J. M., and Woronka, T. Passenger Demand and Modal Split Models. Northeast Corridor Transportation Project, Washington, D.C., Rept. 230, 1969.
32. Roberts, M. J. A Multimodal Transportation Model as a Tool for Regional Transportation Planning. Mitre Corp., McLean, Va., Oct. 1971.
33. Mongini, A. P. Calibration of a Discriminant Function Model of Interurban Modal Split. Traffic Research Corp., New York, March 1966.
34. Kresge, D. T., and Roberts, P. O. Techniques of Transport Planning. In Systems Analysis and Simulation Models, Brookings Institution, Washington, D.C., Vol. 2, 1968.
35. Robillard, P. Incorporating Direct Demand Modeling and Improved Modal Choice Into Freight Commodity Movement Models. M.I.T., Cambridge, SM thesis, 1974.
36. Roberts, P. O. Demand Forecasting for Long-Range and Contemporary Options. HRB Spec. Rept. 143, 1973, pp. 52-71.
37. Manheim, M. L. Practical Implications of Some Fundamental Properties of Travel Demand Models. Highway Research Record 422, 1973, pp. 21-38.
38. Domencich, T. Appendix D. In Effects of Transportation Changes, Charles River Associates, Inc., July 1972.
39. Boyce, D. E., Day, N. D., and McDonald, C. Metropolitan Plan Making. Regional Science Research Institute, Univ. of Pennsylvania, Philadelphia, Monograph Series 4, 1970.
40. UMTA Transportation Planning System Reference Manual. Urban Mass Transportation Administration, 1973.
41. Urban Transportation Planning. Federal Highway Administration, June 1970.
42. Domencich, T., Kraft, G., and Valette, J. P. Estimation of Urban Passenger Travel Behavior: An Economic Demand Model. Highway Research Record 238, 1968, pp. 64-78.
43. Kraft, G Demand for Intercity Passenger Travel in the Washington-Boston Corridor. Systems Analysis and Research Corp., 1963.
44. Quarmby, D. A. Choice of Travel Mode for the Journey to Work: Some Findings. Jour. of Transport Economics and Policy, Vol. 1, No. 3, 1967, pp. 1-42.
45. Pratt, R. H., and Deen, T. B. Estimation of Sub-Modal Split Within the Transit Mode. Highway Research Record 205, 1967, pp. 20-30.
46. Quandt, R. E., and Young, K. H. Cross-Sectional Travel Demand Models: Estimates and Tests. Jour. of Regional Science, Vol. 9, No. 2, 1969, pp. 201-214.
47. Lynch, R. A., Winston, J. D., Lin, K. K., and Pacheco, M. D. California Statewide Transportation Model Development. California Department of Transportation, Sacramento Technical Working Paper 1.
48. Ben-Akiva, M. E. Passenger Transportation Demand: Theory and Models. Department of Civil Engineering, M.I.T., Cambridge, unpublished discussion paper, 1972.
49. Fleet, C. R., and Robertson, S. R. Trip Generation in the Transportation Planning Process. Highway Research Record 240, 1968, pp. 11-31.
50. The Effects of Transit Service on Automobile Ownership. Cambridge Systematics, Inc., Cambridge, Mass., 1974.
51. Lerman, S. R. Towards Behavioral Modeling of Urban Residential Location. M.I.T., Cambridge, PhD dissertation in progress, 1974.
52. Objective Priority Programming Procedures. General Analytics, Inc., and Comsis Corp., March 1973.
53. Gruver, J. E. Highway User Investment Study. Transportation Research Record, 1974.

54. Juster, R. D. A Methodology for Statewide Programming of Transportation Investments. M.I.T., Cambridge, SM thesis, 1974.
55. Neumann, L. A., and Pecknold, W. M. Application of the Time-Staged Strategic Approach to System Planning. Highway Research Record 435, 1973, pp. 20-31.
56. Ruiter, E. R. Analytic Structures. HRB Spec. Rept. 143, 1973, pp. 178-206.
57. An Evaluation of Free Transit Service. Charles River Associates, Inc., Aug. 1968; NTIS, Springfield, Va., PB 179 845.
58. Wilson, Nigel H. M., Pecknold, W. M., and Kullman, B. C. Service Modification Procedures for MBTA Local Bus Operations. Boston Urban Observatory, Mass., 1972.
59. Lave, C. A. A Behavorial Approach to Modal Split Forecasting. Transportation Research, Vol. 3, No. 4, 1969.
60. A Disaggregated Behavioral Model of Urban Travel Demand. Charles River Associates, Inc., March 1972.
61. Ben-Akiva, M. E. Structure of Passenger Travel Demand Models. M.I.T., Cambridge, PhD thesis, 1973.
62. Koppelman, F. S. Aggregate Prediction of Travel Behavior Based on Disaggregate Choice Models. M.I.T., Cambridge, PhD dissertation in progress, 1974.
63. Albright, R. L., and Ben-Akiva, M. Multinomial Logit Estimation Program: Program Documentation. Cambridge Systematics Inc., Cambridge, Mass., 1973.
64. Johnson, W. B., and Dabberdt, W. F. Air Quality Impact Appraisal Procedure for the MTC Regional Transportation Plan. Stanford Research Institute, Phase 1 Prog. Rept., June 30, 1973.
65. Schiff, D. B. Predicting the Impacts of Transportation Projects. M.I.T., Cambridge, SM thesis, June 1973.
66. Procedures for Estimating Highway User Costs, Air Pollution, and Noise Effects. NCHRP Rept. 133, 1973.
67. Solomon, H. L. An Analytical Method to Evaluate and Optimize the Characteristics of Intercity Transportation Modes. Aerospace Corp., El Segundo, Calif.
68. Hinz, E. R. Western Region Short-Haul Air Transportation Program. Aerospace Corp., El Segundo, Calif., Rept. ATR-71-(7190)-1, July 1970.
69. Tan, L. Port Development Problems and Policies and Some Considerations in Developing Models for Their Analysis. Department of Civil Engineering, M.I.T., Cambridge, unpublished discussion paper, 1974.
70. EMPIRIC Land Use Forecasting Model Final Report. Traffic Research Corp., Boston, 1967.
71. Goldner, W. The Lowry Model Heritage. AIP Jour., March 1971.
72. Ingram, G. The Detroit Prototype of the NBER Urban Simulation Model. National Bureau of Economic Research, New York, Feb. 1972.
73. Planning, Programming, and Budgeting System. California Division of Highways, Sacramento, March 1970.
74. Manheim, M. L., Suhrbier, J. H., and Bennett, E. D. Process Guidelines for Consideration of Social, Economic and Environmental Impacts. Urban Systems Lab., M.I.T., Cambridge, June 1972.
75. Frye, F. F. Alternative Multimodal Passenger Transportation Systems: Comparative Economic Analysis. NCHRP Rept. 146, 1973.
76. deNeufville, R., and Keeney, R. Use of Decision Analysis in Airport. In Development for Mexico City, Airport Planning and Location, Vol. 10, Department of Civil Engineering, M.I.T., R72-8, Feb. 1972.
77. Neumann, L. A., and Pecknold, W. M. Integration of System and Project Planning. In A Guide to Social and Environmental Considerations in Transportation Decision-Making, M.I.T., Cambridge, Nov. 1973, ch. 2.
78. Pecknold, W. M. The Evolution of Transport Systems: An Analysis of Time-Staged Investment Strategies. M.I.T., Cambridge, PhD thesis, 1970.
79. Gakenheimer, R. Technics and Conflict. The Boston Transportation Planning Review, Cambridge, Mass., unpublished manuscript, 1974.

Discussion of Resource Paper

Carl N. Swerdloff, Office of the Secretary,
U.S. Department of Transportation

Pecknold has written an extremely thorough, comprehensive, and thoughtful paper on the subject of methodology for statewide planning of passenger transportation systems. The paper identifies the changing environment and evolving set of issues with which individuals and agencies responsible for the planning and development of transportation service and facilities at the state level must contend, summarizes the present status of planning and programming methodology as it is applied by individual states, and recommends how statewide planning and programming methodology must evolve if it is to respond to the rapidly emerging demands cited. The recommended research projects include time and cost estimates and priorities.

There are several major themes in this paper that I find to be particularly noteworthy and should like to discuss.

1. Pecknold recognizes that current evolving statewide methodology has and will continue to have a substantial basis in the methods and techniques developed from the urban transportation planning (UTP) studies. At the same time, he warns that care must be taken in the future if this cross fertilization is to remain profitable. Mistakes and failures accompanying the UTP processes must be exploited, just as have their successes. On the other hand, the issues and relations involved in planning and programming at the state level may severely diminish their appropriateness and may not be directly amenable to the techniques and processes that have succeeded at the urban level.
2. The author also proposes that the evolving statewide methodology be flexible, open, and responsive to a wide range of issues and demands, many of which are unforeseen at this time. Furthermore, he highlights the historical absence of a strong and effective linkage between the transportation planning function and project programming. This deficiency, by the way, is not only symptomatic of statewide planning, but has plagued most urban transportation programs.
3. Pecknold concentrates on the requirements for better methods of predicting travel demand on a statewide basis as the primary target for improved methodology, although he recognizes other areas in which planning methodology is deficient.

With respect to the first point, the problems cited by the author regarding existing methodology as well as his recommendations for improvement maintain a distinct bias toward a planning process that is overwhelmingly directed at the evaluation of system investment alternatives, of both a short- and long-term nature, albeit in a manner that is increasingly responsive to other issues such as environmental impacts and citizen participation.

Clearly capital investment planning and programming will and should continue as a major focus of the planning process; however, it is evident that transportation agencies, at all governmental levels, will be competing with increasing intensity for capital resources in the future and solutions will be required that make more efficient use of existing transportation infrastructure. The paper does not devote adequate attention to the need for analytic methodology with which low-capital planning alternatives can be examined.

The UTP experience, which has heavily influenced Pecknold's presentation, is also, I believe, responsible for the exclusively public-sector orientation of his recommendations. State transportation planning and programming interact either directly or indirectly with the operations and viability of privately supplied transportation service. This requires explicit organizational and policy considerations; I believe there are also methodological implications as well. The paper also does not address the question of incorporating transportation regulatory responsibility into the set of actions and options that should be considered in the development of statewide transportation plans. In many states, this function is not within the purview of the transportation planning and development agency, although it is in some states. In both instances, a

thorough transportation planning process must account for the potential use of regulatory reform or modification as a key element of the overall state planning strategy. How this can and should be incorporated is an area deserving future research and methodological development.

I support Pecknold's suggestion that the planning process evolve such that a variety of tools become available for examining a wide variety of issues at different spatial and temporal scales. I would extend this notion and suggest that the basic methodology that supports this may also have to cover a wide structural range. For example, the traditional network simulation type of analysis may be perfectly appropriate for corridor or short-term planning but not for long-term multimodal systems in which specific routes or projects are not or should not be the primary issue.

There are classes of models, which have attracted attention and which have been successfully applied, that rely on aggregated relations between transportation system supply and demand. Models of this type could prove of great value for examining resource allocation alternatives at the state or regional level where the question is not what specific routes or corridors should be developed and with what priority but how much increase in transportation supply will be required in the state or subregion during the next 10- to 20-year period if transportation service is to be maintained at approximately existing levels or improved to some specified level. Whether we call them sketch-planning or macroanalytic models, they could fill a very important place in the total supply of available methodology. An added attraction of such models is that they are relatively quick and inexpensive to operate so that a large number of alternatives can be examined. A program of research and development in this area should be identified and given a high priority.

As stated earlier, the author concentrates heavily on the requirements for developing better travel demand models and, more precisely, models that are of the disaggregated, behavioral variety. Substantial research activity, supported by a great deal of professional interest in travel demand models of this class, has recently been initiated but deals primarily with travel in urban areas. The positive attributes of this type of model are relatively well known by now and are effectively presented by Pecknold. I am a staunch supporter of continued development of better behavioral modeling techniques and agree in principle with the author's conclusion that there must be expanded research in the development of this class of model for application to statewide planning problems. My only disagreement with the paper is one of emphasis. Although the prospects for payoff with behavioral models are great, the fact remains that they have not yet proved themselves in an operational context. That is, their advantages over existing statistical techniques remain to be demonstrated in a conclusive way. Furthermore, it is not obvious that they will prove to be as advantageous in regional or statewide planning as they appear to be in urban planning. On the other hand, such models have distinct advantages over traditional techniques, not the least of which is their ability to explore low-capital or operational alternatives as well as service improvements that result from major capital investments.

In addition to the need for better travel demand tools, there are major needs for methodological improvement in a number of complementary areas. Few tools are available that treat the supply of both urban and intercity transportation facilities. Rational decisions with respect to investment in transportation facilities or operational and pricing options cannot be expected if the planner or decision-maker cannot relate the effects of changes in system supply or operation to the changes in transportation performance and service. Furthermore, sound recommendations regarding investment and operating options cannot be made unless the analyst and planner can estimate their associated costs and benefits. Supply models that relate the costs associated with attaining different levels of performance change are therefore essential and should be addressed in future research efforts. In addition, much more attention has to be given to the development of transportation performance measures that relate to demand decisions and that at the same time can be used by agencies to measure the changes in transportation service over time and the effectiveness of specific programs.

Pecknold makes a strong case for improved methodology for measuring the distributional characteristics of transportation improvements. However, I would argue that

the benefits of improved models of this nature will be mitigated if concurrent advances are not made in evaluation methodology by which the full range of benefits and costs, quantitative and nonquantitative, associated with particular alternatives can be fully displayed for the use of decision-makers and the public in making trade-offs and choices. Again, methodology has been developed primarily in the urban transportation area and may not be adequate for the scale and range of impacts involved in planning statewide systems or subsystems.

Three additional research areas were either only briefly touched on in the resource paper or not examined at all.

1. Given the changing climate with respect to environmental impacts and the growing interest of federal, state, and local government in better control of land development and resource management, I believe more emphasis should be placed on research directed at methodology that permits better estimates of the influence of transportation improvements on the nature and location of economic activity and the role that transportation planning and programming can have in supporting comprehensive and economic planning for the state.
2. Some research is needed in the area of normative planning and modeling, that is, the development of methodology that accepts as input a desired or planned configuration of land and activity arrangement and produces as output the nature and sequence of a transportation improvement program that most efficiently supports that end state. Progress on these kinds of models has not been overwhelming in the past. However, changing attitudes on behalf of government and the public make their potential utility of growing value and interest.
3. Better fiscal and financial planning methodology is needed. It is clear that grandiose long-term investment plans developed without any thought concerning how they will be paid for are of rapidly declining interest at all governmental levels. Planners and decision-makers must have the tools with which to make relatively accurate assessments of the feasibility and impact of alternative financing mechanisms. Such tools must estimate not only the likely yield of such alternatives but the distributional impacts on the population and the effect upon demand.

I cannot conclude my remarks without strongly endorsing Pecknold's discussion of the continuing statewide planning process and in particular the interdependence between long-term system planning and time-staged project planning. Although I recognize that the proposed scheme is mostly conceptual at this point, I believe it holds the prospects for some very exciting and fruitful methodological development. The paper presents a comprehensive assessment of where we are today in terms of statewide transportation planning and programming methodology and where we ought to be investing future research funds.

Discussion of Resource Paper

Max R. Sproles, Harland Bartholomew and Associates

Two major points in Pecknold's excellent resource paper should receive additional emphasis: the type of methodology to be used to consider the question of environmental quality and the concept of equity of investments in transportation.

The coverage was extremely good of those techniques being tried in the states that have a formal program of statewide planning. But what is being done in the less organized states? Each state is going about the job of assigning priorities, building projects, and dividing transportation funds among regions and types of projects that fit into their legislative mandates. How are all these decisions arrived at? How are

fund levels determined? How are funds being allocated to road systems? How are funds being allocated to areas, and how are funds being allocated to modes? How does the political planning and decision process fit into the technical planning process, especially when the technical process is informal and unorganized?

The question of citizen participation at the state planning development stage needs much more study. To generate broad coverage and involvement in a process is difficult if people do not understand the process and cannot see the impact of a construction project for 5 to 20 years. In other words, how do we solicit the opinions of all those disinterested persons who do not care enough to participate or think that everything is going okay so why participate or have been so dulled by the political process that they feel they cannot make an input that will change anything? How can we integrate the citizen participation program into the political process so that we can depend on political decision-makers to obtain the consensus of their constituency and then be responsible to that constituency?

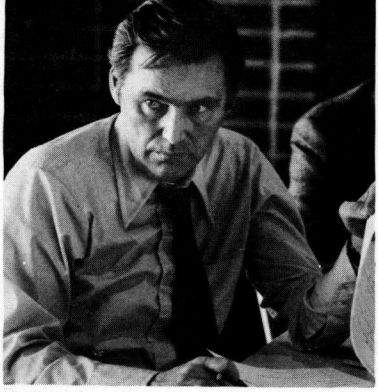
My major interest in commenting on methodology for statewide transportation planning is to make sure that the individuals at the state level who must organize and develop capabilities for decision-making have as a reference recommendations for methodologies that are practical. Too often the statewide transportation planning process has emerged as the result of many relatively minor decisions rather than being a rational process that forms a framework for the decision-making process. The statewide planning process must be supported by funds and personnel capable of responding to a broad range of questions and documenting technical information and presenting it to the administrators.

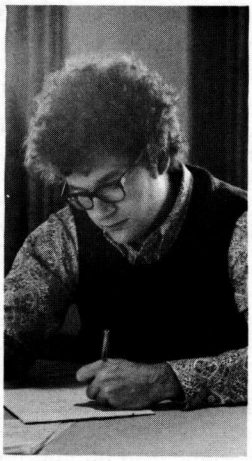
The point is that decisions are going to be made quickly with or without the technical review and documentation. Therefore, the methodologies that are in the kit of the statewide transportation planner must range from the "quick and dirty" to the very sophisticated. I estimate that two-thirds of the questions that must be answered relative to statewide planning will be answered through the quick-and-dirty process. Therefore, the main aim of the development of methodologies should be to establish an overall framework with as much sophistication as can be justified but with specific emphasis on the ability to answer as quickly as possible the day-to-day questions regarding policy.

This means that considerable changes will have to take place in the existing methodology and that possibly very little of the urban transportation planning process will be directly applicable. I am particularly concerned about the use of the urban transportation planning modeling technique in the development of methodologies for statewide planning.

I have 2 additional concerns. One is that in the development of methodology, particularly with regard to data requirements, we must be very careful that we do not fall into the trap of the highway planning survey and the urban transportation planning process in which most of the time and energy was devoted to data collection that was difficult to make relevant to the decision that had to be made with or without data. In addition, we must be very careful in using modeling techniques and in recommending modeling techniques that are more complex than the decision they are designed to assist.

The other concern is that we develop methodologies that will allow the integration of private transportation and land use planning into the public planning process. If we are to develop an effective transportation planning process at the statewide level, input related to decisions of private transportation operators and the land development community must be included as early as possible.





OBJECTIVES

To identify and evaluate current techniques being used to develop statewide multimodal transportation plans, priorities, and programs for goods movement.

To recommend improvements in planning methodology including data and management elements necessary to ensure a continuous and viable process.

To develop a recommended program of research in statewide multimodal transportation planning methodology.

ISSUES

What are the essential data requirements for the preparation of comprehensive multimodal transportation plans, priorities, and programs for goods movement?

What are the current techniques for collection of data on goods movement within states? Are sources adequate?

What techniques are available to forecast statewide travel by mode for goods movement?

What techniques are currently available to develop and evaluate transportation plan alternatives? Can alternative systems be developed at the state level?

Are composite regional transportation plans building blocks for statewide plans?

What special studies and analyses are required to develop plans for the various modes?

How do procedures and methodology for analysis, forecasting, evaluation, and plan preparation differ for various modes?

What techniques are currently being used to evaluate social, environmental, and economic impacts? Are they adequate?

What procedures and techniques are available to respond to new and emerging issues such as energy?

What techniques are used to reevaluate plans, priorities, and programs on a continuing basis?

What techniques are used to provide opportunities for input to the transportation planning process by citizens, elected officials, interest groups, and others?

What techniques are used to integrate and coordinate transportation planning with land use and other functional planning activities?

Are the data collection and analytical techniques developed for urban transportation planning appropriate for statewide planning purposes? Can statewide planning techniques be used for urban transportation planning?

What techniques are used to establish prorities both within modes and between modes?

What techniques are used to develop programs for high-capital and low-capital programs?

WORKSHOP 3B: SYSTEMS PLANNING AND PROGRAMMING METHODOLOGY — FREIGHT MOVEMENT

Everett C. Carter, Louis L. Davis, Joseph S. Drake, John O. Gerald, John Hassell, Lester A. Hoel, Louis J. Keefer, Frank S. Koppleman, Thomas Lisco, Brenda Murray, Owen H. Sauerlender, Richard A. Staley, and Daryl Wright

Report

Lester A. Hoel, Transportation Research Institute, Carnegie-Mellon University, chairman

Unless the role of the state in freight transportation is understood, there is little purpose for preceeding with methodological issues and needed areas of research. Freight transportation is viewed as a key element in the marketing and distribution process and has traditionally operated in the area of free enterprise. However, the role of the state is becoming more important for several reasons.

1. Many of the objectives of freight facilities

planning and development can be met only through the financial involvement of the state.

2. The state is involved in related areas of activities that influence the movement of freight and its modal distribution. Among these are support systems such as highways, waterways, ports, and airports. Also, the state is involved in regulatory and taxing activities and, through various direct and indirect subsidy programs, can substantially influence freight distribution patterns.
3. Broadening the state's role in freight transportation is likely in the future. Several examples could be cited, but perhaps the most noted is the involvement of the state in railroad transportation systems.
4. An important element in freight distribution and location relates to land use decisions, and the state can play a significant role in guiding the location and distribution of key freight generators throughout the region.

Therefore, it is appropriate that the states have knowledge and an analytical capability to properly plan for the future and to incorporate the element of freight distribution within a statewide regional transportation plan.

METHODOLOGY

Freight systems planning is a composite of many different but interrelated activities. Accordingly, there is a need to develop specific analysis tools for specific problems. These should be structured flexibly enough to be applied in other areas. Development of methodology for those problems for which the states have or expect to have a role should be given priority.

Initial models of freight flow should focus on operational simplicity rather than on theoretical elegance; further development should be directed toward conceptual thoroughness and basic knowledge and understanding of the freight phenomena. Freight flow models and related methodology should be designed for quick response to critical problems, and their degree of sophistication should be consistent with data availability, time limitations, and requirements of the real world.

Specific methodological areas that warrant further development are as follows:

1. Regional and state development models to determine the impact of freight on development and the demand for freight services that results from different density and configurations of land development.
2. Freight demand models to represent expected commodity flows on the network. Simple generation, distribution, and mode-choice models should be developed for freight forecast purposes. Simplicity is specified in recognition of the UTP pitfalls and the problems created by a complex set of heavily data-dependent computer models. In addition, behavioral analysis of firm location and shipper mode choice are essential for understanding the system and its workings.
3. Land use impact models to describe the effect of transportation policies on the economy, the environment, and energy resources.
4. Corridor analysis models to deal with specific facility decisions, such as curtailment and rail abandonment. These models are to be developed to be responsive to relevant corridor transportation problems that may arise in connection with freight distribution.
5. Transportation facility cost models to establish parametric values and means for determining the costs of various transportation modes.

DATA

A major lack in freight transportation methodology is the availability of data. Among the conclusions reached by the workshop are the following:

1. Data on freight are generally unavailable and should be obtained to furnish basic

density flows. Flow maps for freight are also generally lacking; they represent a starting point for all studies and are a necessary requirement for freight system analysis.

2. Careful determination of specific data needs and their uses should be made before data collection programs are launched. This is a fundamental point that cannot be overemphasized; the data needs must be carefully structured to be consistent with problems to be solved. Although basic density data are considered essential as discussed above, additional data acquisition should be carefully defined and justified to avoid the possibility of securing data that may not be relevant or may be of such magnitude that they cannot be easily incorporated into the decision process.

3. Many freight data are available and could be used if they were identified and classified.

4. Freight data available from private agencies should be secured through joint cooperation. Private agencies, especially the railroads, have a wealth of data that could be useful for statewide transportation planning. The ability to secure these data often depends on the good faith of both parties. Clearly, if the data are to be made available to the state, mechanisms must be developed whereby the transfer of data is in the interest of both parties.

5. Supplementary special purpose data should be collected as necessary to analyze particular problems and planning issues.

HIGH-PRIORITY RESEARCH PROBLEM AREAS

The discussions within the workshop identified 11 areas of research that related to the needs and issues previously described. Of these, 3 areas were identified as representing high-priority topics for which immediate research efforts should be undertaken.

1. Freight data requirements for statewide systems planning. This research would identify minimum freight data necessary for statewide planning purposes, identify data already available, design data collection programs where appropriate, and test the design within a statewide transportation planning program.

2. Carrier facility curtailments and abandonments. This research is of immediate relevance; it relates to the current crisis of the railroads. However, states are not in a position to evaluate rail abandonments and to understand the impact that these have on the state's economy, energy, and travel redistribution.

3. Simple freight demand models. A strong need in the area of methodology relates to development of demand models for forecasting freight flows and evaluating alternative policies and systems. As has been noted earlier, these models should not follow the traditional UTP process, but should be structured in a form that is readily usable and not heavily data-dependent.

Resource Paper

Joseph S. Drake, Department of Civil Engineering,
University of Pittsburgh

Within their respective areas of concern, the 2 resource papers on systems planning and programming methodology serve 3 stated objectives: (a) to identify and evaluate the current techniques being used to develop statewide multimodal transportation plans, priorities, and programs; (b) to recommend improvements in planning methodology, including essential data and management elements; and (c) to develop a recommended program of research in needed methodology for statewide multimodal transportation planning.

In serving these objectives, this paper reservedly focuses on the task of presenting a generalized synthesis of the current and potential state of the art in statewide freight transportation planning and programming. The emphasis on potential capability is essential simply because minimal technical activity is being directed currently to freight analysis at the state level.

Hence, the paper draws on selective methodological capability in other planning contexts (e.g., the Northeast Corridor Transportation Project) for possible incorporation at the state level. Except for the most obvious matters, such as the pressing need for integrated assembly of goods movement data, the paper generally refrains from any strong advocacy and purports merely to raise major issues.

Planning and programming for freight transportation systems at the state level are practically virgin territory, as highlighted in a recent report (34, p. 31): "It seems that we are in the infancy of long-range goods movement system planning. It is a period during which planners must obtain data and develop analysis techniques before even attempting to simulate those systems." This embryonic status of freight transportation planning represents an appraisal relative to all accomplishments in statewide transportation planning, which itself is approaching adolescence at best. According to Creighton and Hamburg (11, p. 21):

> The position of statewide transportation planning in 1972 has advanced to about the position of urban transportation planning in 1955 Fortunately, to improve this position, we have the advantage of knowing a great deal more about planning processes, goals, simulation, data collection, and evaluation. However, statewide comprehensive transportation planning is a larger and more complex subject than urban transportation planning There are more modes. Both public and private organizations provide the services And freight movement is a vital half of the problem.

Because this entire subject area is so embryonic and raises a somewhat bewildering variety of issues throughout all aspects of the planning and programming process, defining an overall organizational framework is essential for discussion. Figure 1 shows the planning and programming process in terms of developing alternative transportation plans, analyzing their respective consequences or effects, performing a comparative evaluation of those alternatives in terms of their estimated effects, and programming specific projects. The elements of plan development and plan evaluation represent procedures for utilizing analytical techniques to derive most appropriate courses of action. A fourth element, data collection, basically provides quantitative foundation for the analysis of plan effects. The programming of particular projects constitutes the final step in this process leading to implementation. Obviously, execution of this entire operation first requires that the relevant planning instruments (or controls) and the relevant effects (or criteria) be defined.

The discussion of methodological issues in this paper is organized in reference to this skeletal structure of the planning and programming process. The first section begins with an attempt to define the overall scope and character of the process and culminates in several premises regarding appropriate state responsibilities. Sections 2 and 3 discuss and define the relevant control variables (analytical parameters for specifying proposed courses of action) and effect variables (criteria for evaluating alternative plans) respectively. Section 4 discusses data collection efforts, and section 5 discusses analytical techniques; the most specific, hard-nosed issues are raised in these 2 sections. The final section highlights major methodological issues. Selective references are included to give direction to particular concerns for various problem areas cited throughout the paper.

Figure 1. Skeletal structure of planning and programming process.

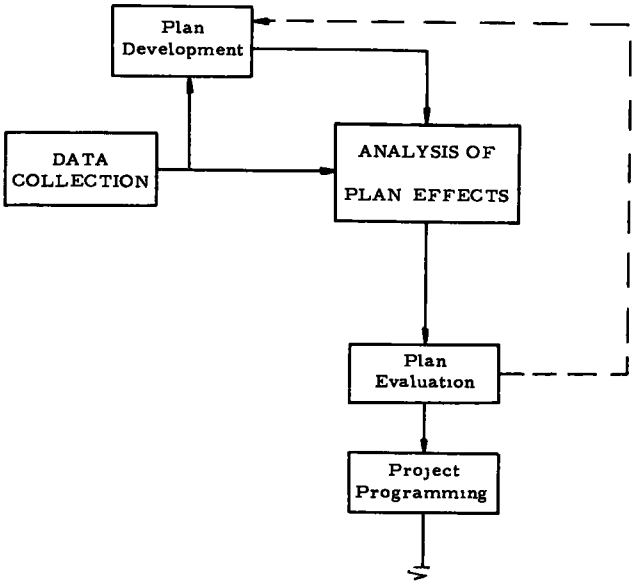
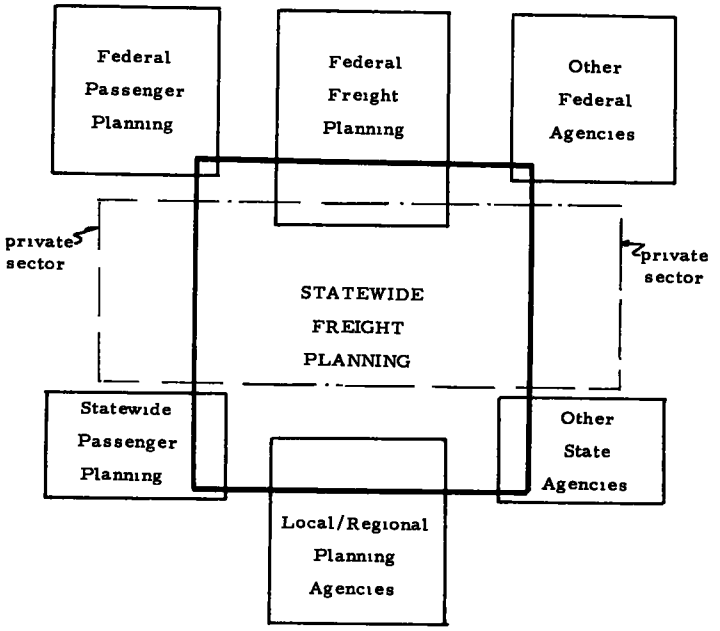


Figure 2. Jurisdictional context for statewide freight transportation planning and programming.



SCOPE AND CHARACTER OF STATEWIDE FREIGHT TRANSPORTATION PLANNING AND PROGRAMMING

The scope and character of planning and programming methodology at the state level obviously depend on the types and degrees of jurisdictional authority vested in that governmental body. The nature of such authority conditions the particular courses of action to be considered by technical analysis. Although specific matters of appropriate jurisdiction were addressed by the Workshop on Policy Planning, some basic observations are in order here, particularly to help define the relevant "control variables" for planning and programming techniques at the state level. In other words, part of the intent here is to lay groundwork for identifying the "knobs," which are within the province of state-level methodology, to manipulate in exploring alternative courses of action.

This matter is not altogether straightforward, inasmuch as any such endeavor is necessarily sandwiched between a variety of overlapping private and public parties, as shown in Figure 2. Obviously the state has a direct interest in affecting the economics of competition among intrastate carriers (e.g., through regulation of rates, route structures, and rights of entry), especially when competitive conditions in one part of the state interact with conditions in another part. On the other hand, state planning presumably would have negligible concern with the house-to-house distribution of parcel post shipments in local communities and certainly could not take on a comprehensive systems analysis of transcontinental rail-merger proposals.

Within this broad spectrum of freight transportation problems, the appropriate role of state planning and programming must be defined in accordance with institutionalized jurisdictional authority. Technical methodology must be considered in terms of relevant endogenous control variables, for they specify in analytical terms the alternative courses of action to be studied. [Endogenous control variables are those parameters that state planning manipulates (e.g., intrastate rates). Exogenous control variables are those parameters that are prescribed by other decision-making bodies, as shown in Figure 2 (e.g., federal import quotas or fuel rationing), and that directly affect state planning.] This section then summarizes the types of instruments that the state generally may exercise in freight transportation. Some exemplary problem areas of major public concern are cited, and from this discussion several raisons d'etre for state planning and programming are inferred. Several premises are next advanced regarding the appropriate scope and character of such a process. Then the limited activities of states to date are summarized in reference to this prescribed scope and character.

Overview of Instruments Within State Jurisdiction

At any jurisdictional level, government typically may exercise 4 distinct kinds of interventional instruments that address the following concerns (31): improvement of resource allocation, improvement of wealth distribution, protection of individual freedoms, and maintenance of social and economic stability. Governmental involvement in transportation (especially freight) is predominantly concerned with instruments of resource allocation to achieve economic efficiency and less concerned with inequities among carriers, modes, and various shipping interests.

Governmental bodies may affect the pattern of resource allocation in terms of 4 basic instruments: (a) direct investment in facilities and services with either public or private operating responsibility; (b) "hard" promotional programs such as subsidies and tax advantages; (c) regulatory controls over the private sector "in the public interest"; and (d) "soft" promotional programs such as information assembly, research, and coordinative planning.

As a whole, the national system of freight transportation is largely an operation of the private sector; the regulatory instrument is the paramount form of governmental involvement. For some modes (notably truck, water, and air) fixed-way facilities generally are provided by direct public investment, and fleet operations are left to private sector decisions. To a limited though increasing extent, the federal govern-

ment has executed promotional programs of both the hard variety (e.g., investment tax credits for rail fleet acquisition and the Regional Rail Reorganization Act of 1973) and the soft variety (e.g., research on fleet utilization, national transportation surveys, and a national network model of long-distance freight movement). Otherwise, the regulatory instrument has prevailed as the key means for influencing resource allocation in freight transport, and the other types of actions are left largely to private initiative.

The role of state government generally follows a parallel pattern, except for an almost total absence of promotional strategy. State agencies administer the provision of highway facilities and some air and water facilities. Otherwise, although promotional subsidies are provided to local passenger operations, the state's control in freight transportation is decidedly regulatory. Except for a few cases (notably Connecticut, New York, Pennsylvania, and Wisconsin) state planning specifically for freight transportation has remained nominal, especially within agencies empowered to make regulatory decisions. Applications of individual carriers are treated on a piecemeal, case-by-case basis in the form of adversary proceedings that are devoid of any comprehensive in-house compilation of objective and systematic impact analysis.

State administrative and regulatory responsibility traditionally has been diffused among a number of departments, commissions, and authorities holding jurisdiction over intrastate traffic. Although the establishment of transportation departments has consolidated some of these responsibilities, state regulatory functions have been incorporated only in the New York transportation department; most other states have retained these powers within a public utilities commission. In all cases of separate regulatory authority, supportive technical methodology remains piecemeal or nonexistent.

State regulatory powers typically include the licensing of carriers, evaluation of rate and route applications, and evaluation of service curtailment and abandonment petitions. Although the apparent intent of relevant legislation generally is to provide regulatory jurisdiction over all intrastate traffic, in practice these powers apply unambiguously only to strictly intrastate carriers. The intrastate movements of interstate carriers fall into a gray area of interjurisdictional responsibility, and federal agencies generally exert more influence. [Volotta (63) presents a case study that contains a revealing elaboration of state transportation regulation.]

Although such ambiguities exist, technically the state has control over the same basic parameters of freight transportation systems—technology, network structure, capacity, service attributes, and costs to operators and users—as those that have been incorporated into passenger systems planning institutions to date. However, the direct influence of those parameters through outright provision of capital facilities and equipment is more limited in the state freight context (primarily highways and, to a lesser extent, air and water facilities). The more prevalent instrument is the regulatory one, which essentially leaves proposals for modifying the aforementioned parameters to the initiative of individual carriers; in this respect state control is less direct, for it basically adopts a binary approval-disapproval approach in decision-making. The utilization of more positive promotional instruments such as subsidies and tax credits has been minimal, and supportive planning efforts have been nominal or, at best, far too piecemeal. Beyond these forms of intervention, the state also has some opportunity to express its interests in freight transportation to appropriate federal agencies (e.g., as an interested party in the piecemeal adversary proceedings of the Interstate Commerce Commission or through the National Transportation Needs Study of the U.S. Department of Transportation).

Exemplary Problem Areas in Freight Transportation

The need for coordinated planning in freight transportation at any jurisdictional level arises from a growing number of outstanding problems that have not been resolved under prevailing institutions. Extensive compilations of specific issues are adequately documented elsewhere. [The Transportation Association of America (52) identified and updates annually a comprehensive set of outstanding issues. The 1972 National Trans-

portation Report (58) also gives a noteworthy summary of some major issues in commodity transportation.] The intent here is to highlight a few major problems that serve to identify distinct raisons d'etre for freight planning and programming at the state level. In general, these problems relate to the roles of competition and coordination (within and between modes) and associated shortcomings of resource allocation. The key point is that these various issues are manifested at different levels of spatial and political jurisdiction.

Consider first some exemplary problems that are of relatively localized relevance. Urban areas are vitally dependent on the efficient distribution of fresh and frozen produce commodities from line-haul carriers to local retail outlets. The typical urban produce yards consist of deteriorated facilities designed for an outmoded era predating urban sprawl, and the efficiency of such operations has been hampered by automobile congestion and by the growth of large-scale food chains with independent distribution systems. If the needs of urban consumers are to be met adequately now and in the future, new distribution systems must be planned and most likely supported by some degree of public subsidy.

In a rural context, the problem of rail branch-line abandonment has developed into immense proportions during recent years. Trunk-line interstate carriers maintain that conditions of intermodal competition for long hauls have made them far more sensitive to the economics of allegedly marginal or unprofitable branch-line operations. The problem has reached the point where the negligence of maintenance on many such lines is noticeable to the "layest" of lay persons. Prospects of abandonment threaten the captive existence of shippers on such lines, and local communities face losses in economic base and tax revenues. Railroads are claiming that public subsidies must be forthcoming if such operations are to continue, at least under their operation.

The most pervasive issues in freight transportation relate to the economics of intramodal and intermodal competition for line-haul movements. Where such movements are of an intrastate nature, state planning has the potential to coordinate heretofore piecemeal perspectives. The exempt status of the private motor carriers is one such issue, which has drawn the following position statement in the New York state master plan (46, p. 50):

> Freight movement by private truck dominates freight transport The remaining freight haulers–the for-hire carriers–are, to varying degrees, subject to economic controls that hamper them in exploiting their inherent advantages and thereby deny them a fair opportunity to compete effectively against private carriage

Another such issue arises when a state regulatory commission approves a rate or route application for one mode in an intercity corridor and has only a very speculative notion, at best, of shipper cross elasticities and consequent impact on competing modes.

Issues of considerably greater complexity arise when any regulatory decision for a carrier in one part of a state may increase or decrease the traffic movements via connecting carriers in other parts of the state. Indeed, the totality of such piecemeal decisions can have a marked influence on the distribution of industrial development throughout a state. The point here is that a variety of physical and economic interdependencies exist in statewide multimodal freight networks and must be considered within an integrated perspective that transcends individual carriers, modes, and local areas.

Similar interdependencies of an interstate character raise similar issues at a suprastate level. Interstate railroads, for example, are burdened with excess trunk-line capacity that has promoted many proposals for intramodal consolidation involving the entire national rail network. Moreover, the growing need for intermodal transfer facilities (especially line-haul to line-haul) is widely recognized, producing proposals such as ship-to-pipeline oil transfer in coastal states, auto-train terminals, or even the concept of a transcontinental land bridge from coast to coast. Such interests in coordination have prompted selected initiatives toward industrial reorganization in the form of single-ownership, multimodal transportation companies. These kinds of issues pertain to interstate traffic, yet may have substantial impacts on the individual states.

This selective discussion of major problems in freight transportation suffices to distinguish several essential levels within an ideal hierarchy of systems planning and programming.

1. Problems of predominantly local concern, i.e., those that are relatively isolated or self-contained within lower jurisdictions of government (but that may be shared by peer jurisdictions throughout a state or the nation and require supportive funding);
2. Problems that require a systematic analytical perspective to integrate the piecemeal proposals of individual carriers by considering the full extent of intrastate interdependencies among various carriers, modes, and geographic areas within the state; and
3. Problems that require the same approach as suggested in level 2, but from an interstate perspective.

Premises Regarding Scope and Character of State Planning and Programming

Obviously we cannot expect any state to take on all of these responsibilities. However, certain premises may be set forth here in order to articulate the appropriate scope and character of statewide freight transportation planning and programming.

1. The planning of relatively localized projects (such as access and terminal facilities) eventually should be executed by local or regional planning agencies. Where such projects warrant state promotional intervention (e.g., through direct or federally channeled subsidy, tax exemptions, or use of eminent domain powers), the projects would be programmed at the state level. Where such problems are common to many peer jurisdictions, they may warrant special research efforts—sponsored by state or federal agencies—to help develop appropriate analytical methodology. State sponsorship would be warranted only for problems relatively unique to the particular state.
2. The problems of the second kind require in-house statewide planning and programming that use systems-analytic methodology with sufficient spatial detail to account for important intrastate origin-destination markets. Techniques of spatial demand analysis, modal-choice analysis, and network analysis are essential to consider fully the economic and physical interdependencies among different carriers, modes, and geographic areas within the state. As necessary and feasible (see premise 3 below), patterns of interstate flow should be superimposed onto such statewide systems analysis. The supportive technical methodology for this activity should be explicitly sensitive to all transportation system parameters that may be influenced by state agencies through direct investment, promotion, and regulation.
3. The problems of the third kind must be treated at the federal level by means of technical methodology similar in kind to that described in premise 2 above for statewide planning and programming. Coordination of this effort with the statewide endeavor is essential, especially in respect to mutual exchange of information. It is assumed that the ongoing statewide process described in premise 2, together with any special studies implemented according to premise 1, will provide adequate basis for advocacy of a state's interests within broader transportation decision-making institutions at the federal level.

These premises define the main concern of statewide planning and programming methodology as the systems analysis of nonlocal intrastate carriage (and related impacts) in a spatial context, but allow for selective special studies for common local problems.

State of the Art: An Overview

The scope and character of current state-level planning and programming generally are

very remote from that prescribed above. The closest approximation to this comprehensive approach (save for the few exceptions noted below) is the inclusion of truck-flow estimates in statewide highway traffic assignments where such procedures are used (20, 59). The typical condition at the state level beyond this consideration of trucks as automobile equivalents involves a regulatory commission resolving piecemeal carrier proposals by means of an adversary process, without any consistent technical estimates of likely impacts. The first national transportation study (58), though oriented to passenger transportation needs and to aggregate data summaries by state, at least seems to have created a consciousness of pressures for statewide freight planning and programming.

Several states have broken some substantial ground in proceeding toward the scope and character prescribed above. The Connecticut Interregional Planning Program conducted special statewide surveys of truck and certain rail freight movements during the mid-1960s and projected origin-destination patterns to the year 2000 (8). The Wisconsin Department of Transportation has taken noteworthy initiative toward a state census of transportation with careful consideration of potential primary and secondary data sources for freight (16). The New York Department of Transportation has taken vanguard steps to integrate regulatory decision-making into a statewide planning and programming process (46), although data collection and analytical techniques remain in an exploratory phase.

Thorough inventories of freight facilities have been conducted for Pennsylvania (65) and Tennessee (67), and the Illinois Department of Transportation currently is attempting to procure link density data for all railroads operating in that state. Elaborate data collection and modeling methodologies have been designed for California (39) and Pennsylvania (6), but have not been implemented. Undoubtedly some other states have taken limited initiative at least in data collection activities.

Despite these instances of meaningful initiative, little has emerged insofar as operational analytical methodology is concerned. The California and Pennsylvania studies developed comprehensive planning methodology in considerable detail, but some elements of each require rather elaborate data collection. The other states cited above either have not developed any analytical methodology at all (beyond data collection) or are just beginning to do so, and documentation is not yet available or—in the case of Connecticut—methodology has been adapted directly from first-generation techniques of urban transportation planning.

State-level programming methodology for freight transportation is even more embryonic. Within those agencies with direct investment responsibilities, programming for freight-serving facilities generally has been treated as described in the Workshop 3A resource paper on passenger planning and programming. Such facilities typically have had a primary orientation to passenger service; freight-serving functions are considered subordinately. Otherwise, the programming of regulatory actions generally has been left to a piecemeal adversary process, and systematic technical methodology has been totally lacking. In effect, priorities are set by the pattern of applications that emanate from the private sector.

Special studies of relatively localized but commonly shared freight problems have been conducted in numerous instances, though with very little involvement at the state level. An extensive body of literature on terminal planning and design has developed through the research efforts of individual private carriers and modal industrial associations (e.g., the Railway Systems Management Association). The federal government (particularly the Federal Rail Administration in recent years) has sponsored various studies of intramodal operating problems such as fleet utilization, car supply, and service reliability. All of these efforts, however, have been directed to the internal operations of individual carriers—in some cases, they consider federal regulatory policy such as per diem car-holding charges, but not any significant role for the state.

Problems of urban goods movement have drawn increasing attention in recent literature; excellent state-of-the-art summaries lead such developments (23, 25, 26). Again, however, these studies have not focused on any planning role for the state. State subsidies for remedial courses of action are occasionally advocated, which would suggest some state-level programming activity. In general, the involvement of states in this

area has been limited to advisory participation in the efforts of urban and regional transportation planning agencies (the New York master plan indicates exceptional initiative in promoting urban goods distribution). The point is that some worthwhile technical methodology has emerged for urban goods movement, but whether such methodology should be incorporated into state planning instead of local and regional planning is open to serious question. Given the general trends recently toward greater self-determination at local levels, it would appear appropriate to have local and regional agencies be responsible for such special planning studies and to limit state involvement to the programming of state or federally channeled funds for such projects.

The problem of rail branch-line abandonment has recently catalyzed, mainly through federal sponsorship, selective studies that assume a supralocal perspective. Two studies of particular note pertain to excess trackage in Iowa: developing analytical methodology appropriate to intermodal regional planning and to intermodal statewide programming. A study by Iowa State University (4), sponsored by the Federal Rail Administration and private interests, applied mathematical programming techniques to determine optimal truck-rail collection of grain for a multicounty region in north-central Iowa. The scope of this physical distribution study also included the consideration of grain-elevator configurations within the region. Earlier work at Iowa State University (49) studied the impact of transportation equipment shortages on grain distribution.

A study just initiated by the University of Iowa (54), sponsored by the U.S. Department of Transportation with the cooperation of local and state agencies, is developing procedures for statewide abandonment programming on the basis of trade-offs between freight service economics and reuse potential. This study focuses mainly on rail branch-line problems, but also is considering the abandonment of local airports and secondary roads. Also, the Iowa Office of Planning and Programming has recently completed an in-house study of 2 rail abandonment proposals (45).

Some states are now in the process of inventorying rail branch lines, particularly since federal legislation (through the Regional Rail Reorganization Act of 1973) specifically provides funds for state-channeled subsidies to continue services that are unprofitable but are beneficial to local economies. Section 402(c) of the act stipulates (56, p. 28), among other provisions, that eligibility for such federal assistance requires that

> .the State has established a state plan for rail transportation and local rail services which is administered or coordinated by a designated State agency and [that] such plan provide for the equitable distribution of such subsidies among State, local, and regional transportation authorities

Such determinations of subsidy requirements may be made by state, local, or regional transportation agencies as long as they follow specified standards of comparative cost analysis. The responses of individual states are unclear at this writing, except that the demanding deadlines of the rail act have set off a flurry of activity. Public hearings currently are under way to solicit responses to the initial reorganization plan (60). For more long-term purposes, the question of local-level planning versus state-level programming arises just as described earlier for problems of urban goods movement. Again, it would appear more appropriate for local and regional agencies to assume responsibility for technical planning methodology and for the state to assume responsibility for statewide project programming.

Having identified these special problem areas, I will concentrate throughout the rest of this paper on statewide systems methodology as defined earlier (premise 2). Again, development of freight-system methodology has been minimal at the state level per se. Moreover, most studies of urban goods movement focus on access elements of intercity transport and, hence, are not directly transferable to the statewide context. Given the embryonic state of the art in this area, much of the following material represents a fresh approach to the problem; it draws on supportive literature (e.g., that pertaining to larger regions) as appropriate.

CONTROL VARIABLES FOR STATEWIDE SYSTEMS ANALYSIS

As mentioned earlier, the instruments typically available at the state level for affecting its freight transportation system include the following:

1. Direct investment in physical facilities for motor carriers and, to a lesser extent, for air and water commerce;
2. Regulatory authority over intrastate commerce via all common carriers in the sense of binary approval-disapproval of individual carrier proposals; and
3. Potential promotional strategies (e.g., subsidies, use of eminent domain powers, and tax credits).

All of these instruments eventually are manifested in terms of the following 6 characteristics of the transportation system: network structure, technology, carrier ownership identity and regulatory status, capacity of facilities, carrier and user costs and rates, and service attributes (e.g., transit time).

As in the established procedures of passenger-oriented urban transportation studies, this kind of systems-analytic approach requires the definition of traffic analysis zones throughout a state (plus external zones as necessary to account for relevant interstate movements). All important state-level courses of action, via any of the aforementioned instruments, would be represented in terms of an abstract network to be superimposed on the system of traffic analysis zones.

Thus, for example, a speed limit of 55 mph for all trucks would be reflected in the transit time value for individual highway links. A rate change for any mode on a given commodity type would be represented in terms of the user cost for the particular origin-destination movements affected. Abandonment of any given line would be reflected analytically by reducing its capacity to zero. A merger of 2 trucking firms would give the 2 carriers the same identity label. These various parameters constitute the control variables within statewide multimodal systems planning and programming for freight transportation.

The level of spatial detail to be used will vary according to the size and development of each state. Freight movements for distances of less than 35 miles are likely to be of more concern to Rhode Island than to Texas. Predominantly rural states will generally involve a relatively longer average haul of shipments and a higher proportion of "bridge" (i.e., through) traffic; this suggests larger analysis zones and less detail in network coding. [The Connecticut Interregional Planning Program defined 15 analysis regions. The Pennsylvania methodological design advocated between 15 and 40 for freight analysis (that state has 67 counties).]

Besides the spatial dimension, the question of time scale for planning and programming requires resolution. This matter is treated in some depth by the preceding paper by Pecknold on passenger methodology; he makes the basic points that capital-intensive investment decisions suggest a long-range planning horizon, yet political realities argue for more short-term responsiveness. The latter factor is especially persuasive in freight planning and programming, for many proposals for system modification emanate from the private sector. Therefore, the appropriate time span for statewide freight planning—in terms of when proposed courses of action should take place—should be perhaps on the order of 5 to 10 years. Ideally, the programming function would be integrated within such a time span, perhaps with annual review and respecification.

RELEVANT EVALUATION CRITERIA

According to the framework set forth in the introductory section of this paper, the process of statewide systems planning and programming calls for analytical methodology that will estimate the relevant effects of proposed courses of action. The control variables identified in the previous section provide for specification of particular courses of action in analytical terms. The next issue logically refers to the definition

of relevant effect variables, or criteria, by which alternative courses of action may be evaluated.

In theory, the identification of relevant evaluation criteria should proceed from a prior definition of goals and objectives (48). In practice such definition at the statewide level has been directed toward passenger transportation if at all existent (35). As for any freight orientation, the following statement of the Connecticut Interregional Planning Program (8, p. 28) is typical:

> Requirements for the movement of goods vary in the same way as needs for the movement of people For some goods, such as fuel, cost is the primary factor and speed is relatively unimportant. On the other hand, components needed to repair a complex piece of factory machinery must arrive quickly in order to reduce costly delays in the production of goods Therefore, the overall goal in planning goods movements is to achieve a system that is efficient and can provide for diverse needs. This requires a variety of modes, a minimum of cost, and sufficient capacity to supply urban and industrial concentrations efficiently.

The New York State master plan for transportation (46, pp. 50-51), which is unique in its integration of regulatory policy into the statewide planning and programming effort, states that policy quite clearly:

> The department's freight transportation policy relies on privately owned and operated common carriers, and utilizes the advantages of competition and private enterprise to define the role of for-hire transportation The allocation of resources among transport markets should depend heavily on competitive market forces to achieve greater economic efficiencies and to lower the total cost of transportation services to the public The department plan calls for modification of economic and safety regulation, modification of taxation of the various modes, and identification of public assistance responsibilities in a comprehensive program to strengthen competition and achieve those development goals which are noneconomic and are not served by the marketplace.

These 2 statements highlight the overriding importance of economic efficiency (i.e., improvement of resource allocation in terms of direct cost-performance characteristics of the transportation system) in statewide freight planning and programming. The New York statement also articulates concern for development goals. Moreover, it is generally agreed (or even self-evident) that the actions of state government must respect environmental concerns, however defined. Also, as observed in an earlier quote from the Regional Rail Reorganization Act of 1973, some sensitivity to the distribution of economic impacts (at least in a spatial sense) is emerging. In summary, for our purposes here the following goal dimensions are of relevance: (a) economic efficiency (overall system cost-performance), (b) statewide economic development, (c) environmental quality, and (d) reasonable equity in the distribution of costs and benefits.

These dimensions suggest a straightforward taxonomy, given below, of relevant effects, which draw pertinent distinctions for guiding methodological design.

Effect	Consequence
Production-related	
Direct	Capital resource commitments
Indirect	Localized externalities (displacement or disruption of socioeconomic and physical activities)
Consumption-related	
Direct	System operating efficiency (system cost performance)
Indirect	System externalities (environmental pollution and development patterns)

Production-related effects refer to consequences that occur by sheer virtue of facility construction (or removal), whereas consumption-related effects refer to "post-ribbon-cutting" consequences (i.e., patterns of system usage or operation and related impacts). Direct effects pertain to characteristics of the transportation system itself,

and indirect effects refer to any impacts on that system's surrounding economic, social, and physical environments.

In these terms, the overriding concern for economic efficiency embraces all direct effects, including all system (capital and operating) costs and the patterns of commodity movements and service levels in a network context. Broadly interpreted (e.g., as in the Action Plan Guidelines promulgated by the U.S. Department of Transportation for state transportation and highway agencies), the concern for environmental quality embraces all production-related localized externalities and use-dependent pollution levels throughout the state. Developmental effects are identified as a separate concern for the effects that actual operating conditions have on the spatial patterns of economic growth (or decline) throughout the state. Distributional considerations may be incorporated not only by spatial analysis throughout this scheme but also by accounting for the major "incident parties" throughout (e.g., shippers, carriers, and the local or statewide community).

This taxonomy suggests a somewhat complex methodological framework, which is shown in Figure 3. The framework consists of analytical models that must be calibrated to data compiled through a base-year inventory. Once calibrated, each of these models addresses respective types of effects as defined above. Capital costs are determined as a function of technological and operating parameters for given facility locations, and production-related externalities (economic, social, and physical disruption or displacement or both) are estimated by superposing facility corridor locations on surveyed data for economic, demographic, and environmental units in such locations.

The more complicated aspects of this framework address patterns of system performance and consumption-related indirect effects. The analysis of system performance requires techniques for estimating goods movement patterns (e.g., by generation, distribution, and modal-split models) and, at least for the motor carrier mode, for determining equilibrium patterns of network utilization (e.g., by assignment models). Environmental externalities such as air and noise pollution are analyzed once a projection of system utilization patterns is accomplished.

A particular complication, not easily understood oftentimes, arises because of the inherent mutual interaction between patterns of economic development, commodity movement patterns, and transportation system attributes. Spatial patterns of economic development must be projected before commodity flows can be analyzed, for the origin-destination characteristics of goods movement depend directly on how traffic-generating activity is distributed over space. However, albeit with some lag of several years or more, the spatial distribution of economic development is itself sensitive to the configuration and service levels of the statewide transportation network. Figure 3 shows the provision for a "small-area activity allocation model," which is rendered sensitive to the attributes specified in any proposed transportation plan and allows for any necessary feedback of equilibrium service levels from network analysis.

No such methodology, in the degree of comprehensiveness presented here, currently exists at the statewide level even for passenger transportation planning and programming. With regard to freight, practically none of these elements has been implemented at the state level beyond the inclusion of truck vehicle flows in statewide highway planning analyses. Clearly all of the elements shown in Figure 3 cannot be developed expediently, but this framework offers a structured perspective from which major thrusts for research can be considered.

The discussions of data requirements and analytical techniques in the next 2 sections focus mainly on the problem of system performance analysis as the matter of utmost importance in methodological development. Attendant consideration is also given to the need for policy-sensitive activity allocation analysis and environmental impact analysis.

DATA REQUIREMENTS

As noted in the introductory section of this paper, the largest impediment to implementation of statewide freight transportation planning and programming is the severe lack

Figure 3. Comprehensive analytical methodology for statewide freight transportation planning and programming.

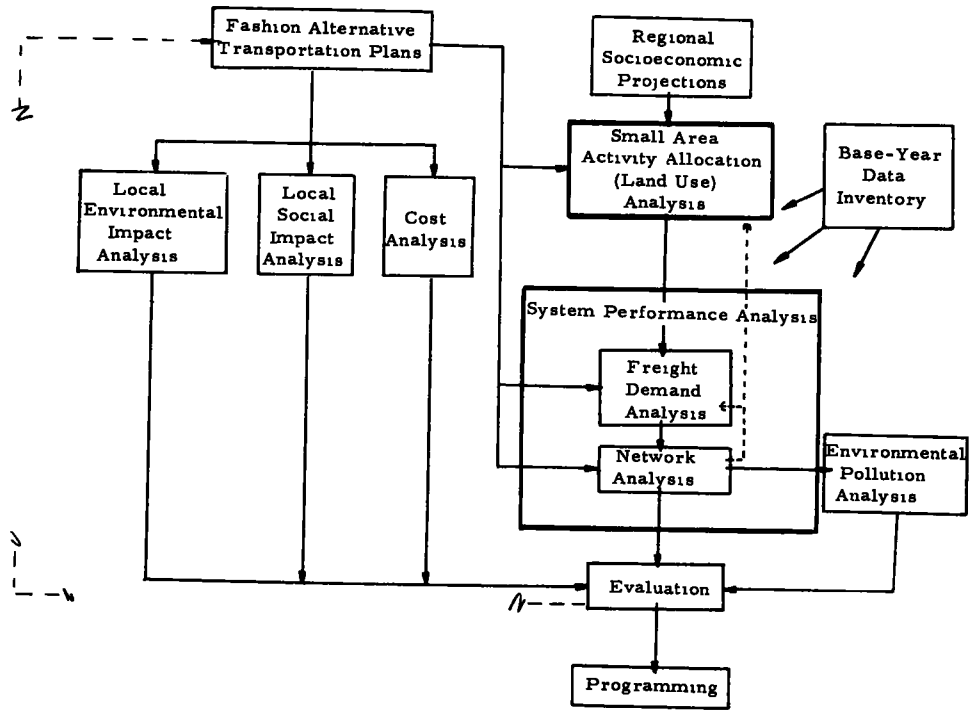


Table 1. Percentage of shippers by rank order of factors influencing mode selection.

Factor	1	2	3	4	5
Availability of equipment	15	19	20	22	24
Freight charges	42	18	16	13	11
Elapsed time in transit	20	33	21	19	7
Freight loss and damage experience	3	6	13	25	53
Dependability of delivery	22	26	29	19	4

Table 2. Percentage of major eastern shippers by factors influencing shift from rail to truck.

Rank	Factor	Percent
1	Faster transit times	24 7
2	Dependable transit times	12 5
3	Convenient frequency	12 5
4	Equipment available when needed	12 1
5	Minimum weights	9 0
6	Lower rates	8 7
7	Specialized equipment	6 5
8	Equipment conditions	4 1
9	Prompt claims handling	3 6
10	Traffic solicitation	2 7
11	Delay notification	2 2
12	Better billing procedure	1 4

of data. The recent NCHRP report on statewide transportation planning (34) stressed this point. That document structured data requirements in terms of 3 categories, which serve as the basis for discussion here: actual goods movements, transportation facilities, and spatial arrangement of human activities and natural resources.

Data on goods movements measure the realized demand for the existing (base-year) transportation system, and a facilities inventory measures the corresponding supply in spatial terms. Information on the spatial distribution of socioeconomic activity and natural resources establishes the traffic-generating capability for different traffic analysis zones, i.e., the ultimate bases for origin-destination demands. From all of this information, forecasting relations may be developed to estimate future patterns of goods movement as a function of zonal activity levels and the attributes of the proposed transportation systems. Zonal measures of socioeconomic activity also are necessary for the calibration of an activity allocation model.

Goods Movement Data

Data on commodity flows represent the dearest information of all for statewide freight transportation planning and programming. Such data preferably would be available in terms of consistent tabulations for origin-destination movements and corresponding link densities for each mode by commodity type.

Most states collect field data on vehicular truck movements for purposes of highway planning. During the mid-1960s, the Connecticut Interregional Planning Program (8) obtained data on motor carrier commodity flows by means of roadside interviews and selective interviews with trucking firms. CIPP also executed a 4-month sample of the New Haven and the Central of Vermont railroads. The information collected included commodity type, origin and destination, number of cars, hundredweight, and character of movement (interstate originated, interstate terminated, local, or bridge traffic). Also, CIPP made noteworthy use of information from the 1963 Census of Transportation to compile aggregate modal flows to and from major regions throughout the nation.

The CIPP experience is unique in that it constitutes the only known effort of a state to collect comprehensive freight flow data for all modes on an origin-destination basis. Some states (e.g., Illinois, Iowa, and Ohio) currently are attempting to compile rail freight density maps for purposes of branch-line abandonment programming. Also, data on origin-destination movements and link densities may be published for selective trunk-line carriers in the evidence and discovery exhibits of particular ICC merger hearings. Otherwise information on freight flows is practically nonexistent beyond the private files of individual carriers and shippers.

NCHRP Synthesis 15 (34) advocated direct surveys of waybills for the various modes, i.e., sampling individual carriers as the ICC used to do in compiling its series of state-to-state rail freight tabulations. That report also noted that the New York transportation department has proposed to conduct a direct survey of shippers, which would permit a more explicit determination of behavioral factors that influence choice of mode, route, and so forth. The methodological design for Pennsylvania proposed a very elaborate survey of shippers to obtain interindustrial flow data for 40 spatial zones and as many as 80 industrial sectors (at an estimated cost approaching $3 million).

It is this author's conviction that the most important research need for statewide freight planning and programming, by far, is to develop feasible strategies for compiling multimodal origin-destination and link density data. NCHRP Synthesis 15 offers basic recommendations on this matter, advocating procedures of waybill sampling through the cooperative efforts of carriers. This direct survey approach (or acquisition of primary data) should not be considered without also giving careful inquiry to the possible acquisition of secondary data via special tabulations (on contract) from the 1963 or 1967 Census of Transportation or both. Prior experiences of this author in compiling commodity flow data for the Northeast Corridor Transportation Project and for a special analysis of the Rock Island merger proposals determined that the U.S. Bureau of the Census would provide special tabulations for subareas within states—at some appreciable compromise of commodity detail—within the constraints of legal dis-

closure restrictions. During the course of the original survey planning, Donald Church gave public notice of this potential service in the following remarks before the 1963 Transportation Research Forum:

> If our publication plans do give the specific detail you need, we shall be pleased to prepare special tables on a reimbursable cost basis, provided (1) the sample is adequate to give useful data on the special subject, (2) the information can be released within the confidentiality rules that apply to data collected by the Census Bureau, and (3) the special work does not unduly interfere with other programs

A major limitation of this source (i.e., the Commodity Transportation Survey) is its restriction to manufactured products; hence, it would be of less value to agricultural states than to more industrialized states.

The thrust of research on this matter should consider all such sources of secondary data integrally with prospects for direct surveys of carriers or shippers or both. Particular attention should be paid to the trade-offs between areal detail and commodity stratification for a given level of expenditure and to the legal disclosure restrictions applicable in each state. Also, any direct survey effort must anticipate considerable difficulty in securing the cooperation of all carriers, especially those private and contract operators that are exempt from regulation. Those who organize and execute efforts to collect flow data should be very alert to potential sources of information within the freight industry (e.g., trade associations). For example, one mode-choice study conducted at Northwestern University (5, p. 63) was able to procure from the Chicago Board of Trade "detailed data on the quantity of freight shipped by truck and rail each month to Chicago from Midwest communities in which grain elevators are located."

Transportation Facility-Service Inventory

NCHRP Synthesis 15 also addressed the need for data on existing transportation facilities or a characterization of system supply. Information on operating services and carrier operating costs are essential ingredients in such an inventory as are strictly physical parameters of facilities. This aspect of data collection is considerably less difficult than the determination of goods movement patterns because confidentiality is not so sensitive an issue.

The information desired in this inventory should encompass all of the facility and service parameters defined in the earlier section on control variables: technology, operator (carrier) identity, operator regulatory status (private, contract, common), facility capacity (vehicular and tonnage), rate structure (and special charges), average operating costs, and service attributes (e.g., transit time). Much of this information is on file in administrative and regulatory agencies, but supplementary field contacts are necessary and quite feasible. An excellent model for all states to follow is provided by the inventory that was conducted for Pennsylvania (65). Also, the experience of the Northeast Corridor Transportation Project in coding freight networks provides valuable guidance (40).

This author's experience in studying patterns of shippers' route choices for transcontinental rail freight service (15) suggests a strong point of caution regarding the determination of service levels. For ascertaining service attributes such as transit time, the obvious strategy is to consult the published schedules of common carriers. Often, however, the actual service levels realized by carriers are substantially different from those advertised in schedules. Some special investigation of the average relation between scheduled and actual performance levels would appear to be warranted in this regard. DeHayes (12) offers guidelines for studying transit time performance of various freight modes.

Spatial Activity Data

Information on the spatial distribution of socioeconomic activity represents the least cumbersome aspect of data collection. Sources such as County Business Patterns, the Census of Manufactures, and the Census of Agriculture may be consulted to ascertain measures of economic activity (in terms of employment if not actual output levels) for reasonably coarse analysis zones, e.g., no smaller than the county. Data on land use, which are of less relevance to freight than to passenger analysis except for data on mineral resources, may be compiled from county records although tacky problems of incompatible use classifications should be anticipated. (Pressures are mounting in Congress for a national land use policy that would involve systematic statewide land use inventories.) Time-series data on activity levels should be abstracted from the aforementioned sources if an activity allocation model is to be developed, for temporal lags often need to be built into such analyses of locational responses to transportation system improvements. Control-total projections of future socioeconomic activity for individual states and multicounty areas are provided by the Bureau of Economic Analysis within the U.S. Department of Commerce (57) and the National Planning Association (36).

Time-Series Monitoring Versus Base-Year Data Collection

Compilation of base-year data for statewide freight transportation planning and programming is a task of substantial proportions. Yet the needs for relatively continual updating of that data base are well known and would appear to be especially important in the freight context since the private sector is responsible for so many decisions. Let it suffice here to state that any state-level effort to assemble base-year data should be designed to maintain organizational arrangements for contacts with individual carriers, at least, so that updating may be accomplished feasibly. For this purpose full consideration should be given to the use of highway traffic counts, tallies of applications to regulatory bodies, annual national statistics (prepared by federal agencies and by carrier trade associations), and even emerging remote-sensing technology.

ANALYTICAL TECHNIQUES

The overriding priority in development of analytical techniques for statewide freight planning and programming is the matter of system performance analysis, especially the estimation of commodity flow patterns. This section discusses major issues regarding analytical techniques for estimating system performance and related impacts.

According to established modeling taxonomy within the realm of (passenger-oriented) urban and regional transportation planning, the analysis of system performance translates a projected spatial distribution of socioeconomic activity into an estimated spatial pattern of origin-destination flows by mode (commonly referred to as demand analysis) and then assigns these flows to specific links as appropriate. Indirect impacts (e.g., those on socioeconomic development and environmental quality) are then analyzed as a function of system performance levels. Approaching the context of statewide freight analysis from this familiar perspective, the following methodological issues emerge as major concerns:

1. User versus operator behavior,
2. Aggregate versus disaggregate analysis,
3. Sequential versus direct demand analysis,
4. Specification of relevant service variables,
5. Relevance of network analysis,
6. Activity allocation analysis, and
7. Environmental impact analysis.

Obviously a host of more detailed issues could be identified, but the perspective here

must be more fundamental (e.g., the relative merits of gravity and opportunity models could be debated again for freight traffic distribution). The following discussion elaborates on each of these major issues, cites pertinent past work as appropriate, and suggests tentative positions on each.

User Versus Operator Behavior

Within the established contexts of urban and regional transportation planning, most operators typically are under direct public control. The planning process under such circumstances can propose fare levels and be reasonably certain that public operating authorities will follow suit with such prescriptions. In the context of statewide freight, however, the lack of direct governmental control precludes such prescriptive certainty. For example, if a public utility commission grants a rate increase to regulated carriers for one mode in a given region, competitive market forces may act to change the rate structures of private (unregulated) carriers. This phenomenon may not be especially crucial under current conditions, but may become very important if, for example, the relaxation of regulatory controls as advocated by the New York plan should be realized. It raises a basic technical issue of whether models of carrier rate-setting behavior might become necessary for a proper analysis of system performance.

In other words, if origin-destination movements are to be estimated as a function of the rates charged to shippers, then the competitive rate-setting behavior of carriers would have to be predicted first. Obviously the interaction here between traffic volumes and free rate structures is simultaneous, and the question opens a can of worms that stirs uncomfortable fantasies of a general equilibrium model! A variety of single-carrier optimization models exist, but are quite expensive beasts to operate. [Representative literature in single-carrier optimization is reviewed by Drake (15, ch. 5).] For the purposes of statewide planning and programming, such models of competitive rate-setting behavior would be prohibitive.

Rather, this complication may be incorporated in an approximate way by developing carrier operating cost relations and, in turn, translating these costs into predicted rates (where necessary) as a function of the particular regulatory policy to be executed for rate-setting (e.g., value-of-service, marginal cost). [The literature on freight transport economics is replete with studies of regulated rate structures (13, 18, 21, 22, 33, 38, 43, 64).] Straightforward regression analysis should suffice for this purpose, e.g., using length of haul, average size of shipment, and average operating speed as determining variables. Such analysis should take particular care to incorporate sensitivity of carrier costs, and shipper rates by implication, to the prices and possible rationing of fuel inputs. Continual updating, obviously, seems highly desirable here.

The classical work in developing empirical cost functions for different freight modes, within a consistent framework, is that of Meyer et al. in 1959. Since than a number of cost analyses have appeared for individual modes, especially for rail freight, but it remains almost impossible to synthesize the results of these mode-specific studies into comparative terms.

A very important contribution to the literature on passenger cost analysis, which not only achieved this virtue of consistency but also defined output multidimensionally so as not to deny different technologies their inherent advantages, was developed by Morlok (32). It would seem well worth pursuing the adaptation of Morlok's methodology to the freight context.

Aggregate Versus Disaggregate Analysis

One of the strongest contentions about demand analysis that has emerged from recent reflections on urban transportation planning is the argument for disaggregate analysis. Basically, the argument is one of statistical validity and parsimony in developing travel demand models, although the approach lends itself quite appealingly to the consideration

of door-to-door service attributes and behavioral attributes of the individual household.

The statistical argument is quite compelling in that it cites the relative amount of variation of household trip-making behavior, which is virtually ignored by zonal-level analysis. Aggregate zonal analysis develops statistical relations based only on observed variation between zones, whereas it has been shown that within-zone variation can be as high as 80 percent of the total variation (17). Demand relations that are developed at the household level (and then aggregated to the zonal level) address all inherent variation and, therefore, offer more promise of temporally stable parameters. This argument is reinforced by the ability to consider behavioral factors, and the transferability of results from one study area to another is alleged to be comparatively high. The main problem in applying such techniques (aside from some computational complexity in the modal-split operation) is that the future values of behavioral variables are difficult to specify.

Although this author personally is inclined to favor the disaggregate approach in urban transportation contexts, the argument appears less compelling for statewide freight analysis. First (and perhaps of equal relevance to statewide passenger analysis), the statistical argument for disaggregate analysis arises from empirical circumstances in which urban traffic zones have been highly heterogeneous in composition; chances seem reasonable that this heterogeneity problem would be less serious for statewide analysis zones, at least in the more rural states. (Clearly this issue commands preliminary research into zone definitions and studies of relative variation before any large-scale commitment to the disaggregate approach is endorsed.) Second, in the case of freight one may expect to encounter stiff resistance by shippers (the individual behavioral unit in this context) to disclosure of behavioral information.

In any event, a disaggregate approach to statewide freight analysis would not be a venture totally lacking in theoretical foundation. Lave (28) has set forth a basic microeconomic framework for transportation demand analysis. In its initial work on freight modal split for the Northeast Corridor Transportation Project, Mathematica (30) developed microeconomic models of shipper mode choice in terms of the individual firm, including optimization of trade-offs between stationary and in-transit inventory costs. Later research by the same consultant (30) reformulated this inventory-theoretic model into an approach that, using complex nonlinear estimation procedures, could be calibrated to aggregate data (taken from the Production Area Series of the Commodity Transportation Survey by the U.S. Bureau of the Census). Also, the work of Beuthe and Moses (5) developed a behavioral model that examined time and cost trade-offs in reference to the firm's production function. These sources constitute valuable points of departure for exploring the application of disaggregate behavioral models to freight analysis.

Sequential Versus Direct Demand Analysis

Apart from the aggregate versus disaggregate issue, there remains a question of whether to develop a sequential set of models as in urban transportation methodology (generation, distribution, and modal split) or to integrate these elements into one direct model form. Actual implementation of either approach at the statewide level has been limited to the Connecticut experience (8) which used a trip distribution model. The methodological design for Pennsylvania proposed to integrate the generation and distribution of freight movements within an elaborate interindustrial econometric model and to subsequently analyze modal split according to abstract-mode concepts (27).

The arguments for and against either the sequential or the direct approach have already been articulated at some length for passenger-oriented analysis (44) and are reviewed to some extent in the preceding paper by Pecknold on passenger methodology. The sequential approach is relatively cumbersome to execute but—as long as internal consistency among service variables is maintained (67), including transport-sensitivity in generation analysis—is generally accepted as forthright. The direct abstract-mode approach (30) has the advantages of not requiring such an exhaustive data set, allowing

the introduction of new technology, and rendering total demand sensitive to the range of alternative modes available for shipping. Also, it permits straightforward interpretation of own and cross elasticities (constant parameters in the usual loglinear form).

The bulk of the literature on freight-flow forecasting generally consists of simple models that correspond to the generation or modal-split operations. Such techniques include straightforward trend analysis (51), empirical studies of price (rate) elasticities (41), and identification of modal shares (usually as a graphical function of distance and size of shipment) from data obtained in the U.S. transportation censuses (7, 47). Although these studies are of interest in their revelation of national trends, they generally have considered little if any spatial detail.

With regard to spatial models, although the direct approach has been applied in selective intercity passenger contexts, applications to freight seem to have been shelved in favor of one or more elements of the sequential approach. Again, the Northeast Corridor Transportation Project stands out as the main contribution here, through the efforts of CONSAD Research Corporation (10) and Mathematica (30). CONSAD developed origin-generation and destination-generation models and a gravity distribution model for 40 superdistricts in the Boston-Washington corridor. Employment variables were used in the generation regressions; the largest methodological issue was to determine an appropriate association between commodity classes and relevant receiving sectors in destination generation.

Sensitivity to network impedances was incorporated only in the gravity model; truck transit time was used. This use of a single mode's attribute—and only one attribute at that (as opposed to inclusion of rates and perhaps other service variables)—typifies the problem of internal consistency mentioned earlier. Composite impedance measures ideally would be used in all models of the complete sequence. The CONSAD study devoted considerable effort to developing composite impedance measures (friction factors) as a function of truck and rail time and cost, but statistical fits were modest ($r^2 = 0.5$). These results may have reflected the difficulties in ascertaining actual versus scheduled transit times for common carriers.

Again under sponsorship of the Northeast Corridor Transportation Project, Mathematica developed a multistaged approach to freight forecasting that was akin to the sequential strategy discussed above. This approach began with spatial trend projections of national commodity outputs as a function of national economic growth indexes, allocated these national tonnage estimates to origin-generation and destination-generation volumes for individual "production areas" as a function of various local economic indexes, allocated these results to interareal flows by using multiple linear regression (including distance and transit time measures for network sensitivity), and allocated these interareal flows to individual modes by using an abstract-commodity model.

> A commodity being shipped by different modes of transportation can be described abstractly in terms of certain transportation characteristics [e g , weight, haul, value per ton, perishability, and rate] The main advantage of this abstract commodity approach is that it enables us to determine the choice of mode for nonexistent future commodities or commodity groups that follow any grouping scheme

Thus, just as the abstract-mode concept interpreted technological options for transport, this approach characterized commodities not in terms of sheer nominal identity but rather in terms of their intrinsic attributes. Modal shares were determined by developing linear regression relations as a function of weight and distance class intervals of commodities. The results exhibited some inconsistencies in the signs of certain coefficients, perhaps because specific modal attributes were not considered. Nevertheless, the abstract-commodity concept, possibly combined with the abstract-mode concept, is intuitively appealing and should be seriously considered in statewide methodological development.

These experiences provide valuable benchmarks for developing statewide freight demand models, although the relative promise of the direct versus the sequential ap-

proach is not immediately apparent. For sheer efficiency in technical analysis, it would be desirable to use the same model structures for both passenger and freight; the direct versus sequential issue should be addressed from this pragmatic perspective.

Specification of Relevant Service Variables

Regardless of the overall modeling approach, it is of obvious concern to identify the various measures of freight service to which shippers are generally sensitive. Models that use distance only are clearly inadequate. Rate and transit time are obviously important, although the point bears repeating that actual times are preferred to scheduled times in modeling.

Three sources in the literature offer some valuable guidance in this matter. In developing his inventory-theoretic model of mode choice, Baumol (30) proposed the following attributes that reflect the role of inventory considerations: (a) shipping cost per unit (including freight rate, insurance); (b) mean shipping time; (c) variance in shipping time; and (d) carrying cost per unit of time while in transit (interest on capital, pilferage, deterioration). Baumol elaborated on these measures in terms of their respective theoretical contributions to total costs of the firm. Allen (2) elaborated, in theoretical and empirical terms, on the conditional influence of loss and damage upon demand.

Woods and Domencich (68) present a quite valuable treatment of rail-truck service differentials for selected measures. They summarize the results of 2 shipper surveys conducted during the early 1960s. These results, given in Tables 1 (37) and 2 (53), indicate those attributes that influence modal choice most significantly.

This author's study of transcontinental rail-freight route choice (15) revealed the importance of certain fixed-network measures to shipper decisions in multicarrier routing contexts. For longer hauls with a variety of routing options, the number of carriers involved (presumably as an index of loss and damage likelihood) was found to be a sensitive consideration. Also, limited microscopic analysis of individual carload data identified the captive influence on routing decisions of single-carrier access at ultimate origin or destination (especially the latter), i.e., a condition of carrier access monopoly. The same persuasion could apply, obviously, to mode choice. Finally, in multicarrier routings it generally is in the shipper's interest to maximize the haul of the originating carrier, for that carrier's division of revenue for a shipment is directly related to its participation in any route.

These observations are offered as food for thought. Obviously any advocacy of specific service measures must consider feasibility of data collection, as discussed earlier.

Relevance of Network Analysis

Given the estimation of origin-destination commodity flows by mode, there remains the question of whether more detailed network analysis is necessary and what its character should be. Elaborate traffic assignment models have been developed for urban transportation analysis, including capacity-restraint features that account for facility congestion and serve to bring the entire system of forecasting models into equilibrium.

Clearly some form of network analysis—perhaps merely a straightforward minimum-path algorithm—is essential to statewide freight planning and especially programming in order to translate origin-destination flows into likely loadings of individual facilities. Obviously such an operation for motor carrier movements could be integrated with passenger assignment analysis. At this point the author would simply like to question whether capacity restraint—which greatly complicates the procedures of network analysis—is at all essential for other freight modes. Certainly the line-haul capacity of rail and water facilities is substantially in excess of likely flows. Some congestion may be significant at terminals, but for our purposes it may be quite valid merely to use edu-

cated estimates of actual processing times in developing impedance measures for demand analysis. Otherwise, we must open a can of worms that invites complicated techniques of network simulation. [Guidelines for such an undertaking are provided by the preliminary investigations of the National Bureau of Standards into the feasibility of freight network simulation for the Northeast Corridor Transportation Project (14).] Again, this question should be considered integrally with the parallel issue in passenger methodology.

Activity Allocation Analysis

The development of a model for statewide activity allocation analysis should be given serious consideration to avert the problem of underestimating the effects of induced development on corridor flow patterns (for both freight and passenger analysis). The purpose of such a model would be to estimate the spatial distribution (i.e., values for the various analysis zones) of socioeconomic activity as a function of transportation network attributes.

The state of the art in this area is reasonably well developed (though infrequently integrated into agency study frameworks) for urban contexts (3, 24), but initiative at the state level has been very limited. The New York State Department of Public Works sponsored the development in the mid-1960s of a direct allocation model that adapted concepts of opportunity-accessibility from urban analysis, but the model was designed for regional application within the state. The California and Pennsylvania study designs cited earlier proposed quite elaborate interindustry econometric models, but these approaches are extremely demanding of data; hence, implementation efforts have not yet emerged and are not likely to for some time. The one case in which a transport-sensitive activity allocation model was developed and implemented for statewide analysis was sponsored by the Connecticut Interregional Planning Program (1).

This approach utilized techniques of shift-share analysis to allocate projected statewide economic growth to individual towns as a function of each town's relative accessibility to such activities as employment centers. The model included 2 policy-determined capacity constraints for each town, namely holding capacities for manufacturing employment and additional population. (Note the value here of accounting for "exogenous" policies on patterns of statewide development.) Its analytical structure consisted of 9 interdependent equations, 6 of which determined areal employment levels for various industrial sectors and 3 of which determined areal population levels for graded incomes.

In contrast to the more elaborate approaches that integrate interregional commerce with interindustrial input-output techniques (9, 29, 42), this more modest approach seems to offer an appealing precedent for first-order approximations. Its adaptation (or the adaptation of any urban accessibility model) to states larger than Connecticut, however, must reconsider 2 basic aspects of methodological design. First, for larger states (with larger analysis zones), activities with smaller supply-market areas may face locational decisions that constitute an essentially intrazonal search; hence, interzonal accessibility would not be a relevant determinant for these categories of industry. Second, activities with larger supply-market areas (e.g., those heavier industries that are treated exogenously as unique locators in urban models) may warrant endogenous analysis since their locational decisions may consider various areas within a state. A corollary of both points is that accessibility calculations—heretofore based on passenger network impedances in models for smaller study regions—should be based more on measures of freight network service. Third, regardless of a state's size, the design of such a model should allow for a lag effect between the response of industrial development and the stimulus of transportation network improvements.

Environmental Impact Analysis

Environmental impacts are of obvious importance to statewide transportation planning for both passenger and freight systems. Process guidelines for consideration of such

impacts have been drafted, according to FHWA directives, in the form of state action plans. Although these procedures (to be fully implemented in November 1974) are highway-oriented and remain in need of complementary analytical methodology, they address issues that are equally germane to various freight modes in many respects. It, therefore, would appear advisable to consider analytical methodology for environmental impact analysis in a manner that embraces passenger and freight systems integrally.

A distinction was drawn earlier between production-related and consumption-related impacts. Environmental effects follow this dichotomy well in that localized displacement or disruption impacts are associated with facility construction and various forms of pollution are associated with facility use. Proposals for new facilities (with the exception of terminal facilities) are not so prevalent in freight as in passenger contexts; indeed, proposals for facility abandonment are perhaps more frequent. In this sense, the production-related impact of various courses of action in freight may actually be beneficial, e.g., releasing land to other uses such as recreation. The current study of reuse potential for transportation property abandonments cited earlier (54) provides a good example of this interpretation.

Of course, many proposals for freight system modification would affect operating patterns and, hence, would suggest analysis of contributions to air and noise pollution. Emission rates for trucks for both types of pollution have been estimated in conjunction with highway-related studies (35). For rail locomotive units, the Environmental Protection Agency has developed average emission rates for noise (61) and for various forms of air pollution (62). Guidelines for determining modal energy consumption as a function of modal traffic volumes have been advanced by Tihansky (50).

The technical capability outlined above can be quite useful for comparative analysis of different modes for individual corridors. Given the emerging character of proenvironmental court actions, we should anticipate the need to prepare environmental impact statements for entire statewide systems instead of individual route sections.

HIGHLIGHTS OF MAJOR ISSUES

Workshop 3B was charged with the responsibility to consider the state of the art, recommend potential improvements, and develop a program of research in needed methodology for statewide multimodal transportation planning. In the case of freight transportation, the embryonic nature of the state of the art has placed an open-ended spectrum of issues before us. Emphasis must lie on specifying the potential state of the art and drawing on a dispersed body of literature that generally has focused on contexts other than the state level per se.

As identified throughout this paper, the major issues that appear to merit discussion in defining such potential fall into 3 general areas: (a) the scope and character of statewide freight systems planning and programming, (b) information systems requirements, and (c) analytical methodology. Points of primary concern within each of these 3 areas are recapitulated below.

Scope and Character

1. What constitutes the appropriate hierarchical structure of state-level planning and programming responsibility (e.g., how much should the state be concerned with methodology for urban goods movement and rail branch-line abandonment)?
2. What degree of spatial detail and system representation is appropriate to different hierarchical levels and functions?
3. Considering the key role of the private sector in initiating proposed courses of action, what is an appropriate temporal horizon in freight planning and programming?

Information Systems Requirements

4. What specificity—in kind (i.e., spatial, commodity, shipper, or consignee) and in degree of stratification—is necessary for useful commodity flow data (e.g., what types of problems require or do not require origin-destination data)?
5. What are the economic trade-offs between primary and secondary data sources and between spatial and commodity detail for each such source?
6. What constraints might formal disclosure restrictions or the guardedness of individual carriers and shippers place on primary data collection efforts? On secondary data collection efforts?
7. What are the differences between actual service levels and the service levels published in carrier schedules? Are published measures adequate for systems planning and programming purposes?

Analytical Methodology

8. Given the absence of direct control over freight carriers (yet the intractability of single-carrier optimization models for most large-scale networks), to what extent must the laissez-faire rate-making behavior of competitive carriers be modeled in a predictive sense?
9. How might we develop operating cost relations that are consistent among all modes and that are sensitive to fuel-input prices? How might we develop the capability to translate such operating cost information into shipper costs as a function of rate policy?
10. Even though it has statistical virtues, is a disaggregate approach to freight demand analysis warranted (in terms of zonal heterogeneity) or feasible in terms of disclosure restrictions?
11. Are sequential constructs for modeling freight demand cost-effective in the statewide context? Is it essential to separate captive from choice market phenomena in this endeavor?
12. What are the best attribute measures by which to characterize the service levels of freight transportation in terms of shipper sensitivity?
13. Considering the excess line-haul capacity available for some modes, to what extent is capacity-restrained network analysis necessary for statewide freight planning and programming? To what extent is even a free assignment analysis necessary?
14. How should statewide activity allocation models differ from their urban counterparts in terms of endogenous industrial classification, incorporation of natural resource endowments, sensitivity to developmental policy, role of the freight system in determining industrial accessibility, and time lags in the response of industrial growth to network improvements?
15. What shall be the methodological character of multimodal, statewide systems analyses of environmental impacts, given that emerging court actions are pointing toward such a requirement?

REFERENCES

1. A Model for Allocating Economic Activities Into Sub-Areas in a State. Alan M. Voorhees and Associates, May 1966.
2. Allen, W. B. The Impact of Transport Loss and Damage on Transportation Demand. Transportation Research Forum, Vol. 14, No. 1, 1973, pp. 605-615.
3. Journal of the American Institute of Planners, Vol. 31, March 1965.
4. Baumel, C. P., et al. An Economic Analysis of Alternative Grain Transportation Systems: A Case Study. Iowa State Univ., Ames, Nov. 1973; NTIS, Springfield, Va., PB 224 819.
5. Beuthe, M. V., and Moses, L. N. The Demand for Freight Transportation: The Influence of Time. In Transportation: A Service, New York Academy of Sciences,

New York, 1968, pp. 61-66.
6. Methodological Framework for Comprehensive Transportation Planning. Carnegie-Mellon University and Pennsylvania State University, 1968.
7. Church, D. E. Highway Share of Intercity Shipments by Manufacturers in the United States. Traffic Quarterly, Vol. 25, No. 1, Jan. 1971, pp. 5-16.
8. Choices for Action: Transportation. Connecticut Interregional Planning Program, Hartford, 1966.
9. Impact Studies: Northeast Corridor Transportation Project. CONSAD Research Corp., Pittsburgh, Vol. 2, Jan. 1968.
10. Development of a Mathematical Model for Forecasting Freight Flows in the Northeast Corridor. CONSAD Research Corp., Pittsburgh, Feb. 1969.
11. Creighton, R. L., and Hamburg, J. R. Current State of the Art in Statewide Transportation Planning. Highway Research Record 401, 1972, pp. 21-27.
12. DeHayes, D. W., Jr. The General Nature of Transit Time Performance for Selected Transportation Modes in the Movement of Freight. Ohio State Univ., Columbus, PhD dissertation, 1968.
13. DeJarnette, K. R. Regulatory Policy and Decisions Relating to Rail Contract Rates. Transportation Journal, Vol. 13, No. 2, Winter 1973, pp. 5-26.
14. Donaldson, J. L. NBS Freight Simulation: Initial Considerations. Technical Analysis Division, National Bureau of Standards, Gaithersburg, Md., March 1967.
15. Drake, J. S. Rail Merger Evaluation and Rail Freight Route Choice: A Study in Quantitative Impact Analysis. Northwestern Univ., Evanston, Ill., PhD dissertation, 1972.
16. Dueker, K. J. Transportation Statistics: Households and Commodities. Department of Civil Engineering, Univ. of Wisconsin—Madison, Res. Rept. 3, 1969.
17. Fleet, C. R., and Robertson, S. R. Trip Generation in the Transportation Planning Process. Highway Research Record 240, 1968, pp. 11-31.
18. Friedlaender, A. F. The Dilemma of Freight Transport Regulation. Brookings Institution, Washington, D.C., 1969
19. Gallamore, R. E. Railroad Mergers: Costs, Competition, and the Future Organization of the American Railroad Industry. Harvard Univ., Cambridge, PhD dissertation, 1968.
20. Hazen, P. I. A Comparative Analysis of Statewide Transportation Studies. Highway Research Record 401, 1972, pp. 39-54.
21. Healy, K. T. The Effects of Scale in the Railroad Industry. Committee on Transportation, Yale Univ., New Haven, 1961.
22. Healy, K. T. The Bases of Future Intercity Freight Transport. Transportation Research Forum, Vol. 12, No. 1, 1971, pp. 239-250.
23. Hedges, C. A. Urban Goods Movement: An Overview. Transportation Research Forum, Vol. 12, No. 1, 1971, pp. 169-197.
24. Urban Development Models. HRB Spec. Rept. 97, 1968.
25. Urban Commodity Flow. HRB Spec. Rept. 120, 1971.
26. Hille, S. J. Urban Goods Movement Research—A Proposed Approach. Traffic Quarterly, Vol. 25, No. 1, Jan. 1971, pp. 25-38.
27. Hoel, L. A., and Sauerlender, O. H. Statewide Comprehensive Transportation Planning. Highway Research Record 401, 1972, pp. 10-20.
28. Lave, L. B. A Model of the Demand for Transportation. Northwestern Univ. Press, Evanston, Ill., Nov. 1965.
29. Martin, B. V. A Model for the Evaluation of Transport Alternatives. Harvard Transportation and Economic Development Seminar, Cambridge, Discussion Paper 1, July 1964.
30. Studies on the Demand for Freight Transportation. Mathematica, Inc., Princeton, N.J., Vol. 1, 1967; Vols. 2 and 3, 1969.
31. McKean, R. N. Public Spending. McGraw-Hill, New York, 1968.
32. Morlok, E. K. An Analysis of Transport Technology and Network Structure. Northwestern Univ. Press, Evanston, Ill., 1968.
33. Morton, A Competition in the Intercity Freight Market. A Waybill Study of the Motor-Carrier Industry. NTIS, Springfield, Va., 1971.

34. Statewide Transportation Planning: Needs and Requirements. NCHRP Synthesis 15, 1972.
35. Procedures for Estimating Highway User Costs, Air Pollution, and Noise Effects. NCHRP Rept. 133, 1972.
36. Economic and Demographic Projections for States and Metropolitan Areas. National Planning Association, Center for Economic Projections, Washington, D.C., Jan. 1969.
37. Summary of Shipper's Questionnaire Survey. National Transportation Research Project, Washington, D.C., 1966.
38. Nelson, J. C. Railroad Transportation and Public Policy. Brookings Institution, Washington, D.C., 1959.
39. California Integrated Transportation Study. North American Aviation, Inc., Los Angeles, 1965.
40. Freight and Commodity Networks: Northeast Corridor Transportation Project. Peat, Marwick, Livingston and Company, Boston, July 1968.
41. Perle, E. D. The Demand for Transportation: Regional and Commodity Studies in the United States. Department of Geography, Univ. of Chicago, Research Paper 95, 1964.
42. Polenske, K. R. Empirical Implementation of a Multiregional Input-Output Gravity Trade Model. Paper presented at the Fourth International Conference on Input-Output Techniques, Geneva, Jan. 1968.
43. Roberts, M. J. Transport Costs, Pricing, and Regulation. In Transportation Economics: A Conference of the Universities, National Bureau Committee for Economic Research, New York, 1965, pp. 3-37.
44. Ruiter, E. R. Analytical Structures. HRB Spec. Rept. 143, 1973, pp. 178-205.
45. Economic Impacts of Railroad Abandonment in Iowa: A Case Study. Iowa Office of Planning and Programming, Des Moines, March 1973.
46. Statewide Master Plan for Transportation. New York Department of Transportation, Albany, April 1973.
47. Surti, V. H., and Ebrahimi, A. Modal Split of Freight Traffic. Traffic Quarterly, Vol. 26, No. 4, Oct. 1972, pp. 575-588.
48. Thomas, E. N., and Schofer, J. L. Strategies for the Evaluation of Alternative Transportation Plans. NCHRP Rept. 96, 1970.
49. Thompson, W. H., and Baumel, C. P. Impact of Transportation Equipment Shortages on Iowa Country Elevators. Transportation Journal, Vol. 12, No. 1, Fall 1972, pp. 50-57.
50. Tihansky, D. P. Predicting Total Energy Requirements of Freight Transport in the United States. Transportation Research Forum, Vol. 14, No. 1, 1973, pp. 717-736.
51. Tihansky, D. P. Trends in Rail Freight Transport. Traffic Quarterly, Vol. 28, No. 1, Jan. 1974, pp. 101-118.
52. Transportation Policy Research, 6th Ed. Transportation Association of America, Washington, D.C., July 1969.
53. The Freight Potential of the New York, New Haven and Hartford Railroad. 1965-1970. United Research, Inc., Cambridge, 1962.
54. Re-Use Planning of Transportation Property Abandonments. Institute of Urban and Regional Research, Univ. of Iowa, Jan. 1974.
55. Guidelines Relating to the Economic, Social, and Environmental Effects of Highway Projects. 92nd Congress, 2nd Session, Rept. 92-45, U.S. Govt. Printing Office, Aug. 1972.
56. Regional Rail Reorganization Act of 1973: Conference Report. 93rd Congress, 1st Session, Rept. 93-744, U.S. Govt. Printing Office, Dec. 1973.
57. OBERS Projections· Regional Economic Activity in the U.S. Bureau of Economic Analysis, U.S. Department of Commerce, 1972.
58. 1972 National Transportation Report: Present Status—Future Alternatives. Office of the Secretary of Transportation, Executive Summary, July 1972.
59. Statewide Travel Demand Forecasting. Federal Highway Administration, Transmittal 147, Vol. 20, App. 59, Nov. 1973.

60. Rail Service in the Midwest and Northeast Region. Office of the Secretary of Transportation, Feb. 1974.
61. Transportation Noise and Noise From Equipment Powered by Internal Combustion Engines. U.S. Environmental Protection Agency, Dec. 1971.
62. Exhaust Emissions From Uncontrolled Vehicles and Related Equipment Using Internal Combustion Engines. U.S. Environmental Protection Agency, Pt. 1, Oct. 1972.
63. Volotta, A. Pennsylvania Transportation Regulation: A Comparison and Evaluation. Transportation and Traffic Safety Center, Pennsylvania State Univ. Aug. 1967.
64. Wallace, W. H. The Future of Railroad Freight Transportation in the United States. Annual Meeting of Association of American Geographers, Atlanta, April 1973.
65. Inventory and Adequacy of Existing Statewide Transportation Systems: Commonwealth of Pennsylvania. Wilbur Smith and Associates, New Haven, 1968.
66. Wilson, A. G. Travel Demand Forecasting: Achievements and Problems. HRB Spec. Rept. 143, 1973, pp. 283-306.
67. Wilson, W. H. Statewide Intermodal Transportation Planning in the Less Urbanized State. Highway Research Record 401, 1972, pp. 6-9.
68. Woods, D. W., and Domencich, T. A. Competition Between Rail and Truck in Intercity Freight Transportation. Transportation Research Forum, Vol. 12, No. 1, 1971, pp. 257-288.

Discussion of Resource Paper

Thomas E. Lisco, Illinois Department of Transportation

Drake has thoroughly and capably presented the existing state of the art of statewide freight systems planning methodology. He indicates that the state does have a role in freight movement, particularly with respect to investment in freight-serving facilities, tax and subsidy programs, regulation, and research and development. Thus, there is a need for adequate freight system planning capabilities at the state level.

Our capability to address these questions, however, is undeveloped in almost every respect. We have few data on freight flows at the state level, almost no information on the spatial distribution of freight-producing activities, no inventory of the supply of state freight systems, no developed capacity to simulate state freight movement, and little understanding of the costs and benefits to freight movement of alternative state transportation plans, programs, and policies. In short, we have grossly inadequate knowledge of the freight phenomenon at the state level and, consequently, a similarly inadequate capability to address the critical state freight planning questions that confront us.

Drake identifies the critical elements of statewide freight planning that must be developed. Most particularly, he identifies the following needs:

1. Compilation of basic data on goods movements, freight transportation facilities, and spatial arrangement of freight producers and consumers;
2. Development of capability to simulate freight movements, particularly intermodal trade-offs and activity allocation;
3. Development, application, and evaluation of different analytical techniques; and
4. Empirical investigation of critical freight questions such as investments in alternative freight-serving modes, potential rail branch-line abandonments, subsidies, taxation and regulations of competing modes, investments in freight distribution systems, and rationalization of freight-producing activity locations.

None of these unmet needs is simply an adjunct to an already well-developed analytical and planning capability; all of them are fundamental necessities for the responsible investigation of statewide freight questions.

Although Drake's paper is admirable and comprehensive in all the above respects, there is one area of concern and that is freight movement simulation. Although the paper does not make any positive statement on the subject, it leaves the reader with the impression that the necessity for addressing state freight planning questions can be met adequately if a sufficiently comprehensive simultaneous multimodal, multicommodity freight simulation capability can be developed covering the entire state. In essence, this would be to extend the simulation method originally developed for urban freeway planning to the state freight question.

The reason that this is perceived as a problem is not that Drake has made such proposals but that he does not explicitly reject them. This, in turn, is a problem because a pervasive tendency in the urban transportation planning field has been exactly to try to use and extend regional travel simulation technology to all transportation planning applications regardless of geographical scope or analytical applicability. The transportation planning tool that was developed to plan urban freeway systems—a job for which it was admirably suited—is being extended, detailed, and misused in all sorts of applications for which it is entirely inappropriate. The unfortunate assumption has been, at least implicitly, that one grand simultaneous computer simulation model can solve all transportation planning questions if it is sufficiently comprehensive and has enough variables in it. The result has been the continued development of a more and more complicated, time-consuming, and expensive process that is completely unresponsive to our needs and often gives misleading and incorrect answers. We know more and more about our transportation planning technology but less about the travel phenomenon; meanwhile, critical transportation planning questions remain unaddressed and unresolved.

The reason for the above disastrous turn of events in urban transportation planning appears to have been at least in part the federal requirements for developing comprehensive intermodal urban transportation plans. It would seem logical to assume that the ideal comprehensive intermodal plan would be the result of a conceptually and methodologically consistent process and that a natural way of doing this would be to use one tool throughout. The only problem is that it does not work. The transportation phenomenon is too complex for us to try to simulate simultaneously all of its many aspects, and the attempt simply breaks down.

Because of the nature of the phenomenon, a far more cost-effective approach is to address transportation planning problems as problems and then synthesize the results rather than try to synthesize the system and then address the problems. Generally, when the problem-solving approach is used, parallelism in methods and results is usually found, and the resultant plans developed are not only consistent, intermodal, and comprehensive but also realistic and practical.

A difficulty similar to that in urban transportation planning is now developing in the statewide transportation planning field—both passenger and freight—where the state of the art is roughly analogous to that of urban transportation planning in the late 1950s and early 1960s. Some rudimentary work has by now been done in developing statewide travel simulation models, and federal and state governments are becoming insistent in their desire for comprehensive intermodal statewide transportation plans. The state appears to be set for a rerun of the urban transportation planning history with all of its attendant mistakes and follies.

A more hopeful prospect, however, is that statewide transportation planning may learn from the errors of urban transportation planning and not be doomed to repeat them. If this is to be the case, we must adopt an explicit problem-solving approach that can lead to a reasonable and worthwhile state-level transportation planning process. The crucial elements of such a process should probably be as follows:

1. Establish goals for statewide transportation,
2. Identify basic problems in statewide transportation that are within the realm of the state's responsibility,

3. Design analysis procedures and identify data requirements for determining appropriate problem solutions that are consistent with goals,
4. Collect data,
5. Analyze problems in terms of alternative solutions, and
6. Synthesize solutions and develop plans.

If this approach is used, we may well find that certain problems overlap considerably in method of analysis, data, and solution. We may also find that there are overlapping needs for travel simulations in many applications. These possibilities, however, should develop as results of analysis rather than as starting points.

Throughout, if we use such an approach, we should be able to plan statewide transportation systems through increasing our knowledge of and ability to deal with the phenomenon of statewide transportation rather than through knowing about a complex transportation planning technology. If we work on the basic needs identified in Drake's paper in directly addressing problems rather than in developing a monolithic procedure, we will be well on our way not only to developing good statewide transportation plans but also to solving our statewide transportation problems.

Discussion of Resource Paper

Everett C. Carter, University of Maryland

The methodology for planning statewide multimodal goods movement systems should begin with a definition of goals and objectives and follow with a systems approach through evaluation of alternatives and final selection of a statewide goods movement system. However, there are several ways to develop such a framework for this planning methodology; the level of detail of each step can vary from state to state; the responsibility for conducting each step may be assigned to either statewide, regional, or local governmental units; and, in general, a framework to satisfy all transportation planners is difficult to envision.

The goods movement system can be viewed in terms of inputs and outputs, with constraints and impacts as shown in Figure 4. Figure 4 also shows the same input-output representation with some elaboration of the constraints, controls, and outputs. The goods movement system is composed of physical, human, activity, and concomitant subsystems, as shown in Figure 5. These subsystems are described as follows:

1. The physical subsystem includes all goods-movement vehicles and facilities and the goods that are expected to be moved in the region;
2. The human subsystem includes the operators of those vehicles and facilities, the shippers and consumers or final receivers, and the community that is affected by the goods movement system;
3. The activity subsystem involves the entire spectrum of activities that occur with the movement of goods and includes total goods flows, flow patterns, costs, operating schedules, terminal location and operation, and land use development; and
4. The concomitant subsystem encompasses the results of the accomplishment of the movements of goods and may be further divided into environmental, social, and economic consequences of goods movements.

Regardless of how one chooses to represent the statewide goods movement system, it remains a very complex system with many viewpoints, involves several modes of transport, and has far-reaching social, economic, and environmental consequences. The consequences of goods movements on the transportation network, land use, land use patterns, and environment must be addressed in any truly comprehensive trans-

Figure 4. Input-output representation of a statewide goods movement system.

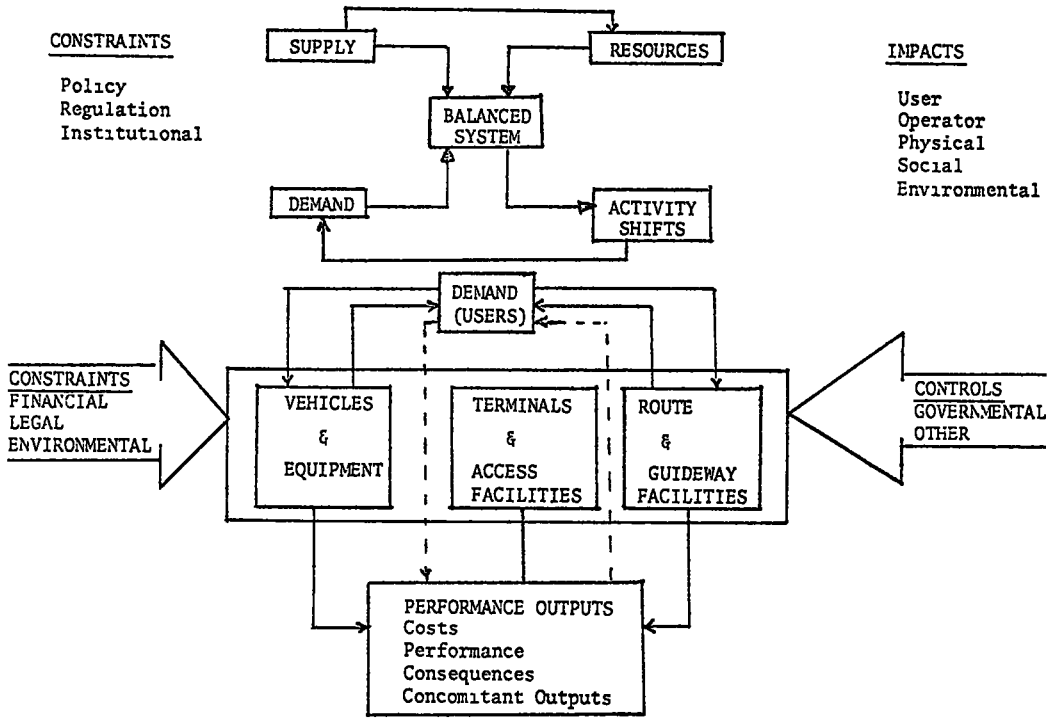
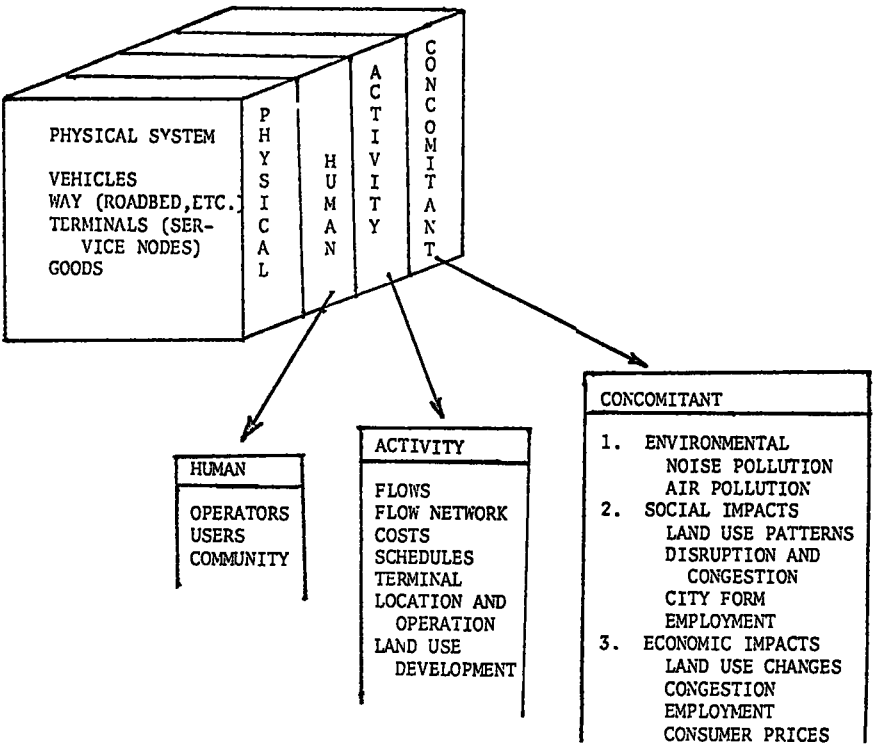


Figure 5. Subsystems and components of a goods movement system.



portation planning effort. A comprehensive study of the goods movement system, even as a subsystem of total transportation, requires a systems approach. Figure 6 shows a systems approach to the analysis of goods movement.

A network study of flows is necessary to enable the reduction of overlapping or unnecessary vehicle movements. The consideration of all modes is also absolutely essential. For example, if the energy situation either becomes worse or remains as a long-term problem, the following types of shifts are entirely possible and desirable:

1. Pipelines may be used to move many products, for they are more energy efficient than either rail or truck;
2. The piggyback type of intermodal coordination may become commonplace (with new terminal distribution systems extending into the city so that system gains in rural movements are not lost in urban congestion); and
3. A major research effort will be made to develop innovation alternative goods

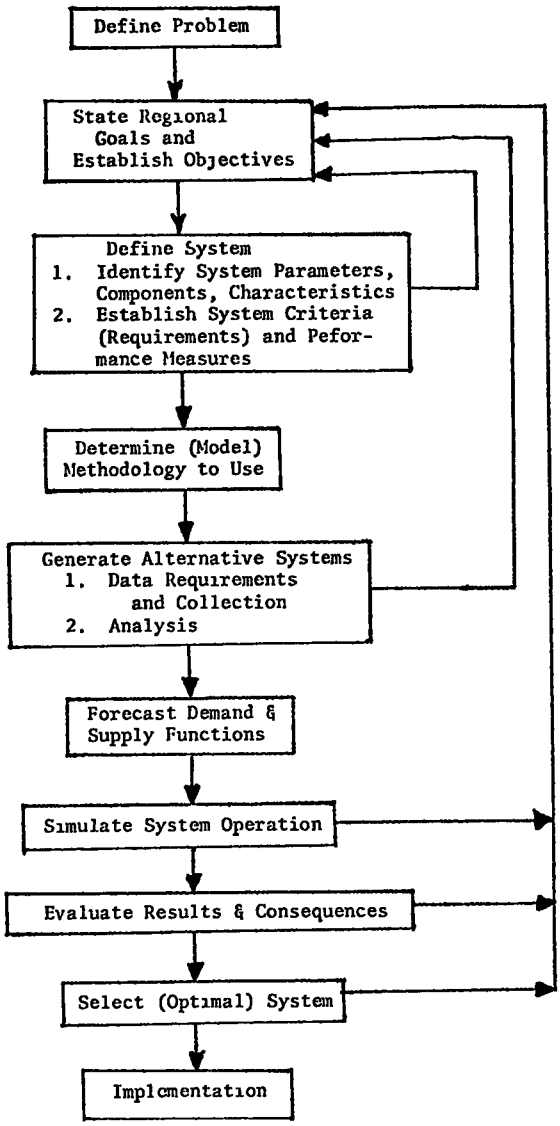


Figure 6. Systems approach to study of urban and interurban goods movement.

movement systems and techniques (currently about 45 percent of the total national expenditures for transportation is for freight).

Drake's discussion of the problems of obtaining behavioral information for freight analysis is appropriate. Careful attention should be given to goods movement data requirements prior to any major data collection effort. This implies that a basic methodology should have been established in order to determine data requirements, and this is precisely the way goods movement research should proceed. Recognizing the almost total lack of goods movement data, Drake recommends that collection of basic flow data begin immediately. However, this recommendation should receive very careful scrutiny; otherwise, unneeded data or data in an inappropriate form may be obtained at a rather high cost.

WORKSHOP 4: STATE AND REGIONAL DEVELOPMENT

Salvatore J. Bellomo, M. F. Brenan, Alan G. Bullen, Arne Gausmann, Irving Hand, Lawrence J. Harman, Edgar Horwood, Garred P. Jones, Hal Maggied, Christa Marden, Robert Marden, Patrick J. McCue, Joanne McGowan, George Raymond, Phil Robers, Thomas H. Roberts, Nat Simons, Jr., Nicholas P. Thomas, John Walker, Theodore G. Weigle, Neil H. Wilson

Report

Irving Hand, Pennsylvania State University, chairman

Workshop 4 divided its members into 3 task forces to discuss the issues assigned to it. Summaries of these discussions follow. The 3 groups came together at the conference for a final session to present their reports and to agree on research recommendations, which are given earlier in this report.

OBJECTIVES

To identify the current strategies being developed and used in the various states to address the linkages between statewide transportation planning and comprehensive development planning at the state and regional levels (comprehensive development planning is defined to include physical, economic, social, and political considerations in state development policies and plans).

To recommend improvements in the overall conduct of both statewide transportation planning and comprehensive development planning at the state and regional levels.

To develop a recommended program of research or policy development related to statewide transportation planning and comprehensive development planning.

ISSUES

What are the current capabilities of the various states in formulating statewide comprehensive development policies and plans, particularly with reference to land use?

What are the current attitudes of governors, governors' offices, and legislatures toward statewide comprehensive development planning and toward statewide comprehensive transportation planning and the implementation of plans?

How important is transportation to development? What is the role and impact of transportation development in stimulating economic growth and development? How can transportation development be formulated, planned, and programmed to help shape and gain desired economic development?

What are the essential elements in statewide comprehensive development policies and plans?

What should the role of the state be in the formulation of regional development policies and plans? Is a state development policy and plan nothing more than a composite of regional development policies and plans? In view of the foregoing, what should the state-regional organizational relation be?

Can effective land use controls be established at the state level? At the regional level? (Particular attention should be directed to the current discussion on national land use policy legislation, the reallocation of power dealing with land use regulation, and the nature and feasibility of specific land use controls at significant transportation points, such as airports, interchanges, and coastal and off-shore developments.)

What is the role of the private sector in statewide transportation planning and in comprehensive development planning? How might these considerations best be taken into account?

How can the relation of and coordination between statewide transportation planning and comprehensive development planning be strengthened and made more effective?

TASK FORCE 1
Nat Simons, Jr., Ohio Department of Transportation

Task Force 1 was asked to list the issues and problems of linkage between statewide transportation planning and comprehensive development planning, define the organizational concepts needed to provide linkage, identify deficiencies related to issues and organizations, and evaluate current methods of implementing linkage solutions.

The basis of comprehensive planning is the same as that for land use or transportation planning. The same factors are analyzed: the economy, population growth and migration, labor force participation, industrial change, and social problems. Although each type of planning uses the basic information for alternate purposes, there are resulting policies expressed in the base information.

There is a lack of linkage between comprehensive planning and transportation planning. That lack leads to short-term program plans rather than longer term, policy-oriented planning. This is manifest in a series of dichotomies, e.g., budget decisions instead of policy planning, executive staffing capability without a countervailing capability in the legislature, and decision-making without executive or legislative arbitration.

There are 2 deficiencies.

1. Long-range comprehensive policy-oriented planning does not exist as an identifiable entity in most states. It requires a distinct strategy, an identifiable constituency, specific goals and objectives, and a system of countervailing power among governmental branches.
2. In transportation there is only implied state policy that derives mainly from the federal budget allocations. Therefore, transportation planning is mainly programmatic.

With the current method, control through budget allocations for planning is developed by federal transportation agencies and funneled through the states to local agencies. Therefore, the broad federal policy is implemented by state transportation program planning.

Problems arise because of the nature of local and state governments. part-time legislative bodies, limited staff capabilities, administrative agencies that often work directly through the legislature rather than support the executive, administrative departmental plans that are often unrelated to one another, and significant lack of cooperation among governmental branches at local and state levels.

Section 112 of the Federal-Aid Highway Act of 1973 provides a breakthrough. The transportation agency used as the driving force now makes it possible to obtain greater involvement of the governor with substate agencies. Also, links from comprehensive planning functions other than transportation can be obtained through implementation of the unified work program process. Thus, transportation planning will become more comprehensive.

Linkage assumes a series of relations which must now be explicitly stated, between (a) comprehensive planning and transportation planning, (b) programs and policies, and (c) budgets (financial allocations) and alternative systems requirements. The explicit expression of processes of interaction will permit more accurate evaluation of policies and programs as these factors change.

Assuming that there exists a lack of understanding of the processes of comprehensive planning, we should study the process, experiment more with the process within the framework of existing governmental institutions, and experiment with variations of the process and institutions.

The focal point for central policy is the federal government, which allocates funds to states and local governments for comprehensive planning. Therefore, each governor or legislature must proceed to tie planning processes together functionally.

TASK FORCE 2
Thomas H. Roberts, Atlanta Regional Commission

Task Force 2 discussed the following list of issues (problems) relating to state and

regional transportation and comprehensive development planning. Following each issue is a statement of institutional or operational gaps (needs) associated with that issue.

1. There is no system of land use controls comparable to the present (admittedly imperfect) transportation implementation system.

There is a need to define and implement statewide and regional roles in land use controls. These should consist of a selective and appropriate mix of the following land use control functions at various levels: land acquisition, zoning and related controls, mandatory referral with override or reversal powers, and mandatory referral for advice and comment (such as the A-95 review).

2. Transportation systems should be used as a shaper of development as well as a server of travel needs. This has 2 aspects: It should be provided to shape desired development and withheld to deter undesired development.

There is a need for larger explicit statewide and substate contexts within which to make transportation decisions.

3. There is a lack of interstate (and substate) coordination (i.e., "horizontal" jurisdictional conflicts).

There is a need for federal support and mandate for interstate (and substate) planning and coordination.

4. There is a conflict between "top-down" and "bottom-up" decision-making processes (i.e., "vertical" jurisdictional conflicts), and both should be accomodated.

5. There is a lack of an adequate evaluation framework for transportation decisions.

The need is to find various ways, such as special task forces, to provide evaluation capability. The Boston Transportation Planning Review is one example.

6. It is not clear whether the state role should involve policies, plans, or programming.

The state needs at least to provide (a) a policy framework within which plans can be made and (b) priority programming to guide and coordinate state expenditures. The state may not need to make the plans per se.

7. It is not clear who makes what decisions. There are too many people who can veto and not enough who can implement.

The need is to make decision-making powers less fragmented.

8. There is a lack of advance awareness or acceptance of the consequences of current action or inaction on the part of the public and, therefore, often on the part of the public's elected representatives. This is a dilemma or "tension" resulting from short-term office tenure (which is a necessary consequence of democratic accountability) versus long-term effects.

9. How should we cope with capacity-demand dilemmas, e.g., in situations where capacity cannot be provided to meet demand or where various capacities cannot be satisfied compatibly?

There is an institutional void here. It is politically difficult to accept demand constraints.

10. How can we better use fiscal and regulatory choices along with physical system choices to achieve desired results?

Institutions for doing this are too fragmented or in some cases absent. The need is to combine or provide these functions where appropriate.

11. How can state transportation planners and decision-makers relate to the state air quality control process?

There is need for a federal mandate for cooperation among state agencies and between state and substate agencies.

12. How can state transportation planners and decision-makers relate to state energy policy implementation processes?

The need is the same as that for issue 11.

13. There is lacking a comparable environmental-impact-statement process for all public and private development, not just for public federal-aid systems and projects.

The need is to explore various ways for states to do this. The California act is one example.

TASK FORCE 3
George Raymond, Raymond, Parish, and Pine, Inc.

Task Force 3 discussions focused on 3 questions.

1. Can effective land use controls be established at the state level? At the regional level?

Without trying to anticipate how effective controls established at the state level may be, if we consider the gross ineffectiveness of the present system, there is no question that more effective controls can be so established.

The chief ingredient in effectiveness is the power to implement plans and enforce controls. If the power is lodged at state and substate levels, care must be taken to ensure that plans relate to local concerns and that any override power will be limited to matters of more than local concern. One model might be local adoption of locally devised plans and corresponding land use controls, giving the state or substate level authority to ensure that such plans and controls are consistent with statewide objectives.

National land use policy legislation is the most significant tool now on the horizon whereby the capability and capacity of states to develop and administer a more effective land use planning and regulatory system might be enhanced.

A land use control system at the state level could include effective controls at significant transportation points, such as airports, interchanges, and coastal and offshore developments. Controls would vary with the nature of the area in which such transportation points are located (e.g., developed versus rural) and, for maximum effectiveness, would have to be established at the earliest possible time after the decision to establish the particular transportation facility.

Future requirements for coordination of areawide transportation planning with areawide land use and other aspects of comprehensive planning should recognize the ineffectiveness of continued reliance on powerless planning structures.

Given the fears generated by efforts to place land use controls at any level higher than the local level and the consequent resistance to the establishment of any effective system, the Transportation Research Board might consider (a) documenting effects and impacts of laws recently enacted in advanced states such as Vermont, Florida, and Oregon; and (b) establishing a center to monitor further developments in this field and assess the effectiveness of different approaches. Both efforts would greatly assist states in moving in the direction of establishing effective land use planning and control systems.

Once a statewide system is established, federal and federally assisted actions should not work against it. The Transportation Research Board might inventory all federal actions that are now having land use impacts in the states preparatory to recommending a system whereby they could be coordinated with the states' efforts.

To be effective, a state land use regulation system must be directive as well as protective.

Impediments to the rationalization of land use patterns, such as continued reliance on the property tax, must be removed. Useful models are the Hawaii state-supported education system and the Twin Cities metropolitan tax-sharing system.

2. What is the role of the private sector in statewide transportation planning?

Since the private sector makes up a major portion of the comprehensive statewide transportation system, it cannot be left out of the transportation planning process. The Transportation Research Board might develop an inventory of the types of information that statewide transportation planning agencies would need regarding the private sector in order to be able to develop an integrated transportation plan.

Competing interests of the several segments of the private sector of the transportation system affect the public interest and are therefore of major public concern. Such issues should be resolved as part of statewide transportation planning, and the power to implement the resulting decisions must be focused at the appropriate level.

There was a feeling that part of the problem arises from the fact that the several segments of the private sector are subject to regulation by different agencies. Tentative suggestions were made regarding centralization of all transportation regulatory

functions and possibly lodging all transportation-related regulatory functions in the state transportation department.

3. How can the relation of and coordination between statewide transportation and comprehensive development planning be strengthened and made more effective?

Comprehensive development planning, characterized as a deliberate, purposeful, internally consistent activity and accompanied by the power to implement the resulting plans, is nonexistent. Consequently, it is difficult to conceive of linkages and improved coordination between it and statewide transportation planning. Comprehensive land use planning, designed to achieve accepted social, economic, and environmental objectives, can be established in the reasonably near future. The level of funding contemplated in the national land use policy and planning assistance act would, for the first time, bring the level of support of at least this aspect of comprehensive planning closer to past support of functional planning.

If comprehensive land use planning is established on a statewide level, transportation planning should fit in with it rather than continue to be an independent determinant of land use distribution patterns.

Resource Paper

Nicholas P. Thomas and Jeffrey J. Orum,
Linton, Mields and Coston, Inc.

A resource paper could be written on each of the issues assigned to Workshop 4. All that this particular paper can accomplish is to help place statewide transportation planning in perspective given current intergovernmental trends and patterns affecting statewide comprehensive planning, regionalism, and regional structure.

Since universal agreement has not been reached as to precisely what terms and definitions should be used to describe the various aspects and levels of planning, some basic definitions must be set forth to facilitate communication.

1. Regionalism. The use of processes and systems by our 3 tiers of general-purpose government to directly affect persons, the economy, and the natural and man-built environments within geographical areas. Efforts of the federal government to bring the full force and effect of numerous policies and programs to bear on Appalachia to stimulate social and economic progress offer one example. Another example is the action taken by a state legislature a few years ago that altered state general revenue sharing to local governments by changing the distribution formulas to reflect factors such as population and tax effort. This change in process was aimed at eliminating community tax islands and reducing fiscal disparities between central cities and suburban communities as well as between multicounty urban and rural substate districts.

One of the major characteristics of regionalism is a conscious attempt on the part of one or more governments to deal with equity questions. The Minnesota legislature, for example, granted authority in 1970 to a regional organization to collect a significant portion of the taxes paid by new commercial and industrial enterprises anywhere within the region. These taxes are to be reapportioned and allocated to local governments. This redistribution process is intended to provide imbalanced fiscal capacity-fiscal equity communities with what might be termed "regional general fund revenue." The process also represents an attempt to reduce economic competition among communities not consistent with orderly regional development.

2. Regions. Geographical areas used by our 3 tiers of general-purpose government to deal with problems and realize opportunities. National regions are groupings of states by the federal government. Examples include the 13-state Appalachian Region

and the 10 multistate federal regional councils being used to coordinate federal domestic programs. The Southwest Federal Regional Council includes Texas, Oklahoma, New Mexico, Arkansas, and Louisiana.

3. Multistate regions. Groupings of states by federal or state government. The groupings usually reflect unique geographical factors and socioeconomic factors below the national average such as employment, per capita income, and median school years completed. Examples include the Coastal Plains Region (Georgia, South Carolina, and North Carolina), the Upper Great Lakes Region (Michigan, Wisconsin, and Minnesota), and the New York Metropolitan Region (parts of New York, New Jersey, and Connecticut).

4. Substate districts or state planning regions. Groupings of counties and municipalities by state government to foster comprehensive multijurisdictional general-purpose planning and development and to expedite intergovernmental coordination. The multicounty character of these districts and regions tends to distinguish them from groupings often termed subdistricts or subregions (e.g., 2 cities; a city and a county; a county, several cities, and several villages or townships). The number of substate districts or state planning regions is determined by each state government, usually the central agency responsible for statewide comprehensive planning, taking into account quantitative factors and the preferences of local interests (including local elected officials). California has officially designated 10 substate districts; Texas has designated 24. Ohio uses 11 substate service districts for state planning and programming and 15 substate planning regions to determine the boundaries of umbrella regional planning and development organizations. Each planning region is contained within a service district to ensure coordination.

5. Regional structure. The various types of institutional arrangements used by our 3 tiers of general-purpose government to formulate policies and plan and implement programs and projects within regions. The Appalachian Regional Commission and the 10 federal regional councils are federal regional structures used in conjunction with national regions.

The Coastal Plains Regional Commission and the Upper Great Lakes Regional Commission are examples of regional structures used by federal and state government in conjunction with multistate regions. The Tri-State Regional Planning Commission is an interstate compact regional structure relied on by the states of New York, New Jersey, and Connecticut.

Councils of governments, associations of local governments, economic development commissions, and other forms of multijurisdictional organizations responsible for comprehensive general-purpose planning are types of regional structures used by local and state governments in conjunction with substate districts or state planning regions. The term regional council is used by the National Association of Regional Councils (NARC) when referring to any regional structure that reflects multijurisdictional representation on its governing body and carries out a multipurpose or multifunctional program. More than 600 regional organizations meet this criterion. Most regional councils service an entire substate district within a state, but there are notable exceptions. For example, the Metropolitan Regional Council's service area includes portions of New York, New Jersey, and Connecticut; the Ohio-Kentucky-Indiana Regional Planning Authority's service area includes a portion of each state. Examples of single-state regional structures include the North Central Texas Council of Governments (NCTCOG), the Association of Bay Area Governments (ABAG), the Atlanta Regional Commission (ARC), the Central Savannah River Area (Augusta) Planning and Development Commission, the Baltimore Regional Planning Commission (a state agency), the Metropolitan Council (Minneapolis-St. Paul), and the Southeast Michigan Council of Governments (SEMCOG). The San Diego County Comprehensive Planning Organization is unique in that it serves a 1-county substate district. All other California districts contain from 2 to 10 counties.

For the purposes of this resource paper, the term regional council also refers to regional structures classified as umbrella multijurisdictional organizations (UMJOs) by the 7 major national public interest groups (including the National Governors' Conference and National Legislative Conference) in 1972. An UMJO is defined as follows (1, p. 7):

A multijurisdictional organization which has policy control over two or more functional planning and policy development programs, each functional program having a corresponding advisory committee to assist the policy board of the umbrella multijurisdictional organization An umbrella multijurisdictional organization has coordinative powers and the ability to mediate conflicting policies among independent single-purpose, functional agencies

6. Comprehensive general-purpose planning. Planning carried out by a comprehensive multistate planning and development organization (e.g., Coastal Plains Regional Commission), a comprehensive statewide planning agency (e.g., Pennsylvania Office of State Planning and Development, New York Office of Planning Coordination, Georgia Office of Planning and Budget), or a regional council-UMJO (e.g., ARC). The distinguishing feature of this type of planning is that it is usually directly responsible to a governor, as chief state planning officer, or to chief local elected officials, as members of a policy body. This type of planning (although it also takes place at the subdistrict, county,and city levels)at the state and substate district levels is the focus of this paper.

Comprehensive planning involves research and analysis, policy formulation, program development, and performance evaluation. Its precise scope and depth are largely determined by the chief executive user or users. It always attempts to deal with the whole as being greater than the sum of the parts. Thus, heterogeneous functions, programs, projects, and activities are integrated to facilitate decision-making by executive and legislative branch officials.

7. Functional planning. Planning carried out by a single- or limited-purpose multistate agency (e.g., the Tri-State Transportation Commission); state "mission" (i.e., line operating) departments and agencies (e.g., a department of transportation); special-purpose state agencies (e.g., comprehensive health planning commission); single- or limited purpose organizations (e.g., comprehensive health or health planning agencies) at the substate district and subdistrict levels; general-purpose mission departments and agencies of local governments (e.g., Wayne County Highway Commission); and special-purpose local agencies, districts, and authorities (e.g., a single county port and harbors authority).

The use of "comprehensive" as an adjective in federal statutes and regulations referring to certain functions (e.g., comprehensive health, comprehensive manpower, comprehensive transportation) has often blurred the distinction between comprehensive general-purpose planning and comprehensive functional planning.

8. Comprehensive planning. Planning carried out by comprehensive multistate and statewide planning agencies and regional councils-UMJOs.

9. State planning agency (SPA). The comprehensive statewide planning agency in each state.

10. Statewide transportation planning (STP). Functional transportation planning even if it is multimodal in character.

11. Regional development. Planning and development at the substate district or state planning region level that is linked to statewide comprehensive planning and statewide transportation planning. Regional development may take place at the international, national, multistate, substate district or state planning region, and subdistrict or subregion levels. Although some attention is devoted to multistate regional planning and development in this paper, the major focus is on substate district or state planning region.

In addition to the definition of terms, the acronyms of the various agencies and programs referred to in the paper are given below:

Acronym	Agency or Program
ABAG	Association of Bay Area Governments
ACIR	U.S. Advisory Commission on Intergovernmental Relations
ACSC	Area of Critical State Concern
APDC	Area Planning and Development Commission
ARC	Atlanta Regional Commission

BARTD	Bay Area Rapid Transit District
BCDC	Bay Conservation and Development Commission
COG	Metropolitan Washington Council of Governments
CPO	Comprehensive Planning Organization
CRS	Congressional Research Service
DECD	Department of Economic and Community Development
DOT	U.S. Department of Transportation
DRI	Developments of Regional Impact
EDA	Economic Development Administration
EDD	Economic Development District
FAA	Federal Aviation Administration
FEA	Federal Energy Administration
FHWA	Federal Highway Administration
HGAC	Houston-Galveston Area Council
HHFA	U.S. Housing and Home Finance Agency
HUD	U.S. Department of Housing and Urban Development
LDD	Local Development District
MARTA	Metropolitan Atlanta Rapid Transit Authority
NARC	National Association of Regional Councils
NCTCOG	North Central Texas Council of Governments
NRB	National Resources Board (1934)
NRC	National Resources Commission (1935)
NRPB	National Resources Planning Board (1939)
OMB	U.S. Office of Management and Budget
PPBS	Planning, Programming, Budgeting System
RIP	Regional Improvement Program
RTPAC	Regional Transportation Policy Advisory Committee (Texas)
SCAG	Southern California Association of Governments
SEMCOG	Southeast Michigan Council of Governments
SEMTA	Southeast Michigan Transportation Authority
SPA	state planning agency
STP	statewide transportation planning
TPA	transportation planning agency
UMJO	umbrella multijurisdictional organization
UMTA	Urban Mass Transportation Administration

The authors have used a wide variety of primary and secondary materials in preparing this paper. A number of officials and staff at the national, state, and substate district levels were personally interviewed, and a telephone survey involving 10 selected regional councils was conducted. The full cooperation of these officials and staffs from various parts of the nation indicates that there is a great interest in strengthening transportation planning at the substate district level through regional councils-UMJOs. The findings and recommendations reflect the input of many people in addition to those of the authors.

REGIONALISM AND TRANSPORTATION ISSUES

Not since the establishment of the Public Works Administration during the Great Depression in 1933 have so many top elected officials at every governmental level and leadership officials of almost every segment of the economy demonstrated such an interest in regionalism and regional structure. The general consensus that seems to be building up reflects the following considerations:

1. Current public policies, processes, systems, and institutions are no longer adequate to solve complex interrelated problems and to realize opportunities associated with human, economic, and natural resources;

2. Tinkering with existing situations will not suffice—fundamental changes are required;
3. A central focal point is needed within the federal executive branch to deal with national growth and development and to coordinate federal policies and programs;
4. Regionalism involves addressing problems and opportunities through policies, processes, and systems (e.g., the proposal for a national development bank) and through regional structures; and
5. Multistate and statewide planning and development systems linked to substate district regional councils-UMJOs are necessary and in the national interest.

The national administration's posture on regionalism is curious and in many ways paradoxical. The validity of multistate regional planning and development commissions established under Title V of the Public Works and Economic Development Act of 1965 and the Appalachian Regional Commission has been questioned by administration spokesmen. U.S. Department of Housing and Urban Development (HUD) officials remain intent on divesting the federal government of any parental responsibilities for regional councils-UMJOs and claim it is time for state and local officials to decide the future of these regional structures. Budgetary cutbacks initiated or allowed to occur by the administration have severely weakened the capacity of HUD and other federal agencies to encourage and support various types of regional structures. The Economic Development Administration (EDA) of the U.S. Department of Commerce and the Appalachian Regional Commission is finding it increasingly difficult to relate to regional structures serving multicounty economic development districts (e.g., economic development commissions, area planning and development commissions) and local development districts.

Many aspects of federal general revenue sharing, the administration's proposed Better Communities Act (i.e., special revenue sharing for community development), and the implementation of functional policies and programs (including manpower and transportation) by administration officials can be viewed as detrimental to regionalism and regional councils-UMJOs. A discretionary action by HUD officials allowing every state government to assume responsibility for federal comprehensive planning and management assistance to "metropolitan" regional councils-UMJOs and cities with a 50,000 or more population effective January 4, 1974, drew a response from NARC in the form of a lawsuit.

Conversely, many of the administration's special revenue-sharing proposals would strengthen the comprehensive planning responsibilities of SPAs and regional councils-UMJOs. The September 1972 report by the Congressional Research Service (CRS) on national growth and development policy actions notes (2, p. 13):

> Section 6(c) of the transportation revenue sharing proposal (S 1693) would permit the Secretary to make funds, up to ten percent not otherwise statutorily appropriated, available at his discretion This discretion is, however, guided by "areawide stimulator and sweetener" language which provides that the Secretary shall make additional commitments to a consortium of governments equal to 10 percent of the shared revenue received by such consortium through State apportionment This areawide provision is designed to encourage State governments to "pick up the reins" of areawide planning and development It is significant that the term "consortium of governments" is defined in the bill as any association which is formed by general purpose governments located within a metropolitan area the combined population of which constitutes at least 75 percent of the total population of the metropolitan area Section 6(c) specifically directs the Secretary to give priority to assisting recipients in developing and implementing comprehensive transportation plans, establishing consortia of governments in metropolitan areas having powers to implement comprehensive transportation plans for the various jurisdictions comprising the consortia

Regional councils-UMJOs would qualify as consortia of governments relative to planning funds, but most would not qualify for action (e.g., construction, equipment acquisition) funds because they lack implementation authority.

The gap between promise and performance has expanded since the special revenue-sharing proposals were introduced. The specific financial incentives for areawide approaches to manpower have given way to pragmatic administration decisions that have compromised regional councils-UMJOs in their relations to large central city and urban county members as well as to state manpower agencies. Administration officials have allowed similar situations to occur in several states relative to transportation planning. The Texas situation will be further discussed in later sections of this paper.

On a more positive side, the Office of Management and Budget (OMB) issued a revised version of Circular A-95 in November 1973 to become effective January 1, 1974. The circular strengthens the role and broadens the responsibilities of regional councils-UMJOs and other types of regional structures designated as review and comment agencies. Part III of the circular provides a new framework for coordinating planning between state agencies and regional councils-UMJOs. Multisource programs, including the Unified Work Program of the U.S. Department of Transportation (DOT), are specifically referenced. OMBs action has been favorably received by NARC and its constituency as well as by the National Governors' Conference and states with policies and programs in support of regional councils-UMJOs.

Congress is taking a new interest in regionalism and regional structure. This is partially due to the fact that NARC and other proponents have shifted their attention to Congress, given the erratic behavior of the executive branch. It is also attributable to many proposals being developed by individual congressmen and private sector organizations. Congressional versions of community development special revenue sharing and national growth and development proposals all recognize the desirability of some type of planning system that includes the substate district level. There is less agreement, however, on the type of regional structure that should be encouraged. The regional council-UMJO approach seems to offer the most practical approach. There is evidence that congressional committees are more comfortable with this approach than ever before.

The proposed Land Use Policy and Planning Assistance Act and other national land use proposals have sparked considerable interest in planning and development at the state and substate district levels. Senator Henry M. Jackson's bill requires each state to develop a statewide land use planning process and a land use program. The importance of interstate land use planning and management is also recognized.

Proponents of regionalism and regional structure would like the national land use legislation that is enacted to specifically provide regional councils-UMJOs with strong policy and planning roles. There is some concern that land use planning might lead to the establishment of new functional agencies at the state level with new functional agencies and constituencies at the substate district and local levels. The Council of State Planning Agencies and other organizations supportive of comprehensive planning want land use planning and management systems linked to comprehensive planning at the state and substate district levels to ensure multijurisdictional and multifunctional coordination.

The testimony reflected in the many hearings associated with national land use planning is replete with references to the importance of linking transportation and land use in terms of policy formulation, planning, and program implementation. There is little question that all states will have to come to grips with new processes and mechanisms to ensure the coordination of statewide land use planning with statewide transportation planning within the next 2 or 3 years.

Congressional interest in comprehensive planning and development systems is also on the rise. Serious proposals have been made to transfer the comprehensive planning assistance program administered by HUD to the U.S. Office of Management and the Budget (OMB). Although this movement is partially attributable to a growing dissatisfaction on the part of many states, regional councils-UMJOs, and local governments relative to HUD's policies and administrative regulations, it also reflects a growing recognition that support for comprehensive planning must come from the Executive Office of the President. The testimony of local elected officials on behalf of the National League of Cities and the U.S. Conference of Mayors before congressional committees acknowledges the importance of comprehensive planning and supports a major new role

for OMB as one of the president's principal staff agencies. Many long-time observers of the congressional mood seem willing to earnestly speculate that Congress will turn to OMB as the focal point for comprehensive planning, intergovernmental planning and program coordination, and national policies in support of regionalism and regional councils-UMJOs. A few observers feel that Congress will establish new institutional arrangements.

Senator Hubert H. Humphrey's 1973 proposal for achieving balanced national growth and development calls for a basic restructuring of the federal executive and legislative branches along with the establishment of a top-to-bottom national planning and development system (3). Although the proposal deals extensively with organization and structure at every governmental level, it also sharply focuses on the use of policies, processes, and systems to solve fundamental problems and realize opportunities. An office of balanced national growth and development within the Executive Office of the President is called for. Guided by a cabinet-level council, the new functions of the new office would include the following (3, p. 12):

> assess national needs, goals, and priorities, evaluate effects of present and proposed Federal tax incentives and State and local government tax policies upon the private industrial mix and location in the context of balanced national growth, evaluate all present and proposed Federal credit programs, and evaluate the effects of fiscal and monetary policies and other economic stabilization tools that may be adopted upon changes in income and the composition of economic production.

The envisioned national growth and development policy would be implemented through "a national regional development system of regional commissions" (3, p. 10). Selected features of this proposed legislation include the following:

1. Consolidation of federal comprehensive planning and planning assistance programs;
2. Establishment of 8 to 12 multistate regional planning and development commissions with a federal-state membership, including governors and state legislators;
3. Recognition of a unified national planning and development system encompassing comprehensive planning at the federal, multistate, state, substate district, metropolitan, and local levels;
4. Transfer of the comprehensive planning assistance program authorized by Section 701 of the Housing Act of 1954, as amended, from HUD to the new office with additional appropriations to encourage and strengthen a single umbrella comprehensive planning agency for each state and substate district;
5. Establishment of uniform planning requirements for federal grant-in-aid programs;
6. Use of common policy and planning information by comprehensive planning agencies at every governmental level;
7. Strengthening of the federal legislative branch by creating a joint committee on balanced national growth and development and a congressional office of policy and planning;
8. Creation of a federal independent agency called the "Foundation on the American Future" to stimulate and guide basic research pertaining to national growth and development;
9. Establishment of a federal independent agency called the "National Citizens Council on the American Future" to advise the new office and Congress; and
10. Encouragement of public and private sector officials at the state and local levels to establish multistate and state citizens councils.

Transportation is recognized as a key factor in regional planning and development throughout the proposal (3, p. 9).

> The development of a balanced and efficient transportation system is essential to the commercial life and general welfare of the people, and present transportation facilities, rate structures,

planning and development are inadequate to meet minimum current and future needs.

The "development of an integrated national transportation system" is identified as a national goal along with references to full employment; income distribution; environmental quality; "coordinated land use planning, regulation, and development among governments in a region"; a national communications system; energy; housing; new communities; health care and services; manpower training; educational opportunity; and productivity (3, pp. 10-11).

This far-ranging proposal is rated just short of treason by the Committee to Restore the Constitution, Inc. and other opponents of regionalism and regional structure in any form. Indeed, it is considered by many liberal proponents as being too radical. The important significance is that it was submitted to the Joint Economic Committee of Congress to stimulate debate on the need to overhaul our federal system rather than merely tinker with it and remain captive to a mentality that suggests incremental change is the only change possible.

Trends at the national and state levels suggest that the time for fundamental change has come. Proposals and concepts labeled as radical, foolhardy, and idealistic a few years ago are now ingrained in new public policies, processes, programs, and institutional arrangements. After ticking off an impressive list of significant changes that have occurred during the past few years (including enactment of federal general revenue sharing, passage of the Florida Environmental Land and Water Management Act, establishment of a statewide and 6 regional coastal zone conservation commissions through citizen initiative to protect more than 1,000 miles of Pacific shoreline, and national land use legislation pending before Congress), a report by California Tomorrow states (4, pp. 9-10):

> The opinion polls reflect the growth of an ominous public attitude, to more and more people "government"–any level of government–seems the automatic enemy, intimidating the citizen by petty unpleasantness, bad service, or sheer size . So it is not surprising that so many people–conservationists, advocates of social causes, businessmen, politicians–are asking for some basic change in government, some thorough reform.

The facts, as outlined, convincingly support the contention that the "restructuring of government, then, is not just some vague future dream. It is all around us, a pressure, a necessity" (4, p. 12).

The National Regional and Area Development Act (5), drafted by a task force of the National Governors' Conference, is not quite so sweeping as Senator Humphrey's proposal. But, it also focuses on the need for "a national policy that would guide the mobilization of the nation's resources in order to achieve balanced national development" and would establish "a nation-wide system of planning and development regions" (5, p. 1). Multistate regional commissions would be expected to "prepare comprehensive and coordinated regional development plans; administer grants to States to support approved State and area development programs and projects" (5, p. 1). At the national level, the proposal would establish an agency for regional and area development in the Executive Office of the President. At the state level, the proposal would require that states establish statewide planning and development systems, including the use of state-certified substate districts or state planning regions and regional councils-UMJOs.

Comprehensive planning as envisioned in this proposal includes transportation as a major element. A broad array of federal funding incentives in support of regional development, including the establishment of a national development fund, would be provided. The funding of demonstration and special projects "to discover or test new and innovative solutions to basic developmental problems having regionwide significance" would include public transportation (5, p. 36).

Many examples could also be cited to demonstrate that individual state governments are taking a great interest in solving problems and realizing opportunities within the framework of regionalism. Again, transportation is acknowledged to play a key role in dealing with matters of social and economic equity as well as regional development.

Several examples, including Florida's approach to developments of regional impact under the Environmental Land and Water Management Act of 1972, are discussed later.

Clearly, one fact is evident on the intergovernmental scene today. Regionalism is coming into its own as a subject area of public policy. The hearings and research on substate regionalism conducted by the U.S. Advisory Commission on Intergovernmental Relations (ACIR) during 1972 and 1973 indicate that elected officials at every governmental level now recognize that regional considerations will affect all areas of public policy. ACIR's continuing work also reveals that more and more elected officials are making a basic distinction between solving problems and realizing opportunities through regional policies, processes, and systems (including the use of public regulatory powers) and the use of various types of regional structures (including multistate regional development commissions and regional councils-UMJOs). Transportation issues are definitely affected by this trend. The theory and practice of regional planning and development acknowledge the importance of transportation in shaping our social-economic-physical environments.

PUBLIC POLICY AND REGIONALISM

National and Multistate

To fit a discussion of public policy and regionalism into neat packages is difficult. Policy initiatives between the federal and state levels are often blurred in history. The 1972 ACIR report traces the involvement of the federal government with various concepts of regionalism (i.e., geographic, economic, social, administrative, and planning) since their emergence in the period between 1900 and 1933. The report notes (6, p. 6), "With the creation of the multi-purpose TVA in 1933, the first comprehensive multistate regional authority came into existence." The establishment of the Public Works Administration in 1933 and the National Resource Board (NRB) in 1934 focused national attention on multistate and substate district regionalism for comprehensive planning purposes. By 1935, the National Resources Commission (NRC), which the NRB became, was encouraging every state to establish some form of central state planning board or agency, delineate multicounty planning regions or districts, and encourage the establishment of substate regional planning boards or agencies. Every state but one responded by establishing a new agency to coordinate economic recovery efforts and foster planned growth. These state planning agencies were usually established under the direction of a semiautonomous or autonomous board-commission not responsible to the governor. Inventories, reports, programs, and projects developed by these state entities, and their substate district counterparts reflect an attempt to be comprehensive in dealing with social-economic-physical problems. Transportation is almost always visible in such documents as are land use, employment, housing, and public works facilities.

Interest in multistate and substate district regionalism waned at the national level with the advent of World War II. New federal and state agencies were established to deal with resource allocations, mobilization, rationing, regulations, coordination, and postwar reconversion.

The NRC became the National Resources Planning Board (NRPB) in 1939, and that board was abolished in 1943. The special purpose wartime entities at the national and state levels were gradually phased out of existence. Lacking an agency in the federal executive branch to provide inspiration and policy support, state planning programs and entities were gradually abolished or lodged in major state agencies responsible for postwar economic recovery, development, and expansion. Further evolution of general public policy theory and practice in support of regionalism at the national and state levels was set aside until the mid-1960s. Federal policies and actions in direct support of regionalism, such as the Federal-Aid Highway Act of 1962, did not really begin to converge within a general, albeit vague, national policy framework until 1965.

The Public Works and Economic Development Act and the Appalachian Regional Development Act of 1965 focused attention on national and multistate regionalism. These

and other pieces of federal legislation, including the Water Resources Planning Act of 1965, stimulated state and local public officials to once again consider ways and means to solve problems and realize opportunities at the multistate and multicounty substate district levels through policies, processes, systems, and new regional structures.

The president and the federal executive branch offered many initiatives to Congress between 1960 and 1968 in support of regionalism and regional structures. Policies, processes, and systems were also relied on to encourage governors and local elected officials to support regionalism and regional structures at the multistate and substate district levels. In addition, federal incentives were offered to governors in support of the establishment of overhauling of statewide comprehensive planning programs directly responsible to the governor, as chief state planning officer. HUD emerged as the focal point during the mid-1960s for national policies in support of statewide planning systems linked to multistate and substate district regional structures.

As indicated earlier, the current national administration has chosen not to advance strong and consistent policies and programs in support of regionalism and regional structure. Rather, the initiative has shifted to Congress, the major national interest groups representing state and local governments, and other interested parties. The net result of this situation is that a clear and consistent national public policy in support of regionalism will be delayed as the executive and legislative branches move along different routes at different planes. The following ACIR findings seem noteworthy (6, p. 9): "Regionalism remains current due to the multiplicity of regional problems encountered in modern life; it also remains a delicate task to fit regional institutions into a political system that is not organized along regional lines."

ACIR has recommended that the several types of multistate regional processes and structures established pursuant to various federal statutes "be retained pending further experience and further recommendations by the commission as to what form of multistate regionalism, if any, should be adopted" (6, p. 208). The authors support this recommendation based on field work completed in conjunction with this paper. The policies, processes, plans, and programs developed by various multistate regional structures and linked to federal incentives and requirements have stimulated state and local governments to move forward in formulating public policies supportive of regionalism. The "backbone transportation plan and program" developed through the Upper Great Lakes Regional Commission has, for example, influenced the manner in which dollar allocations have been made by federal, state, and local agencies. Equally important, transportation decisions have been made by taking into account their probable impact on other public functions; on the economic development of each state, appropriate substate districts, and local communities; on citizens; and on the man-built and natural environment. This type of process seems important to refine, for it offers a basis for ensuring some measure of regional comprehensiveness in public policy-making.

Georgia's participation in the planning and programming processes of the Appalachia Regional Development and the Coastal Plains Regional Development is reflected throughout the state-prepared biennial development programs and multiyear investment plans. Equally important, this participation has enabled Georgia state and local officials, as well as the private sector, to gain experience in working with the statewide system of multicounty area planning and development commissions (APDCs) within the framework of a statewide planning system. Transportation policies, plans, programs, and projects have been placed in better total perspective at every governmental level through this imperfect, but working system.

There is a need, in the opinion of the authors, for a national policy supportive of multistate regionalism and regional structures within the framework of a broader national growth and development policy. Transportation planning and decision-making must be addressed by these policies so that guidance can be provided to state and local governments as to their roles in regional planning and development at the multistate and substate district levels.

The developing 253-mile Tennessee-Tombigbee Waterway involves 5 states and numerous regional councils and local governments. It illustrates the need for statewide planning systems that can assist public officials at every governmental level to set prior-

ities and make informed decisions on matters affecting the future of the nation, states, substate districts, and local communities.

The development is being coordinated by the 5-state Tennessee-Tombigbee Waterway Development Authority established by interstate compact. Massive federal funding commitments have already been made, and state policy and program decisions are constantly being made outside of a comprehensive planning framework. Yet this development will have a profound effect on the national economy (including energy policies) and on citizens, economies, and man-built and natural environments of each state. One could readily ask, Where lies the national interest?

Today, the authority is seeking HUD funding to initiate a multiyear comprehensive planning and development process before it is too late. This process centers around each SPA; encourages each state to develop and implement a biennial waterway development program and a multiyear waterway investment plan; and provides for the direct involvement of substate district agencies in each state. Every mode of transportation is covered by the authority's preliminary overall program design. A federal executive branch focal point that can relate this type of development to national growth and development and expedite intergovernmental policy and program transactions among federal, multistate, substate district, and local governments is desirable and necessary. How otherwise can national functional interests (e.g., transportation, employment, housing) be coordinated and served?

State

State policies and programs in support of regionalism and regional structure show no definite trend. A handful of states have taken purposeful actions to deal with matters of social-economic-environmental inequities and imbalances through policies, processes, and systems that reflect regional considerations. Michigan is experimenting with state general revenue sharing and other approaches to intergovernmental fiscal relations designed to realize statewide goals and objectives. New York has built up considerable experience in trying to affect the growth and development of substate districts and communities through state policies and programs. The New York Urban Development Commission's efforts in support of new communities offer one example. The location and siting of state office buildings and other major state facilities to realize community development goals and objectives (including central city revitalization and stabilization) provide another example.

The attention focused on the need for a national growth and development policy has stimulated many governors to show interest in the development of state growth and development policies. The governors of Oregon and Florida, for example, have raised the issue of growth versus no growth to new levels of public visibility and dialogue. Hawaii, Vermont, Florida, and several other states have indicated a willingness to use state laws and regulatory powers to deal with land use and other aspects of development that affect citizens, the economy, and the man-built and natural environments.

Despite the progress made by some states, there are no model state policies, processes, and systems relative to how state governments should approach regionalism. The Georgia approach through a biennial development program, a multiyear investment plan, and constant interactions with regional councils suggests one alternative. Most states are hampered by the same institutional weakness evident at the national level. There is simply no focal point within the executive branch responsible for developing a policy on regionalism and regional structure. Thus sporadic and haphazard approaches are often relied on. All too often, states respond to federal incentives or requirements or both outside the framework of a statewide strategy or policy.

The early and mid-1960s witnessed a trend on the part of governors to establish or overhaul statewide comprehensive planning programs. Three of the 37 SPAs existing as of 1960 were located in governors' offices (used here to include the executive office). By 1969 there were 50 SPAs; 20 were located in governors' offices, and several were pending transfer. This trend continues with approximately half of all SPAs now located

in offices of governors. SPAs received strong policy and financial support from HUD between 1960 and 1969. Although the legal status, authority, organization, structure, and staffing of SPAs varied widely, they were all moving to become the focal point for statewide comprehensive planning. Members of the Council of State Planning Agencies were able to reach general consensus that comprehensive planning includes the coordination of functional state planning and intergovernmental planning relations involving multistate regional structures, the delineation of official substate districts of state planning regions, and the establishment and development of various types of regional councils and subdistrict and local governmental planning agencies.

A 1970 special report to the U.S. Department of Transportation (DOT) noted (7, p. 2),

> The state planning agency, however, is one of those few and, we would argue, the most likely set of points where the totalities of public policies are considered In our view it is more probable that the prospects for relating functional plans to larger and more nearly comprehensive policy frameworks are apt to occur within a state planning agency

The report also documents the volatile nature of statewide comprehensive planning within an extremely competitive bureaucratic and political environment. The study attempted to answer several key questions (7, p. 8): "Does the state planning agency have formal jurisdiction for the physical, social, and economic development of the state? That is, is state planning reasonably comprehensive?" The finding was that it is not. Only 13 of the SPAs existing at that time possessed a legislative mandate to engage in comprehensive planning. Twenty-one SPAs had undertaken this responsibility, including 6 of those with a mandate (7, p. 8).

A closer examination of the work programs of SPAs indicated an even worse picture. The researchers found that none of the SPAs was adequately dealing with the 4 broadly defined public policy sectors of transportation, human resources and environment, economic development, and other physical facilities including public works and facilities, parks, and sewage systems (7, pp. 44-45). With regard to transportation the researchers concluded (7, p. 42), "There is no missing the message—the transportation policy sector is simply not an integral or prominent part of state planning agency programs." This policy sector was defined to include roads and streets, land use and open space, airports, waterways, and transportation. Only one SPA was involved in all 5 areas, and only 17 were involved in more than one. At that, the researchers found that SPAs were "taking a rather 'scattershot' approach with no clearly agreed upon focus" (7, p. 45).

On the positive side, the researchers felt (7, p. 39),

> Strengthening of the chief executive in the states is also at work here as governors work with the more comprehensive problems of transportation within their states Certainly the emphasis in the regional development programs such as Appalachia, the Rocky Mountain Federation, the New England Commission, etc –all elevate the governor to a prime role in interstate cooperation especially in the field of transportation.

The report suggested (7, p. 46),

> Clearly some remedial actions and efforts are necessary to (a) raise the transportation component to a higher surface visibility within existing comprehensive state planning and policy efforts and (b) link the transportation policy sector more effectively to policy coordination at the state level

A current general assessment of SPAs by the authors indicated that the national situation has not changed drastically since 1969. Many SPAs have experienced substantial personnel and organizational changes because of changes in party administration and pressure placed on the governor by strong functional interests and legislatures. The once-vaunted New York Office of Planning Coordination, for example, has been severely weakened by legislative actions even though it still remains a staff arm to the governor and enjoys his support.

Other shifts have also taken place that may strengthen or weaken statewide comprehensive planning as it relates to growth and development policies. Several major states have moved to consolidate their SPAs with the central budget agency. Georgia, for example, abolished its Bureau of State Planning and Community Affairs in the office of the governor as the result of a 1971 gubernatorial-initiated executive reorganization program. A streamlined Office of Planning and Budget was established and many of the former bureau's responsibilities, including relations with regional councils, are now lodged in the Department of Community Development. Michigan, Ohio, and several other states have also drastically realigned their institutional arrangements to link comprehensive planning closer to the budget process. This approach offers the advantage of placing planning staff in the resource allocation decision-making stream. The disadvantage lies in the fact that the budgetary focus is usually internal. Thus, planning staff may lose the ability and incentive to engage in the external intergovernmental planning relations associated with policies, processes, and systems designed to affect growth and development at the multistate, state, substate district, subdistrict, and local governmental levels.

Despite many studies and recommendations stemming from the Council of State Governments, the Council of State Planning Agencies, the National Governors' Conference, federal agencies, states, and other sources, there is no indication that governors and legislatures are yet willing to fully accept the concept of a strong central SPA responsible for comprehensive planning. General rejection of the concept of a strong central SPA and a comprehensive state plan in favor of an SPA responsible for stimulating policy trade-offs and planning coordination through a continuing comprehensive statewide planning process is the course that appears to be most acceptable to governors and legislators.

The controversial California Tomorrow Plan, like Senator Humphrey's proposal, addresses the systematic problems that hinder comprehensive planning. The plan calls for a major restructuring of the governmental processes and institutions from the state level down to the local level. The proponents deserve a fair hearing. They have put their finger on the real issues that will determine the future capacity of states to formulate and enunciate a comprehensive public policy in support of regionalism and regional structure.

The existing California situation is described as one in which "politicians pay lip service to 'coordination' and 'comprehensive planning,' but no integrated framework exists for making public policy" (8, p. 24). The plan represents an approach to establishing a new political framework that "guarantees strong public control over state conservation and development policies at every level. It offers the opportunity for citizen involvement when policies and programs are being formulated, and when they are being carried out" (8, p. 43).

The responsibility for developing "central policies" and preparing an annual comprehensive California state plan would rest with an 11-member state planning council. The governor would serve as chairman, and 3 cabinet members would serve ex officio. Seven members appointed by the governor and confirmed by the senate would represent the general public. Public members would receive cabinet-level pay, and the council would have its own staff.

The plan and corresponding regional plans would contain a section dealing with statewide growth and development. Land use, transportation, energy, and environmental standards would be reflected in this section. To ensure implementation, the council would assume the budgeting responsibilities of the Department of Finance, and the annual plan would specify short- and long-term goals, policies, programs, and budgets.

The legislature would be responsible for annually adopting the plan and a coordinated budget. State executive agencies would be responsible for action implementation.

The plan envisions a statewide planning and financing system with 10 multipurpose regional governments responsible and accountable to citizens as the keystones. Citizen participation and involvement are provided for at every level; new emphasis is placed on the use of elected community councils at the local government levels (e.g., the East Palo Alto Municipal Council established in 1967 by San Mateo County as authorized by the state legislature).

This radical proposal may not be viewed as radical at all by the year 2000. Several radical legislative proposals dealing with regional planning and regional government now pending in the California legislature will be briefly discussed in the next section of this paper. Enacted and pending California legislation that "radically" affects transportation planning at the state and substate district levels will be briefly discussed in the last section.

The use of policies, processes, and systems by state governments to realize growth and development goals and objectives is catching on. This is most significant because it allows governors and legislators to break out of the "institutional mentality" that prevents decision-makers from dealing with systematic problems. Proponents argue that this approach is the only way for states to forge strong policies in support of regionalism. They also contend that old institutional arrangements will give way to new ones. In short, form will follow substance or process. They may be right.

The Florida Environmental Land and Water Management Act of 1972 provides an example. The act deals with 2 statewide concerns: "(1) areas of critical state concern, and (2) developments of regional impact" (9). The Division of State Planning in the Department of Administration is responsible for implementation.

The 4 major participants relative to developments of regional impact (DRI) are "developer, local government, regional planning agency, and Division of State Planning" (9, p. iii). The roles of these participants were structured not merely in response to existing institutions but by working through the process. Thus, process was allowed to dictate or at least strongly influence institutional arrangements and roles. Regional planning agencies (i.e., regional councils) have "the principal responsibility ... to prepare reports and recommendations for proposed DRIs. In addition, the regional planning agency should serve as the coordinating agent for local governments in their region, as well as between the Division of State Planning and those local governments" (9, p. 4).

At the state level, the Division of State Planning recommends guidelines and standards for adoption by the governor and cabinet, as the Administrative Commission, and the legislature. The division administers rules and regulations, manages state financial assistance to regional planning agencies, acts on appeals, and prepares the state land development plan. Appeals are brought before the Administrative Commission acting as the Florida Land and Water Adjucatory Commission.

Airports, port facilities, shopping centers, residential developments, office parks, industrial plants and parks, and recreation facilities are covered by guidelines and standards. The relevancy to transportation is obvious.

Each regional planning agency prepares regional reports and recommendations. And, each agency plays a major role in the required public hearing process. Each report must assess the impact of the DRI on public transportation, the regional economy, housing, public facilities, the environment and natural resources, and other factors determined by the regional planning agency.

The Big Cypress Area of Critical State Concern (ACSC) offers another example of how the Florida process will affect transportation policies, planning, and programs. This ACSC was designated by the legislature pursuant to the 1972 act. The Division of State Planning was directed to recommend a definitive boundary and land development regulations. The legislature passed the Big Cypress Conservation Act in 1973 and appropriated $40 million to be matched by some $116 million from the federal government. The final report and recommendations submitted by the division include consideration of transportation issues. Three specific transportation regulations are recommended (10).

The report to the governor and legislature by the Florida Environmental Land Management Study Committee recommended the strengthening of regional planning agencies. The following statement is of interest (11, p. 12):

> It has been suggested that the staff of a Regional Planning Agency under the Land Management Act should consist of (a) a housing and community facilities planner, (b) a transportation planner, (c) an environmental specialist or scientist, (d) a land planner, and (e) staff resources or consultants in the legal economic areas.

The Local Government Comprehensive Planning Act recommended by the committee specifically recognizes transportation as an essential element. Again, emphasis was placed on the planning process and systems to be used to attain goals and realize objectives.

The continued evolution of state public policies on regionalism is necessary to determine the future of substate districts and regional structures serving local governments and citizens within these districts. In the absence of such policies, substance or process can be expected to follow form. Traditional institutional arrangements will dominate, and the many opportunities associated with choices relative to substate district and local community growth and development patterns will be delayed or lost.

Substate District

States pioneered the use of multicounty districts long before there were massive federal "carrots" in the form of grants and loans or "sticks" in the form of requirements directly linked to these funds. Texas, as one example, first used multicounty districts in 1904 to support the Agricultural Extension Service, and its highway department adopted a multicounty substate district layout in 1919. This early pattern in Texas is quite typical of most states.

A 1926 report of the New York State Commission of Housing and Regional Planning is often cited as the first real attempt to construct a comprehensive framework for functional government programs aimed at education, housing, health, highways, conservation, and public works. The commission's research documented the cause-effect chains of public actions and highlighted the general disregard for interrelations in the public policy-making process.

Substate districts for planning and programming first appeared at the state level during the early 1930s. Stimulated by the NRB, many states delineated multicounty areas as planning districts or regions. Some states used watersheds, forest areas, and other factors to determine district or regional boundaries. Inventories and analyses relative to land use, employment, housing, public works and facilities, and other community development aspects were often prepared on a district or regional basis.

The early concept of a national planning system embodied a national planning board, interstate planning bodies, state planning boards, substate (areawide) planning agencies, county planning boards, city planning departments, and in some cases planning boards at the town, township, and village levels. As noted earlier, abolishment of the NRPB took away the stimulus for the federal government and states to establish top-to-bottom planning systems intended to deal comprehensively with social-economic-physical matters through multifunctional programs. Although many federal programs continued to recognize the need for multijurisdictional planning, cooperation, and coordination after 1943, the emphasis shifted to a single focus with minimal, if any, attention given to complex multifunctional and intergovernmental relations. States followed the same pattern; departments and agencies used various combinations of counties, cities, and smaller governmental units in substate districts, planning districts, or administrative districts. But, without a central SPA responsible for statewide comprehensive planning, there was no institutional force to prevent the use of multiple districting schemes or layouts by various state agencies. Duplication, confusion, tangled communication lines, and much waste resulted. The pattern was set for what Wright (7) terms "picket fence federalism" to describe the new linkages that were forged between counterpart functional agencies at the federal, state, and local levels.

State legislatures favorably reacted to initiatives at the local level between the mid-1940s and 1960. Permissive legislation authorizing local governments or local elected officials or both to establish multijurisdictional planning agencies or new "experimental" forms of regional councils (e.g., councils of governments) was enacted. The work programs of these agencies usually contained a highway or transportation element. This approach resulted in the proliferation of various types of multi-

jurisdictional agencies (e.g., multicounty, city-county, intercity) with planning responsibilities. These agencies were not conceived as part of a statewide planning system. And, they were not backed by federal policies and financial assistance in support of regionalism and regional structure to foster comprehensive planning. Georgia was the only state that committed itself to the establishment of a statewide planning system, with multicounty planning and development agencies serving multicounty substate districts, during this period.

Certain federal and state departments and agencies promoted comprehensive "functional" planning and regional structure as a means to realize a broad fusion of intergovernmental programs and funds throughout the 1950s into the 1960s. The federal government also began encouraging states to "think regional" along functional lines. A number of federal agencies, each in its own way, began to channel funds and use regulations to support approaches such as school district consolidations, regional medical centers, regional vocational education facilities, regional air and water quality monitoring, and regional economic development.

Not until the mid-1960s, however, did federal policies and programs have their greatest impact on the development of areawide planning and coordination. Federal programs under the New Frontier and the Great Society stressed the need to deal with problems and opportunities by taking into account intergovernmental cause-effect relations. Direct citizen involvement and participation in public policy formulation and decision-making, particularly at the local and regional levels, also were emphasized.

The model cities program, the antipoverty programs, and a wide variety of other programs were mounted to interrelate programs and projects. Planning requirements were attached to 61 of the new major grant programs established between 1961 and 1966, and the U.S. Bureau of the Budget launched numerous Planning, Programming, Budgeting System (PPBS) demonstration projects to tie federal, state, and local programs together.

Some projects, including ones at the neighborhood level, attempted to link public and private resources together. The concept of "one-stop public service shopping centers" was translated into several major demonstrations.

The Federal-Aid Highway Act of 1962 stimulated interest in regionalism and regional structure within metropolitan areas by requiring that after July 1975 federal funds be linked to a continuing multijurisdictional transportation and land use process. State highway or transportation departments were involved because of their planning and programming responsibilities for interstate and urban systems. The institutional response was mixed. Some metropolitan areas relied on traditional regional planning commissions. In others, councils of governments, associations of local officials, and similar regional structures broadened their work programs. Still other metropolitan areas established new special-purpose functional agencies.

By the mid-1960s several federal programs were being used to encourage states to delineate and use multicounty substate districts for planning and programming. The Public Works and Economic Development Act of 1965 encouraged the establishment of multicounty economic development districts (EDDs), and the Appalachian Regional Development Act of 1965 encouraged multicounty or multijurisdictional (e.g., city-county) local development districts (LDDs). Other federal initiatives, like the 1967 Partnership for Health Amendments to the Comprehensive Planning and Public Health Service Act of 1966 and the Omnibus Crime Control and Safe Streets Act of 1968, called on governors to establish regional (i.e., substate) planning and programming agencies. Responding to functional pressure groups, most governors agreed to the establishment of additional multijurisdictional institutions. This proliferation of new regional structures served to exacerbate the problems associated with governmental fragmentation.

States were generally overwhelmed by the mounting number of federal programs, intergovernmental financial flows, and new substate and local agencies being established to qualify for federal grants-in-aid. Georgia was the only state with a framework for dealing with these events at the substate district level. Georgia pioneered in the delineation of multicounty districts and the establishment of fairly uniform area planning and development commissions (APDCs) starting in 1959. New state planning legislation was enacted, and public-private partnership efforts were mounted to encourage

local elected officials to establish APDCs. By January 1965, 134 of Georgia's 159 counties were participating in 14 APDCs. The formation of the eighteenth in 1968 completely blanketed the state with APDCs. Today, every county is included within one of the 18 state-certified, general-purpose substate planning and development districts. Several counties still, however, do not participate in an APDC.

Georgia was quick to make use of its substate districts in conjunction with federal programs and insisted that federal departments and agencies recognize the APDCs as comprehensive and functional planning agencies. The Office of Economic Opportunity was the first federal agency to designate APDCs for administrative and program purposes in 1965. Subsequently, the substate districts and APDCs were recognized by federal and state agencies in conjunction with economic development, health, law enforcement and criminal justice, transportation, and other functional areas.

The proliferation of substate districts is typified by Ohio's experience. In Ohio, geographic districts for planning, programming, and service delivery by federal and state agencies responsible for specific functions have traditionally been determined on the basis of factors related to those various functions. According to a 1971 report, Ohio's 200 agencies were using 366 districts set up in 41 major configurations. A few districts coincide, but no 2 configurations are identical; the result is much overlapping.

The substate district and planning agency maze that was developing throughout the nation was addressed by President Johnson in 1966 and 1967. Several memoranda were issued by the president and the Bureau of the Budget (now the Office of Management and Budget) directed toward preventing conflict and duplication among federally assisted planning efforts. Federal agencies were directed to use substate districts or state planning regions designated by the governor of each state. Governors were urged to exercise leadership and delineate official substate districts on a statewide basis similar to Georgia's "wall-to-wall" districting scheme.

Only 6 states had failed to delineate official substate districts of September 1972. New Jersey remains the only large state yet to take action. Despite this apparent progress, few states have made significant headway in getting various state mission (i.e., line operating) departments and agencies to fully use these districts for planning and programming. Governors have issued executive orders and executive directives and have relied on persuasion. But, it still is not possible to go to a single focal point in a given state and find a complete and current analysis of the planning and programming (including the impact of intergovernmental financing) taking place within a target substate district. In short, substate districts are still not being used in a systematic manner for analysis and decision-making by officials at the state and federal levels.

The 1973 ACIR report contains the following significant statements (12, pp. 14, 217, 353):

> Most state governments until recently have been silent partners in regionalism They have neither discouraged substate districting activity initiated by Federal legislation and guidelines, nor attempted to coordinate and systematize the development of areawide bodies. . They are the strategic middlemen between conflicting Federal and local pressures for areawide action . The Federal government itself has not organized effectively to promote general objectives in substate regions .The commission concludes that the role of the states in substate regional developments has become pivotal

The recommendations included in the report (12, p. 353) call for state actions that would provide for

> The establishment of a formal procedure, involving participation by units of general local government, for delineating and revising the boundaries of substate regions. .The required use of substate regional boundaries, insofar as is practicable, established pursuant to legislation by all state agencies to the extent that their implementation of state and/or Federally assisted state programs requires the geographic division of the state for administrative or other purposes.

Several states, including Georgia, Texas, Virginia, New York, Kentucky, and Ohio, have made significant strides in delineating substate districts and in encouraging

the establishment of a single umbrella multijurisdictional planning and development organization to serve each district. Ohio and several other states are also beginning to experiment with regional analysis linked to regional budgeting at the state level. The importance of a clear and consistent state policy relative to the use of substate districts cannot be overemphasized. The role of transportation in substate and local community planning and development will be determined by such policy or the lack of same.

Findings

1. Public policy in support of regionalism on a multistate and substate district basis remains fragmented and inconsistent at every governmental level. There is growing support on the part of elected officials and top executive management officials at every governmental level for the formulation and execution of national policies by Congress and the federal executive branch to achieve balanced national growth and development within the framework of comprehensive national, multistate, state, and substate development policies.
2. There is growing support on the part of private sector leadership organizations and interest groups (including the Committee for Economic Development, the U.S. Chamber of Commerce, and the National Association of Manufacturers) for the formulation and execution of growth and development policies at every governmental level.
3. A trend seems to be emerging that is characterized by public and private interests making sharp distinctions between governmental approaches to regionalism and regional structure.
4. Policies, plans, and programs in support of regional problem-solving and opportunity realization can be developed and carried out through a variety of processes and institutional arrangements, but comprehensive policy frameworks are needed at every governmental level.
5. The several proposals now before Congress that would affect state policies and approaches to both regionalism and regional structure fail to indicate a general consensus relative to definitions, national purposes, intergovernmental planning systems, and the role of multijurisdictional planning organizations at the multistate and substate levels.
6. There does appear to be general consensus on the part of the federal executive branch and Congress that state governments, particularly governors as chief state planning officers, must provide the focal point for establishing new intergovernmental planning systems characterized by 5 tiers: national, multistate (i.e., national region), state, substate district (i.e., areawide), and local.
7. There also appears to be general consensus on the part of the federal executive branch and Congress, as documented by language contained in special revenue-sharing policy, growth and development policy, and community development legislative proposals, that transportation is a major public policy area in terms of both regionalism and regional structure.
8. There is no central focal point within the federal executive branch where continual quantitative and qualitative policy analysis can be carried out in a systematic fashion. Rather, reliance is placed on individual mission departments and agencies (e.g., transportation, housing and urban development, commerce, and interior) to conduct analyses and then attempt to reach general consensus through committees, task forces, and one-on-one consultations.
9. DOT is making continuing progress in formulating and executing a general rational transportation policy framework that recognizes the need to directly link transportation policies, plans, and programs with comprehensive planning directly responsible and accountable to governors, local elected officials as members of regional councils, and local elected officials as chief executives of local general purpose governments.
10. It is essential that different policies be formulated and executed at the federal, multistate, state, and substate district levels to deal with the varying patterns of pub-

lic and private sector transportation responsibilities. These differential policies must be internally consistent within a general transportation policy framework at each governmental level.

11. State general transportation policy frameworks that are consistent with state general comprehensive policy frameworks are fundamental because a state occupies the position of constitutional middleman in terms of the constraints and powers that govern the capability and capacity of local general-purpose governments, special transportation or multifunctional districts and authorities, and private sector transportation interests.

12. Most state agencies responsible for comprehensive statewide planning have a limited, if any, capability to conduct continuing, quantitative, and qualitative policy analysis that can focus on transportation policies, plans, and programs within the framework of comprehensive statewide and substate district development policies, plans, and programs.

13. There is a growing trend to directly link comprehensive statewide planning agencies with central state budget agencies to ensure that planning and planning coordination lead to policy executive and program implementation.

Recommendations

1. The Transportation Research Board should design and mount several research projects aimed at developing specific proposals on regionalism at the multistate and substate district levels for consideration by Congress and state governments.

2. The Board in conjunction with various transportation interests should actively participate in current congressional deliberations affecting regionalism (e.g., growth and development and land use proposals) by sponsoring hearings involving transportation interests in each of the 10 federal regions.

3. The Board should work closely with ACIR relative to its extensive investigations of multistate and substate regionalism and regional structures to ensure that specific attention is given to transportation as it relates to emerging federal initiatives affecting state and substate development.

4. The Board should assume a leadership role in encouraging various transportation interests to support the statutory designation of OMB as the focal point for formulating and executing national policies on both regionalism and regional structure as well as for coordinating all federal functional planning assistance programs and requirements in support of comprehensive, compatible, and consistent intergovernmental planning systems.

5. OMB should seek statutory authority to issue rules and regulations requiring all federal executive branch agencies to provide all federal financial planning assistance and implement planning requirements through comprehensive statewide planning agencies.

6. OMB should work closely with federal executive branch transportation departments and agencies to amend existing statutes and modify administrative requirements to clearly reflect a strong mandatory role for comprehensive statewide planning agencies in developing and approving all federally assisted or required multistate, statewide, and substate district (i.e., areawide) policies, plans, programs, and projects.

7. OMB should develop and submit a proposal to Congress requesting that urban highway funds be conditioned on each state possessing a comprehensive statewide planning agency with general policy responsibilities for ensuring the coordination of transportation with other state functional areas (i.e., housing) and with comprehensive development policies and functional areas at the multistate and substate district levels.

REGIONAL STRUCTURE

Multistate Regional Planning and Development Commissions

Multistate regional commissions will continue to play an important role in transportation planning. The future organization, structure, and intergovernmental position of these commissions will have to be determined through partnership actions involving federal and state governments. Considerable initiative will have to come from both the federal executive and legislative branches. The authors can but agree with the conclusion reached by ACIR based on extensive field investigation and hearings (6, p. 216):

> It would be premature to make any final judgment at this time on the effectiveness and continuing relevance in the Federal system of these multistate regional commissions. They represent quite different and novel intergovernmental approaches to broad regional problems in the economic and water resources development area. Their brief operational experiences provide a meager basis for accurate assessment They appear to hold some promise as institutional devices for joining and implementing certain Federal, state, and local policies. But, in our view, it is too soon to make any final judgments regarding their present effectiveness or ultimate fate More time, much more time, is needed to gauge the value of these Federal-multistate experiments.

There does appear to be an emerging general consensus that such commissions should, and will, have an important intergovernmental role to play in the development and implementation of a national growth and development policy. The proposals developed by the National Governors' Conference and Senator Humphrey clearly indicate that considerable thought is being given to the future. Indeed, the Appalachian Regional Commission is in the process of soliciting research proposals aimed at finding answers to some of the questions posed by ACIR and other interested parties. The question of how block grants might be used to stimulate economic development typifies one of many fundamental issues that the commission seeks to examine.

The specifics of a national growth and development policy and the institutional relations required to implement such a policy remain to be determined. It seems reasonable to speculate that multistate regional commissions will have to be linked through state governments with regional councils-UMJOs. Their future evolution will depend on joint actions taken at the federal, state, and substate district levels. During the interim period, the following position taken by ACIR in its 1972 report (6, p. 208) seems to be the best one available:

> Given their funding levels, difficult assignments, and wholly novel institutional make-up, the Federal-multistate instrumentalities established pursuant to the Appalachian Regional Development Act, Title V of the Public Works and Economic Development Act of 1965, Title II of the Water Resources Planning Act of 1965, and the Delaware and Susquehanna River Basin Compacts have performed their assigned missions adequately and should be continued to gain additional experience against which their performance and role in the federal system might be further appraised

ACIR (6, p. 208) went on to recommend that:

> The Federal-multistate regional instrumentalities created pursuant to the Appalachian Regional Development Act, Title V of the Public Works and Economic Development Act of 1965, Title II of the Water Resources Planning Act of 1965, and the Delaware and Susquehanna River Basin Compacts be retained pending further experience as to what form of multistate regionalism, if any, should be adopted

Umbrella Multijurisdictional Organizations

A small number of multijurisdictional planning agencies emerged during the middle

and late 1950s in metropolitan areas (e.g., Atlanta Metropolitan Planning Commission and Detroit Metropolitan Area Regional Planning Commission). These agencies were organized on a multicounty basis with central city participation. The pattern was for local governments to appoint citizens as policy body members. Few, if any, local elected officials routinely served on policy bodies.

Then in the mid-1950s a new regional structure phenomenon—the voluntary council of governments—began. The establishment in 1954 of the 6-county Detroit Metropolitan Area Supervisors Inter-County Committee marked the beginning of a regional movement with distinguishing characteristics such as multijurisdictional with the county as the geographical foundation, voluntary association of local governments with no enforcement and enforcement and taxing authority, and policy body membership of at least 51 percent of local elected officials.

Throughout the 1960s the U.S. Housing and Home Finance Agency (HHFA) and HUD, its successor, moved to encourage umbrella general-purpose regional planning agencies directly responsible to local elected officials. Priority was given to metropolitan areas. Recognizing the keystone position of state governments in intergovernmental relations, HHFA and HUD officials initiated efforts to revitalize comprehensive statewide planning. Alaska received the first federal comprehensive statewide planning grant in 1960.

By the mid-1960s, HUD was actively encouraging states to use federal comprehensive planning assistance to delineate substate districts and encourage umbrella general-purpose regional planning agencies. HUD made its first comprehensive regional planning grant in 1964 to the San Francisco Association of Bay Area Governments (ABAG). HUD's statutory base was broadened in 1965 to allow the use of urban planning assistance grants to support the establishment and development of new regional structures. HUD chose to favor councils of governments and associations of local governments. The Washington Metropolitan Council of Governments (COG), serving the District of Columbia and portions of Virginia and Maryland, received the first HUD grant under its expanded authority in 1965.

HUD's effort was often frustrated by the responsibility for statewide comprehensive planning being outside of the governor's orbit in a line operating agency. In addition, concurrent federal program efforts were in conflict with HUD's concept of a statewide planning and development system.

Federal regulations issued by EDA applicable to economic development districts provide an example. EDA called for the policy bodies of economic development commissions or other types of EDA-recognized regional structures to be constituted of local officials, citizen representatives of special groups, and representatives of business and industry. HUD officials preferred a structure using only traditional local governments and local elected officials.

Georgia led the nation in encouraging the use of multicounty substate districts for multifunctional planning and programming in the late 1950s. A hallmark of Georgia's wall-to-wall substate district system is its bottom-up evolution. Georgia's Area Program preceded actions by Congress and the federal executive branch in support of substate district systems. It also provided the stimulus for the revitalization of state planning as an executive tool of the governor.

The Georgia general assembly amended the General Planning Enabling Act of 1957 in 1960 to facilitate the establishment of multicounty area planning and development commissions (APDCs). As of January 1965, 134 of Georgia's 159 counties were participating in 14 APDCs.

The State Planning and Programming Bureau, with the governor recognized as the "ex officio director of state planning," was established in the Executive Department in 1967. The State Planning and Community Affairs Policy Board chaired by the governor was created in 1970. The authorizing statute mandated the board to establish substate district (i.e., APDC) boundaries within a year. The board agreed on 18 substate districts in 1971. Today, every county is included in one of the 18 state-certified substate districts.

The Georgia legislature expressed confidence in the APDC system through a 1970 statute that strengthened the role of APDCs in intergovernmental relations. Each APDC was required to review and comment on applications by units of local govern-

mental or private agencies for loans or project grants. Each was also required to prepare an area biennial development program, including 6-year schedules of area capital improvements.

The APDCs find themselves in a relatively strong intergovernmental position as new federal initiatives on special revenue sharing (i.e., block grants), multisource categorical funding, land use, and environmental protection take shape.

The APDCs in northwest Georgia were suggested as local development districts (LDDs) for the purpose of the Appalachian Regional Development Act of 1965. Georgia refused to designate LDD boundaries to include only eligible Appalachia counties that would slice across substate district boundaries. Each of the 5 APDCs containing Appalachia counties was designated an LDD to ensure multicounty coordination and the integrity of the substate district system.

APDCs have also been designated as economic development districts (EDDs) and for comprehensive health, transportation, manpower, law enforcement-criminal justice, and other functional planning purposes by state and federal agencies.

The Atlanta metropolitan area has always received special attention to meet federal requirements peculiar to large urban concentrations. The Atlanta metropolis clearly demonstrates that states can support statewide substate district and regional structure systems while mounting differential, yet consistent, strategies to deal with urban concentrations. The Atlanta Regional Commission (ARC) was created by a special-purpose statute in 1971 to serve as the umbrella multijurisdictional planning and development agency for the 7-county substate district. The Atlanta Region Metropolitan Planning Commission, the Metropolitan Atlanta Council of Local Governments, the Metropolitan Atlanta Council for Health, and the Atlanta Area Transportation Study Policy Committee were amalgamated into the umbrella regional structure. ARC's membership area is 5 counties, and its review and comment area is 7 counties. Provision has been made for the 2 most rural counties to become members in the future.

The state statute creating ARC is broad and flexible. It could be easily amended to individually or collectively strengthen other APDCs. The statute provides 11 representation districts. Twelve local elected officials serve on ARC, 6 by virtue of office and 6 by peer-group election. These officials elect 11 citizens, 1 from each district delineated by state legislators from within the substate district, to complete the 23-member commission.

ARC is receiving priority attention and support from both the state and federal governments. The Southeast Federal Regional Council is providing ARC with coordinated multisource funding and allowing the waiver of selected requirements to encourage program integration. ARC's tri-party agreement with the Georgia Department of Transportation and the Metropolitan Atlanta Rapid Transit Authority (MARTA) is expected to provide a precedent for other state functional agencies. Since ARC is the designated metropolitan transportation planning agency, it possesses considerable authority to encourage multimodal planning. ARC's chief of transportation planning directs the regional planning program and works with counterparts in the state transportation department and MARTA. ARC takes the lead in all long-range planning. Short-range planning remains a gray area. MARTA, for example, makes decisions on routes, station locations, and so forth. Any disagreements are handled through staff negotiations. Today, ARC is the grant applicant for UMTA, FHWA, and FAA funds. Both the transportation department and MARTA engage in contractual arrangements with ARC for planning services.

The tri-party memorandum of agreement clearly sets out the role of ARC (13, pp. 1-3):

> In accord with Section 14 of Act No. 5, the Atlanta Regional Commission has authority and responsibility to carry out comprehensive regional planning (including transportation) for Metropolitan Atlanta.
>
> The ARC. . shall serve as the single agency through which consensus among Metropolitan Atlanta local governments is developed regarding metropolitan or multijurisdictional policy matters. Further, ARC shall serve as the official spokesman for local governments
>
> Each participating agency shall, to the maximum extent possible, implement its land use

and transportation related activities in accord with Development Guides, comprehensive transportation studies, . . developed by ARC

Georgia's success in working with umbrella regional councils has been attributable to state financial support, consistent policy support on the part of the governor, strong state planning legislation, and continual program involvement between state and regional council officials and staff. Several other states, including Texas, Virginia, New York, and Kentucky, have developed wall-to-wall substate district and regional structure systems. Each system is somewhat distinct, but all have one thing in common: They reflect a strong and consistent approach to establish meaningful program relations between state mission (i.e., line operating) departments and agencies and the regional councils.

Michigan illustrates the impact that federal actions and sporadic state responses have had on regional structure. A 1970 survey revealed 98 multicounty agencies in the state. Of these, 18 were engaged in comprehensive multifunctional planning and development activities, 18 were multicounty community action agencies, 9 were multicounty comprehensive health planning agencies, and 11 were multicounty law enforcement and criminal justice planning agencies.

In Michigan, the executive and the legislature have made numerous recommendations for solving problems within a regional context. The state's Revenue Sharing Act of 1971 provides a revised basis for distributing state-shared taxes and adds almost $30 million in new money. The governor feels that local governments with relatively low tax rates should not receive preferential treatment with state aid.

Michigan consistently ties regional incentives to state programs. Local governments have, for example, been able to qualify for more funds in conjunction with the state's multimillion dollar water pollution control and recreation bonding programs by allowing regional councils to prepare master programs and package projects.

Yet Michigan has not committed itself fully to a statewide system of umbrella multijurisdictional regional planning and development agencies, although such a system is under consideration. Nor has the state designated regional agencies for A-95 review and comment in nonmetropolitan multicounty state planning regions. But several regional development agencies have been organized to satisfy a variety of federal statutory and administrative regulations.

One such agency is the combined Central Upper Peninsula Planning and Development District and the Central Upper Peninsula Regional Planning Commission, which constitute 2 legal entities with an overlapping policy body and a single staff. This agency must coordinate with several multistate agencies, including the federally initiated Upper Great Lakes Commission, and a mix of multicounty agencies. The latter include the Upper Peninsula Commission for Area Progress and the Upper Peninsula Comprehensive Health Planning Association, which is divided into 4 zones, 2 of which geographically correspond to state planning and development regions.

The 7-county Detroit metropolitan area is served by a number of multijurisdictional regional structures. SEMCOG is responsible for comprehensive general purpose planning and development. It was established in 1968 through a consolidation of the Supervisors Inter-County Committee, the Detroit Metropolitan Area Regional Planning Commission, and the Transportation and Land Use Study. Private sector leaders provided much of the impetus and political support for this effort.

Although SEMCOG's efforts include transportation, health, law enforcement and criminal justice, and manpower components, the agency finds itself in competition with other regional structures. The Southeast Michigan Comprehensive Health Planning Council, for example, views its responsibilities to include A-95 review and comment. (Such review authority has not been granted to rural regional councils by the state.) The Detroit-Wayne County Criminal Justice System Coordinating Council and 2 similar entities serving Macomb and Oakland counties contend that they are the focal point for their functional specialties.

The Southeast Michigan Transportation Authority (SEMTA) was created in 1967 by statute. The authority's area is identical to SEMCOG's, and the 2 structures are linked in several ways. SEMCOG's policy body shares appointments to the authority

with the governor, and SEMCOG exercises broad review over SEMTA's budget, program, and fund applications.

The statute charged SEMTA with the responsibility of carrying out a broad program to achieve balanced transportation and improve existing services and facilities. SEMTA can plan for, acquire, construct, and operate transportation facilities. Limited provision was made for the issuance of revenue bonds.

SEMCOG and SEMTA have enjoyed good relations to date. SEMCOG has exercised its prerogatives of appointment and review and comment. SEMCOG has provided SEMTA with extensive planning data and information through the Transportation and Land Use Study. SEMCOG and SEMTA staff work together closely on committees, plan preparation, and projects.

Governor Milliken has been a strong supporter of SEMTA since its conception. Seeking to strengthen SEMTA, the governor submitted a "mass transportation financing package" to the legislature as 1 of his 3 highest priorities in 1972. The governor has proposed the creation of a statewide transportation fund. Revenues were to be derived from a 2 cents per gallon increase in the state motor vehicle fuel tax. The increased tax was to yield some $83 million, of which $26 million was to go for transit purposes. A new state discretionary fund was to be used to channel money for transit and highway development in urban areas.

SEMTA was to receive approximately $13 million from the fund in the first year to acquire and improve bus systems in the region. It was not sufficient to help finance a rapid transit system.

SEMTA also proposed the use of the real property transfer tax now in effect to generate revenue for general transportation improvements, including rapid transit. A dedicated increase in this tax could yield SEMTA some $18 million annually.

The transportation fund proposal was bottled up in the Senate Highway Committee. The committee held a series of public hearings in predominantly rural areas. The committee chairman openly challenged the governor's position and, according to senate staff, hoped that a delay in voting on the bill would give opponents time to mobilize. The State Highway Commission mildly supported the bill in public. Privately, commission members and department staff criticized the bill as weakening the Highway Trust Fund. Opponents of the bill included road builders, the Automobile Club of Michigan, and the Michigan Travelers Association. The "big three" of the automobile industry softened their separate positions to at least have the bill voted on by the entire senate. SEMCOG supported the bill along with leadership organizations like the Greater Detroit Chamber of Commerce, Metropolitan Fund, Inc., and New Detroit, Inc.

The legislature did take favorable action in 1972 by increasing the gas tax and dedicating a portion for the support of public transportation. In addition, a small amount of funding was set aside to help support specific projects (e.g., a people-moving project). Both SEMTA and SEMCOG are eligible to receive funds and both agencies are jointly working to attract a special project. Yet despite this "breakthrough," SEMTA remains underfinanced in terms of its broad multimodal mandate and responsibility to consolidate bus service in the metropolitan area.

Depending on one's viewpoint, California regional councils such as ABAG in San Francisco and the Southern California Association of Governments (SCAG) in Los Angeles are complemented or threatened by other regional structures.

The California legislature has shown a preference for functional comprehensive agencies that can both plan and implement. The legislature established the San Francisco Bay Conservation and Development Commission (BCDC) in 1965 to operate until 1969. Rather than strengthen ABAG, which was established by local officials in 1961, the legislature chose to give BCDC a permanency. The legislature has preferred that a number of other regional structures, including the Bay Area Air Pollution Control District and the Bay Area Rapid Transit District (BARTD), deal with pressing and highly visible problems.

A Conference on Bay Area Regional Organization was held in 1970 to review the many alternatives to regional structure. State legislators, executive branch officials, local elected officials, local appointed officials, representatives of special interest groups, and citizens offered their viewpoints. As reported by Stanley Scott and Harriet

Nathan, a consensus emerged on the need for a stronger form of regional structure, but there was sharp disagreement on the form of the structure and on how regional decision-makers with implementation authority were to be selected. The conference analyzed a host of legislative proposals dealing with different regional structures. Three substantive legislative proposals calling for a Bay Area home rule agency (1969), a regional government of the Bay Area (1969), or a conservation and development agency of the Bay Area (1970) received considerable attention.

ABAG spokesmen outlined the many problems stemming from continued governmental fragmentation during ACIR's 1973 hearings on substate regionalism. It was noted that 14 separate agencies were carrying out planning or program implementation or both on a multijurisdictional basis within the 9-county substate district. Of these, 4 agencies were involved in transportation. To counter this trend, ABAG officials called for a national policy on regionalism and noted (14, pp. 8-9):

> ABAG's regional home rule policy would see multifunctional regional organizations throughout the State Each of these organizations would reflect the region in which it was located with mandatory membership and participation by all cities and counties .
>
> Use of the comprehensive regional agencies by the State seems a necessity if we consider, for example, the land use legislation that is emerging from Washington The State has no land use planning capability at this time

Resolution 1-71 adopted by ABAG was submitted to ACIR for consideration. The resolution outlines the state legislation sought. According to the ABAG program, each regional organization would be required to prepare and adopt a general regional plan with mandatory elements, including transportation, land use, natural resources, and housing. In addition, the statute would provide for "an 'umbrella' relationship between the regional councils and existing regional special districts and agencies" (14, p. 10).

California Tomorrow has called for a statewide system of regional governments corresponding with each of the 10 substate districts. Each region would have its own legislature, whose members would be elected regionally, and a regional mayor. Each regional government would be responsible for preparing, adopting, and implementing a regional plan and program. Regional plans and programs would be linked with the California State Plan. Each regional plan and program would set forth in detail means for implementation including regulation, direct action, and control of funds. According to this proposal (4, p. 20):

> The region would operate the principal transportation network It would build and maintain hospitals and health centers The region would carry out a large-scale public building program, constructing new transit facilities, housing, treatment plants, hospitals and educational facilities

Assemblyman Knox introduced a bill in 1973 that would create a Bay Area Regional Planning Agency. The proposed agency would "be the sole and exclusive public agency within the region with the responsibility for general purpose regional planning" (15, p. 1). The proposal notes, "Because of the comprehensive regional responsibilities required of the agency, the agency. . .notwithstanding any other provision of law, shall be the regional transportation planning agency. . ." (15, p. 12). Moreover, it was recommended (15, p. 4) that the agency "have the ability to enact ordinances and to secure cease and desist orders. . . in order that the regional plan will, in fact, be capable of implementation." The proposal calls for a board constituted mostly of local elected officials appointed by their local legislative bodies. The regional plan would contain elements specifically dealing with environmental quality, including water and air; solid wastes; transportation; open space; parks; land use; and natural resources conservation, development, and management. Although extensive hearings have been held on this proposal, it has yet to gain widespread support.

A coalition of San Francisco Bay Area environmentalists took a far-reaching regional structure initiative proposal directly to the voters in November 1972 and won. The coastal land regulation law set up 6 regional and 1 statewide regulatory commissions.

Local elected officials serve on the commissions as do representatives of special interests and citizens. The state commission hears appeals from the 6 regional commissions and must submit a development plan for the 1,200-mile coastline to the legislature in 1975.

The South Coastal Regional Commission in Los Angeles poses new intergovernmental coordination problems for SCAG, for it is in a position to halt, slow down, or approve private and public development projects involving billions of dollars. The long-range impact of this approach to regional structure has not yet been assessed.

The California State Transportation Board took positive action in support of regional councils-UMJOs when it issued guidelines in 1973 relative to regional transportation plans. As indicated in the transmittal letter (16), the guidelines place an emphasis on

> . citizens' involvement and participation throughout the planning process, planning through local levels of Government to the Regional and State levels, the concerns for environmental protection through systems level environmental reports, and the development of an implementation plan to carry out the regional consensus

Councils of governments (i.e., regional councils-UMJOs) are specifically recognized as eligible regional structures for preparing regional transportation plans. Most of the California regional councils-UMJOs have been recognized as the official substate district agencies for transportation planning purposes.

The guidelines state (16, p. 7), "The relevant State agencies, boards, and commissions will generally conform to the adopted regional transportation plans and programs, except for matters of overriding statewide significance."

The guidelines note that each recognized transportation planning agency (TPA) should have a guaranteed source of funds to support multimodal transportation planning. California enacted a statute in 1972 (AB-69) establishing the State Transportation Board and providing for state financial support to TPAs out of the Transportation Planning and Research Account within the comprehensive State Transportation Funds. Regional councils-UMJOs and other types of regional TPAs may receive as much as 70 percent of nonfederally reimbursed costs for regional transportation planning.

The 1972 statute outlines the state's role and its relation to regional councils-UMJOs and other types of regional and local TPAs. The linkage between regional plans and programs and the California Transportation Plan is also indicated. Citizen participation is provided for at the state and substate district levels through mandatory public hearing processes. The planning processes to be used are outlined with emphasis placed on "measureability". The guidelines specify that regional policies and objectives be stated in terms that facilitate measurement; "This requires that evaluation criteria be developed again through the public participation process" (16, p. 11). The multimodal process is broadly defined relative to mandatory subject areas to be considered. They include energy, wildlife and vegetation, aesthetics, neighborhood and community cohesion, housing, tax and properties, and agriculture.

The Transportation Development Act of 1971, as amended, provides a means for the state to raise and allocate funds in support of transportation at the substate and local levels. Regional councils-UMJOs and other types of TPAs were granted a key role in determining the allocation of funds out of local transportation funds established in each county. These funds are allocated to public transportation entities for capital and operating purposes. Specific provision is made for the use of funds in large metropolitan areas in support of transit and research and demonstration projects.

The San Diego Comprehensive Planning Organization (CPO) carries out regional transportation planning as 1 of 4 major planning areas. The other 3 are intergovernmental planning and management (including plan implementation activities and review and comment), regional growth and economic development (including land use), and environmental quality and natural resources. CPO has assisted in the preparation of a proposed new piece of legislation that would authorize the establishment of the San Diego metropolitan transportation district. The city-county district would implement the regional transportation plan prepared and adopted by CPO. Article 4 sets forth the powers and duties of the board of directors of the CPO relative to the district's board

of directors. These powers include approval of the facilities to be acquired and constructed, operational plans, financing, and the district's annual budget.

A brief review of developments affecting substate districts and regional councils in a few other selected states indicates the wide range of interest and activity taking place. The Colorado legislature enacted the Service Authority Act of 1972 as required by the 1970 constitutional amendment on local government. Citizens in metropolitan Denver voted in 1973 on a multifunctional regional service authority with planning and program implementation responsibility. The proposal called for the merging of several regional agencies, including the Denver Regional Council of Governments. The proposal would have granted the authority responsibility for 16 services, including transportation. The voters rejected the proposal. Advocates feel that the proposal can still win approval and are taking steps leading to another test. This approach represents a pragmatic compromise between formal regional government and voluntary regional councils with no inherent capability to implement plans and programs. It would also serve to reduce and halt governmental fragmentation at the substate district level.

NARC completed an evaluation and analysis of the feasibility of regional councils preparing regional improvement programs (RIPs) in 1973. Five regional councils participated in the project. The Metropolitan Council of Minneapolis-St. Paul was one of the participants. This council found that the RIP approach was useful and necessary to link planning with implementation. The policy body authorized the development of draft legislation for submission to the Minnesota legislature. All of the participating regional councils supported the RIP approach and found it to be politically feasible. NARC subsequently developed draft national legislation calling for federal support of the RIP approach in conjunction with federal planning and special revenue sharing (including community development).

The Puget Sound Governmental Conference is the regional transportation agency and works closely with the Municipality of Metropolitan Seattle, a federation of local governments, to implement plans and programs. The Municipality of Metropolitan Seattle works through the regional council to obtain UMTA and FHWA funds. The implementing agency has launched a free bus program that has reduced traffic congestion by some 20 percent while stimulating downtown Seattle business. The METO agency took over Seattle's 2 unprofitable bus lines more than a year ago and has turned them into going concerns linked to central city revitalization and regional development.

The Metropolitan Washington Council of Governments (COG), which serves the District of Columbia and portions of Virginia and Maryland, is deeply involved in transportation. Like many regional councils, COG does the planning and works with METRO, the transit authority, on implementation. COG's Transportation Planning Board has just taken a controversial position opposing an extension of Interstate 66. The Virginia Highway Commission has approved the extension. A legal battle could ensue. The matter is now before the Secretary of Transportation for final action. This example indicates that the COG is prepared to take steps to implement its plans and programs.

The Richmond Regional Planning District is now considering a consultant's report recommending a regional services demonstration program for the next 5 years. Transit was one of the services recommended for inclusion in the program, which is now being considered by the district and local governments. There is strong and vocal opposition to the proposal.

The Florida Commission on Local Government proposed legislation in support of multicounty planning and areawide service delivery commissions. The 1973 report outlined a broad proposal that recognized that, "in order to prevent the development and accumulation of plans without implementation possibilities, the multicounty planning commissions will require policy making and program operation powers" (17, p. 5). This proposal is receiving widespread attention and has attracted both strong support and opposition.

The experiences of Georgia and Texas contrast sharply with that of Michigan. These 2 states have been able to prevent the proliferation of separate multijurisdictional agencies outside the framework of comprehensive regional planning and development. Since 1965 Texas has been developing a system of regional councils that are

comprehensive regional planning and development agencies and review and comment agencies.

Experiences of other states with regional structures vary. Some states rely heavily on special-purpose districts, authorities, and agencies. New York, for example, has actively supported such agencies to deal with urban development, transportation, and housing. California's experience demonstrates that any particular form of regional structure, including regional government, must pass the stiff tests of American pluralism, pragmatism, and local self-determination.

States have initiated action on problems and opportunities within the framework of regionalism, and there appears to be a direct relation between the overall capacity of a state government and its posture toward regionalism. Available evidence suggests that state commitment to regional councils and other forms of regional structure is weaker in those states that have the capability of dealing directly with problems and helping local governments finance programs or projects. These states tend to have a stronger posture toward regionalism in terms of financing public services (including education and health), locating public works and facilities, and providing direct public services. Michigan, Wisconsin, New York, and California have strong executive and legislative branches; they provide substantial direct financial assistance to local governments and economically disadvantaged citizens, taking into account regional considerations. Texas, Georgia, and Virginia on the other hand possess strong state regional council systems but weaker executive and legislative branches. They provide little direct state financial assistance to local governments or programs having regional impact.

The status of local government does not appear to be a contributing element. Both Michigan and Texas have strong municipal charter provisions. Counties in Texas are weak, whereas they are relatively strong in Georgia.

A state's commitment to regionalism does not necessarily mean a commitment to the establishment of statewide regional structure or a substate system. Nor does a commitment to regional structure necessarily imply commitment to a process of regionalism on the part of the state government.

The critical importance of federal action was recognized by the "big seven" national public interest groups representing state and local officials in their joint December 1972 report. The report (1, pp. 2-3) noted:

> In spite of efforts of the Office of Management and Budget, including A-95 review and comment, the federal programs that encourage, support or utilize multijurisdictional organizations are badly coordinated, are inconsistent, and ignore the problems the programs cause general purpose local government
>
> The policies tend to greatly inhibit crossfunctional policy planning by local and state chief executives This problem appears to be due to the excessive functionalization of the planning and operating activities of the multijurisdictional organizations

Significantly, the report does not address itself to the need, validity, or rationale for the use of multijurisdictional, areawide organizations. Rather it begins with the assumption that regionalism is a fact of life. The question it seeks to answer is, How can we make it work?

The report presents a series of action recommendations addressed to the president, the federal executive branch, the states, and local general-purpose governments in support of umbrella multijurisdictional organizations. The definition offered for such an organization describes each of the Texas regional councils (1, p. 7):

> A multijurisdictional organization has policy control over two or more functional planning and policy development programs, each functional program having a corresponding advisory committee to assist the policy board of the umbrella multijurisdictional organization
>
> An umbrella multijurisdictional organization has coordinative powers and the ability to mediate conflicting policies among independent single purpose, functional agencies

Although the national administration seems willing to consider strengthening the A-95 review and comment process, it appears that the initiative for strengthening regionalism and regional councils must come from the national public interest groups, working independently and collectively with Congress, and from state chief executives and legislatures.

Future of Regionalism and Regional Councils

The current national administration claims to favor the solution of problems and the realization of opportunities through multijurisdictional approaches. Yet there is a certain air of detachment evident concerning support of regionalism and regional councils in the form of national policies, funding, and regulations linked with "hardware" grants.

The administration has taken a number of steps designed to place the responsibility for the future of regional councils almost solely on governors and local elected officials. Commitments to general and special revenue sharing have been accompanied by gradual withdrawals of federal areawide planning requirements linked to grants, federal funding incentives to state and local governments to stimulate the evolution of regional councils, and enunciation of strong federal policy in support of regionalism.

It is questionable whether the progress made by Texas and other states can be sustained without a strong, positive federal involvement. Moreover, regionalism may not have become embedded deeply enough within local political processes that local elected officials will actively strengthen regional structures in the absence of federal carrots and sticks. As one Texas Regional Council executive director commented: "At the crucial time when we are approaching real maturity and getting it together, we are faced with shriveled carrots and broken sticks." Another executive director noted that the administration's special revenue-sharing proposals fail to require or consistently encourage multijurisdictional planning and programming by umbrella regional councils.

The administration's trend is clear. Regionalism and regional structure will be endorsed in principle, but the states are to be the shapers of policy, the conduit for federal funds, and the source of requirements. This approach can hardly be expected to promote a national planning and development system that focuses on umbrella regional councils as the keystones in statewide planning systems designed to strengthen intergovernmental coordination.

ACIR concluded (12, pp. 15, 272, 217):

> The 1970s will be a watershed period for substate regionalism and for American federalism. Recent regional activity in metropolitan areas raises again many of the questions that accompanied the evolution of our federal system, including centralization-decentralization, responsiveness, representation, and accountability. Taken together, the above themes constitute an agenda of challenges that will have to be faced and successfully resolved if mild chaos is to be preserved and extreme disorder is to be avoided
>
> Obviously, the State role is of major importance to substate regions. If the organizations established to serve these regions are to be given governmental status, they must look to the States for it.
>
> Federal areawide programs, more often than not, have exhibited ambivalence as to the degree to which national objectives are to be carried out, and the degree to which the States and local governments, and the areawide organizations are to be allowed to exercise their own discretion Those Federal programs which have required areawide planning organizations covering whole areas as a prerequisite to continued Federal "hardware" grants–like the highway program–have promptly and completely blanketed eligible areas with organizations having the specified representational characteristics Those programs–like comprehensive health planning–which have not provided such strong incentives and directives have taken much longer to develop only partial coverage of their target areas.
>
> The Federal government itself has not organized effectively to promote general objectives in substate regions Every Federal areawide program except A-95 is administered by an individual Federal department or agency with its own priorities and with independently enacted legislation.

Separate constituencies have developed around these departments and agencies, their programs, and the responsible Congressional committees, leaving the President and OMB unmentioned. Although the Intergovernmental Cooperation Act of 1968 sought to give the Executive Office of the President a generalist oversight role with respect to a wide variety of programs, the resulting Circular A-95 has been little match for the vested interests and the special program "turfs" already staked out by them

ACIR also recognized (12, p. 109):

Regional councils are producing more and more comprehensive and functional plans, yet still lack the power to implement them directly or to compel or coerce constituent general purpose jurisdictions or special districts to carry out or abide by them

Even though a consensus is emerging regarding the need to perform certain urban functions on an areawide basis, only a handful of regional councils have been able to assume operational responsibilities for public services and programs

While considerable support exists among regional council directors, mayors, and county executives for these organizations to become umbrella agencies, the feudalistic attitudes of program specialists and the general public's opposition to metropolitan or regional government remain considerable barriers to expanded action

ACIR has taken a strong position in support of umbrella multijurisdictional organizations. The following excerpts (12, pp. 372-373) indicate the general nature of the type of regional agency called for.

The UMJO would be a comprehensive and functional planning, coordinating, programming, servicing and implementing body–in short, a regional council with some meaningful, but limited authority.

What would be the source of its powers to carry out these difficult functional assignments? A mix of positive Federal-State-local actions are recommended to provide the needed arsenal of powers to guide substate regional development

(1) The UMJO would become the preferred implementing instrumentality for all Federally assisted districting programs, thanks to State legislation establishing a comprehensive substate districting system and to the promulgation of a new OMB directive covering all Federally assisted areawide programs

(2) It would be assigned a decisive policy-guiding–but not operating–role vis-à-vis regional special districts and authorities by (a) a proposed amendment to the Intergovernmental Cooperation Act of 1968 giving such councils a review and approval authority over special district applications covered by the A-95 process, (b) State legislative action converting such districts via assignment of one or more controlling powers (appointment of the district's policy board, review and approval of district budgets and/or projects, project suspension authority, etc), and (c) concerted efforts on the part of local governmental representatives on special districts to have their umbrella unit designated as the policy board of such districts

(3) The UMJO would be assigned special review authority over State agency actions having a regional impact. Two amendments are proposed to the Intergovernmental Cooperation Act of 1968 to accomplish this. They would empower the organization to review State agency-sponsored major capital facility projects slated for its region and to resolve inconsistencies between them and regional plans and policies (provided the former are subject to the A-95 process or are financed in part by Federal block grant or, potentially, special revenue sharing funds). Moreover, pursuant to recommended State legislation, the UMJO would be authorized to review all such State agency projects and resolve any differences in light of adopted regional plans and policies At the same time, the governor would be authorized to veto any umbrella organization's actions that conflict with State plans or policies having statewide application or with policies or actions of another regional council

(4) The UMJO also would be assigned special review authority over certain local government actions having a multi-jurisdictional impact, including the powers to (a) review and resolve inconsistencies in A-95 covered applications submitted by constituent localities, pursuant to a proposed amendment to the Intergovernmental Cooperation Act, (b) review any proposed major capital facility of a local jurisdiction having a pronounced areawide impact that is to be funded partially or wholly from a Federal block grant or any special revenue sharing program and to resolve any inconsistencies between the proposed project and regional policies, under another proposed amendment to this Federal legislation, and (c) review and comment on all locally funded major capital facilities, as a consequence of recommended State legislative action. In addition, the UMJO would have its officially adopted regional policies or plans

recognized as guides for pertinent local governmental programming, planning and implementation activities, pursuant to proposed action by the governing bodies of its local jurisdictions

Such would be the powers conferred on these reformed regional councils by Federal-State-local actions. With them, an UMJO could speak with authority Without them, its areawide policy making and implementation roles would be faltering and feeble.

Significantly, ACIR is taking a strong stand on authority and heavy state financial assistance. The following findings (12, pp. 362, 636) indicate the general direction of ACIR's overall position.

The Commission is convinced that officially designated umbrella multijurisdictional organizations should be assigned the authority to take on areawide operating responsibilities when the need arises. Such authority should be carefully spelled out in the authorizing State statute, including specific provisions to cover the financing of any assumed operating function and to give local governmental members of each multijurisdictional organization a chance to react to and approve each proposed direct servicing role. Without this authority, the specter of an ever increasing number of special districts, admittedly of the subordinate variety, looms large on the future regional horizon. Such a development would complicate unduly the basic regional policy-directing and coordinating roles that this omnibus recommendation assigns to the umbrella organizations To maintain existing special districts in a separate operational status is one thing, but to assign the same status to new districts is quite another. The Commission is mindful of this basic distinction in urging the authorization, under certain constraints, of operational assignments to the officially designated umbrella organizations

Some of those opposed to State financial assistance to umbrella organizations take the stance that these organizations should be fundamentally local in orientation and in funding. Others claim that most of these bodies have been established as a result of or in reaction to Federal programs and requirements, hence, the chief outside funding for them should come from Federal sources.

These arguments, the Commission believes, are invalid The States–not local governments–are the constitutional repositories for non-delegated powers under the Constitution, and have a basic responsibility for ordering local and regional governance systems. The fact that States historically have been slow in reordering the pattern of local government responsibilities does not excuse them from now assuming the development of viable multifunctional regional institutions through the judicious and continuing allocation of funds.

Finally, the Commission wishes to underscore the fact that most of the organizations to be aided are part and parcel of a State substate districting system. This system, in many instances, is slated to meet State as well as local needs at the regional level To leave the funding of these instrumentalities with these purposes and with the representational formula called for here to the localities involved and to the Federal government, in our opinion would be an abdication of State responsibility in an area where it must grasp the mantle of leadership

The following excerpts (12, pp. 354-355) from ACIR's many recommendations seem most appropriate to a consideration of regional councils-UMJOs and their future role relative to regional development.

The Commission recommends that the governors and legislatures of all applicable States, after appropriate and adequate consultation with representatives of units of general local government and their respective State associations, develop and enact a consistent, comprehensive statewide policy to provide a common framework and a clear set of State and local purposes for existing and future substate regional planning, programming, coordination, and districting undertaking The Commission further recommends that, at a minimum, such State actions should provide for .

A The establishment of a formal procedure, involving participation by units of general local government, for delineating and revising the boundaries of substate regions, relying on specific topographical, economic, social, communication, political, and jurisdictional criteria specified in legislation.

B The required use of substate regional boundaries, insofar as is practicable, established pursuant to legislation by all State agencies to the extent that their implementation of State and/or Federally assisted State programs requires the geographic division of the State for administrative or other purposes

C. A specific process, involving the governor and the units of general local government in a

substate region, which results ultimately in the designation by the governor of a single umbrella multijurisdictional organization in each region, with such designation conferring the legal status of an agency of local governments.

D A membership formula which requires that there be State representation on each umbrella multijurisdictional organization but that at least 60 percent of the membership of each such organization be composed of elected officials of units of general local government within the substate region and that all such units must belong to their officially designated umbrella multijurisdictional organization.

E. A voting formula which requires a dual system involving the application of the one-government, one-vote principle in most voting matters but permitting certain larger local constituent jurisdictions to overrule this procedure on certain issues, thus bringing a proportionate or weighted voting procedure into operation

F Adoption and publication by each officially designated umbrella multijurisdictional organization of regional policies or plans and of a program for their implementation

G. Reliance by all State departments and agencies on the officially designated umbrella multijurisdictional organizations for any substate regional planning, programming, coordinative management, and districting activities in which they might engage pursuant to their assigned responsibilities under State or Federally-aided State programs

H Planning and programming inputs into the State planning and budgeting process on a systematic basis from officially designated umbrella multijurisdictional organizations

I. State designation of all official umbrella multijurisdictional organizations as the A-95 clearinghouse for their respective substate regions.

J. Conferring on all officially designated umbrella multijurisdictional organizations the power the review and approve, in light of adopted regional policies and plans, all proposed major capital facility projects of State departments and agencies which are slated for location in the organizations' respective substate regions.

K. Review and comment by officially designated umbrella multijurisdictional organizations on locally funded major capital facility projects proposed or authorized by units of general local government within their respective substate regions.

L. Assignment to each officially designated umbrella multijurisdictional organization of a policy controlling role with respect to the operations of multijurisdictional special districts and authorities functioning within their respective substate regions to assure conformance with adopted regional policies and plans.

M. Promotion of mutual problem solving by officially designated umbrella multijurisdictional organizations and rendering by these organizations of such services as may be requested individually or jointly by member units of general local government.

N. Authorization for officially designated multijurisdictional organizations to assume a regionwide operating responsibility with financing as provided in State legislation, subject to approval of a majority of member units of general local government representing at least 60 percent of the substate region's population

O A State program of financial assistance, on an ongoing basis, to officially designated umbrella multijurisdictional organizations

P Gubernatorial authority to disapprove any actions of an officially designated umbrella multijurisdictional organization after making a finding that such actions are in conflict with officially adopted State plans, policies, or actions having a statewide impact or in conflict with officially adopted plans, policies, or actions of another umbrella multijurisdictional organization.

To predict the effects of special revenue sharing or broad block grants or both on regionalism is difficult. It appears that states with a strong commitment to regionalism will seek new processes to fuse federal, state, and local funds and programs at the state and local levels. These states will probably continue to take aggressive legislative and administrative actions to establish trends and shape patterns concerning community growth, development, and social economic balance within regional frameworks. Significantly, actions taken by these states show a willingness to regulate the private sector on the one hand and an ability to forge new public-private sector partnerships on the other. It is not clear how regional councils and other forms of regional structure will fare in these states during the next 5 years.

The statements of officials and staff representing NARC indicate frustration over events at the national level, but optimism prevails as the regional movement finds new supporters. Ohio Governor John J. Gilligan's massive commitment to a statewide system of umbrella multijurisdictional planning and development organizations stands in contrast to national trends. The U.S. Chamber of Commerce, the Committee for

Economic Development, and other private sector leadership organizations are also advocating that every governmental level further refine and extend the concepts of regionalism and regional structure. Clearly, regionalism has become a fact of life within the American political process. State and local officials are making it work, albeit imperfectly. By the end of this decade, it seems safe to predict that a new and stronger generation of regionalism and umbrella regional structure will have emerged.

The interstate situation is beyond the scope of this paper. But, brief mention must be made because of the number of interstate compact agencies with planning and program implementation responsibility for transportation. ACIR noted (12, pp. 278-279):

> There are more interstate metropolitan areas than most people realize, and their number is bound to increase. These areas were not designed to be interstate, they just happened If political, administrative, and jurisdictional considerations were determinative, the major urban developments that mushroom into metropolitan complexes would be confined within single States, in order to simplify the conduct of State-local relations and the provision of services. . . .Three of the five largest metropolitan areas are interstate and many smaller but increasingly important urban centers are the hubs of interstate metropolitan communities The interstate metropolitan area will be with us for the indefinite future and will increase rather than diminish in importance.
>
> The ability of local governments in interstate areas like those in other parts of the State, to make or participate in extraterritorial arrangements (e.g , interlocal cooperation) is largely determined by the State government. Communities composing an intrastate metropolitan area have a common point of departure. Their powers and responsibilities may be affected by whether they are incorporated as cities, towns or villages, but their frame of reference is a common State law At any given time, they also deal with a single group of State officials.

ACIR concluded (12, pp. 310-311):

> The Federal government has played an important but somewhat ambivalent role in interstate metropolitan areas. In recent years, Congressional enactments and administrative policies have given increasing attention to the encouragement and financing of comprehensive areawide planning, urban transportation planning, and A-95 review and comment procedures encompassing whole interstate metropolitan areas. Comprehensive planning agencies in interstate metropolitan areas generally owe their existence to Federal funding requirements of individual Federal laws that there be comprehensive areawide planning as a condition precedent to the receipt of Federal grants, and their designations as A-95 review agencies.
>
> However, in most interstate metropolitan areas, comprehensive health planning, although it is supported by Federal financial assistance, is not performed on an areawide basis. Moreover, in most such places, it is performed by bodies independent of the regional comprehensive planning agency, thus making it difficult to coordinate health care with other services. In addition, there are no interstate law enforcement planning agencies even though this activity, too, is supported by Federal financial aid. Also, in a number of instances Federal programs emphasize States or special regions such as river basins, even though they vitally affect programs having metropolitan areawide significance or addressed to many problems of particular metropolitan concern.
>
> Because of the intensified jurisdictional problems faced by interstate metropolitan areas, and because of the importance of the Federal role in urban affairs, the development of a consistent set of national policies in support of interstate metropolitan areas could be especially helpful

The following excerpts (12, p. 348) from ACIR's many recommendations seem appropriate to indicate the extent of its support for the UMJO approach.

> Amendment of Section 402 of the Intergovernmental Cooperation Act of 1968 to give officially designated umbrella multijurisdictional organizations the power to review and approve or disapprove grant applications covered by the A-95 process which emanate from multijurisdictional special districts and authorities operating within these organizations' respective substate regions
>
> Amendment of the Intergovernmental Cooperation Act of 1968 to give officially designated umbrella multijurisdictional organizations the authority to review grant applications covered by

the A-95 process emanating from units of general local government within each organization's jurisdiction and to resolve any inconsistencies between such applications and officially adopted regional policies or plans, such applications to be processed by the pertinent Federal departments and agencies only when these inconsistencies have been resolved. The umbrella organization should exercise a similar role with reference to grant applications of State agencies for major capital facilities not having a multiregional impact located within each organization's substate region.

Amendment of the Intergovernmental Cooperation Act of 1968 to require that any major capital facilities projects having a pronounced areawide impact or intergovernmental effect, whether sponsored by a State agency, a multijurisdictional agency or authority, or a unit of general local government, must be reviewed and any inconsistencies between such projects and officially adopted regional policies or plans must be resolved by the officially designated umbrella multijurisdictional organization in the substate region wherein the project is scheduled to be located, provided Federal funds from block grants, or potentially from special revenue sharing programs are involved.

ACIR recommends the following (12, pp. 366-367):

A. The Federal government and the affected States join with the localities involved in developing a strategy leading to agreement on the boundaries of the interstate metropolitan areas and to establishment of a single officially designated umbrella multijurisdictional organization in each of these areas

B. The affected States formally recognize in their substate districting statutes the existence and integrity of interstate metropolitan areas and specifically consider these factors when delineating the boundaries of substate regional districts

C. The President initiate changes in OMB's Circular A-95 to require conformance, to the maximum extent possible, of all Federally assisted areawide planning, programming, coordination, and districting programs in interstate metropolitan areas to the boundaries resulting from joint Federal-State-local action, and the President mandate a policy of relying on the officially designated interstate umbrella organization as the sole policy board for those Federally assisted undertakings that are interstate metropolitan in scope and as the ultimate policy review and coordination board for those assisted activities which focus more on single State portions of the metropolitan area, provided that until the pertinent States have joined in designating such an organization, this policy would permit a majority of the counties and cities accounting for two-thirds of the population in the affected interstate metropolitan region to join in establishing their own preferred interstate umbrella organization and to request its official OMB designation for the purposes cited above.

D The affected States initiate and Congress subsequently approve amendments to all interstate compacts whose implementation has an interstate metropolitan area impact with a view toward conferring on the officially designated interstate umbrella organization the power to review and approve all capital facility programs and projects initiated by interstate compact bodies.

E. Congress amend the Intergovernmental Cooperation Act of 1968 to give officially designated interstate umbrella organizations, including locally initiated umbrella organizations, in metropolitan areas the power to approve or disapprove grant applications for major capital facilities assistance emanating from multijurisdictional special districts and authorities operating either within a single State's portion of or across State boundaries in an interstate metropolitan area and from units of general local government in the area.

F. The Federal government and the affected States, after appropriate consultation with the localities involved, join in drafting and enacting Federal-multistate compacts which define the legal status of umbrella multijurisdictional organizations operating in interstate metropolitan areas, spell out their general planning, programming, coordinative management, and other pertinent powers and functions, detail a membership formula which takes into consideration appropriate local, State, and Federal representation

G. The Federal government and the affected States make adequate provisions for the fiscal support of officially designated umbrella multijurisdictional organizations in interstate metropolitan areas, including locally initiated umbrella organizations by stipulating such support in the Federal-multistate compacts establishing such organizations and by earmarking for such organizations an appropriate portion of a general Federal-State block grant program of planning, programming, and coordinative management assistance to all interstate as well as intrastate organizations In instances where localities have been obliged to initiate their own preferred interstate umbrella organization, the Federal government should make arrangements for direct provision of financial support to such organizations.

Special Districts and Authorities

Although special districts and authorities are beyond the scope of this paper, they will play an increasingly important role in the implementation of transportation plans and programs. The number of special districts increased from 488 to 889 between 1962 and 1972. Highway districts decreased from 786 to 698, but transit districts increased from 10 to 33.

The trend to establish single and multimodal special districts will most likely continue. State government will be responsible for determining whether such districts are to be directly linked to substate district comprehensive planning processes carried out by regional councils-UMJOs. This trend also seems to be developing.

The SEMCOG-SEMTA linkage described earlier indicates how substate district comprehensive transportation planning within the framework of general-purpose comprehensive planning can support a substate district agency with operational authority. The initiative for SEMTA's establishment came from public and private leaders in the Detroit metropolitan area. SEMCOG proposed the linkage, and the SPA supported it throughout the legislative process. Then, as today, this Michigan approach does not represent an overall effort by the state to link transportation operating agencies to comprehensive planning agencies at the substate district or state levels. Nor does it represent an attempt to link both agencies to the Michigan Department of Highways and Transportation, the U.S. Department of Commerce, and other departments and agencies with transportation responsibilities in a consistent fashion.

California illustrates how statewide linkages can be developed. The state has provided the San Diego CPO and other regional councils with a strong state-down role in transportation planning. CPO is not proposing the establishment of the San Diego Metropolitan Transportation District. As indicated earlier, the district would be directly linked to CPO in a variety of ways. This proposal is a logical extension of the state's strong policy in support of transportation planning carried out within the framework of comprehensive planning at the substate district level. It helps to strengthen a state-substate district-local planning process.

The next generation of developments may witness the integration of regional councils-UMJOs into multifunctional regional service districts and authorities. The Denver Regional Service Authority proposal would have accomplished this. A variation of this approach would be to strengthen the planning role of regional councils-UMJOs (e.g., responsibility for the preparation and adoption of regional capital improvement plans and programs) and directly link them to multifunctional regional service authorities responsible for implementing the plans and programs approved. Georgia could accomplish this by consolidating several districts and authorities (e.g., MARTA) and linking them to ARC.

Federal policies and programs could be used to support the strengthening of regional councils-UMJOs vis-ã-vis special districts and authorities. Requirements for substate district planning tied to grants-in-aid and other forms of assistance should be used across the board by the federal government to help reduce the number of special districts and authorities and to ensure that those that are carrying out basic services are directly linked to regional councils-UMJOs.

Regional Government

Some advocates of stronger regionalism feel that regional councils-UMJOs should merely be a transition state leading to formal regional government. This viewpoint is not shared by the vast majority of local elected officials serving on regional councils-UMJOs. They still feel that regional councils-UMJOs should serve as local government service agencies and intergovernmental coordinating mechanisms. Many of these local elected officials also do not favor strengthening existing comprehensive planning processes at the state and substate district levels.

At ACIR's hearings, Francis B. Francois, president of NARC and councilman of Prince George's County, Maryland, stated (14, p. 2):

> There is one thing that we frankly don't need in America, and that is yet another layer or tier of government. We already have a very complex Federal-State-local three-tier governmental structure, and to add yet another layer is neither necessary nor desirable. And yet, as I read between the lines of the ACIR report look at its recommendations, and in particular read the staff summary entitled "Authoritative Regional Councils A Brief Analysis", I can only conclude that it is contemplated the regional council will emerge from the ACIR recommendations as such a fourth layer or tier of government. I believe this must be avoided.

This view appears to be dominant at the present time. For this and other reasons, the development of regional governments on a national basis seems unlikely for many decades. Today, there is no true regional government in the nation. Most so-called "metros" are city-county consolidated governments. The Toronto and European forms have consistently been rejected by American political leaders and public and private sector leadership organizations.

Emphasis will continue to be placed on establishing special districts and authorities. The extent to which these agencies can be linked to regional councils-UMJOs will largely determine the rationality of planning and service delivery in substate districts. States must play the key role. The Michigan legislation applicable to SEMTA-SEMCOG offers an example. Arkansas provides another. The Little Rock Metroplan Regional Council acts as the trustee for 3 member governments for the operation of the transit line.

The California Tomorrow plan and other proposals advanced by other advocates of some form of regional government in the state legislature clearly indicate the potential associated with regional government. Reaction to these proposals also indicates how difficult it will be to establish regional government without first building a strong regional citizenship. The Metropolitan Council of Minneapolis-St. Paul represents a first-generation compromise. The council was established by the Minnesota legislature in response to a broad-based citizen movement in the Minneapolis-St. Paul substate district. The council has strong planning responsibilities, including veto authority, and demonstrates that planning can be implemented without the need to establish a formal regional government. The significance of the state legislation applicable to both the metropolitan council and ARC is that it could be amended to provide for formal regional government. The technical aspects are there, including a means to achieve the necessary transition to the direct election of regional representatives.

The states, with encouragement by the federal government, will have the lead in establishing regional government. Two decades from now we may well see joint federal-state actions in this regard. The full implementation of a national growth and development policy will certainly focus greater attention on the need to implement plans and programs on a substate district basis. Environmental considerations alone may require the federal government to designate "endangered national districts" or "endangered national population districts" or both. A careful reading of the testimony offered by scientists before congressional fact-finding committees indicates that this is not fantasy. The Los Angeles basin has been declared a health hazard today. Statistics that few would dispute indicate that it will be an environmental death trap tomorrow. Action can only be taken by the state and federal levels in both the statewide and national interest. A regional government would be a logical helpmate in carrying out the types of programs required to conserve human, economic, and natural resources.

Findings

1. Congress, most of the major national public interest groups (including the National Governors' Conference), and other interested parties (e.g., ACIR) are demonstrating an interest in a new generation of multistate regional planning and development organizations whose functional responsibilities would include transportation.
2. The national administration continued to deemphasize the role of existing multistate planning and development organizations, and there appears to be no commitment to strengthening their intergovernmental position through federal financial incentives

and multistate planning requirements.

3. There is growing support within the public and private sectors for national incentives in support of the establishment of statewide planning systems with UMJOs serving each officially state-designated substate district (frequently referred to as state planning regions).

4. The findings released by ACIR in conjunction with its continuing investigation of regional structure clearly indicate that almost all elected officials at every governmental level do not favor regional forms of governments or greater use of special single- or multiple-purpose special districts and authorities.

5. The ACIR findings do indicate that elected officials at every governmental level, general citizen organizations (e.g., League of Women Voters), and private sector organizations (e.g., U.S. Chamber of Commerce) appear to favor UMJOs serving officially state-designated substate districts within every state.

6. There appears to be widespread support on the part of existing regional councils, as reported to ACIR by the president of NARC in October 1973, for becoming UMJOs within comprehensive statewide planning systems.

7. UMJOs offer a politically acceptable means short of formal regional or metropolitan government to transcend and coordinate the jurisdictional responsibilities of general-purpose governments at every level, special districts and authorities, and private sector interests through comprehensive policy and planning processes.

8. Regional structure is evolving in different states and in a variety of forms. Although it is not desirable to predetermine a particular form for every multistate, state, and substate district situation, the major national public interest groups, ACIR, and other interested parties suggest a positive federal leadership role in favor of umbrella multistate organizations and UMJOs.

9. Almost every state needs to sort out governmental jurisdictions relative to the various transportation modes, public works, public facilities, and regulatory responsibilities. Without such an effort, it will continue to prove difficult, if not impossible, for states to develop a statewide transportation system within a general statewide transportation policy framework.

10. Positive, consistent, and sustained federal leadership from within the executive office of the president, especially from OMB, is needed if progress is to be made toward the establishment of statewide planning systems with UMJOs serving officially state-designated substate districts within every state.

Recommendations

1. The Transportation Research Board should assume a leadership role in encouraging various transportation interests to support the following recommendations contained in the report of the 7 major national public interest groups (1).

2. In interstate urban areas, the thrust of federal programs concerned with areawide planning and intergovernmental coordination should be on increasing the abilities of local and state governments to develop the multistate character of the area. Toward this end, priority among federal programs concerned with areawide planning and intergovernmental coordination in large interstate areas should be directed to strengthening the ability of the interstate umbrella multijurisdictional organization to deal with areawide problems. In small interstate urban areas, due recognition and coordination will have to be given to the affected state planning and development agencies.

3. The interstate coordination of planning and policy development programs is a special problem requiring unique solutions worthy of a major study. Therefore, OMB should insist that urgent attention be given by all federally sponsored multijurisdictional programs to align their program boundaries with state-designated substate region boundaries to permit maximum initiatives for state implementation; take positive steps to encourage the integration of the policy boards of the variously sponsored and independent federal multijurisdictional programs into a single, areawide umbrella multijurisdictional organization; and insist that administering agencies recognize for funding purposes the priorities established by the umbrella multijurisdictional organiza-

tions that are composed of locally elected officials.

4. The umbrella multijurisdictional organization should be empowered to make decisions in order to resolve competing objectives and to set regional priorities that should be recognized by both federal and state funding agencies.

5. DOT should provide states and UMJOs, through states, with new criteria and factors that can be used to assign jurisdictional responsibilities to state government and local general-purpose governments.

6. The Transportation Research Board should work with ACIR and the Council of State Governments to develop proposed state legislation for introduction by interested states that would clearly mandate UMJOs to be responsible multistate or substate district transportation planning agencies for all state and federal purposes.

7. OMB should encourage all federal transportation agencies to require that federal financial assistance and planning requirements for areawide planning and programming be directed exclusively to state-certified UMJOs.

8. The Urban Mass Transportation Administration (UMTA) should deal with UMJOs through comprehensive statewide planning agencies.

9. DOT should tie all federal and state-administered federal transportation funds to the "pass-through" concept and give UMJOs a clear and strong interposition role between the federal-state levels and local general-purpose governments or multijurisdictional and local special district-authority transportation agencies.

10. OMB should work with comprehensive statewide planning agencies to encourage the enactment of state statutes and the establishment of statewide planning systems designed to enable UMJOs to analyze and exercise strong review and comment, and perhaps veto, authority relative to developments of regional impact (including multimodal transportation works, facilities, and services).

11. In official substate districts lacking a state-certified UMJO, OMB should encourage all federal transportation agencies to require that federal financial assistance and planning requirements for areawide planning and programming be directed to and through comprehensive statewide planning agencies.

REGIONAL TRANSPORTATION PROCESSES

Multimodal Programs and Linkages

Strong advocates of statewide and substate district comprehensive planning would argue that for statewide transportation planning to serve the interests of all citizens and to contribute to a balanced system it must be multimodal in character. The quest for multimodal considerations remains elusive.

Once again it seems important to start at the top of the state planning hierarchy. A strong central SPA directly responsible and responsive to the governor, as chief state planning officer, and linked with the central budget process is essential. Two researchers suggested to DOT in 1970 that SPAs were the most appropriate agencies to close the gap between policy generalists and functional specialists while also serving as the linchpin between various functions and governmental planning levels. The multiple-agency and intergovernmental character of comprehensive planning was stressed. Although these researchers acknowledged that no single agency could be responsible for comprehensive planning, they did conclude that a single agency to guide and direct the comprehensive planning process was needed. The following commentary (7, p. 74) on "counteracting picket-fence federalism" reinforces this conclusion:

> The theory and practice of policy determination and administration within our federal system has been the subject of debate centering around the culinary analogies of "layer cake vs marble cake" federalism A more accurate analogy, we would argue, is the "picket fence" character of contemporary U S federalism Here the horizontal bars of the fence represent the federal, state, and local levels of government The vertical slats stand for the alliances and associations

between like-minded professional specialists in the same program field connecting in a vertical fashion the levels of government

Outstanding examples of picket fence federalism are the highway and health fields A governmental report once called these vertical linkages "vertical functional autocracies " Most state planning efforts and the policy proposals included in this report are aimed at counteracting the negative features of picket fence federalism

At the state government level this need to overcome the vertical specialties focuses on the governor and his immediate staff functions Therefore this places a great priority on enhancing such staff functions as planning

To strengthen both comprehensive planning and statewide transportation planning, these researchers offered the following recommendations (7, pp. 65-66), which are as valid today as they were 4 years ago.

State-Level Review, Comment and Finding

The Department of Transportation should incorporate into federal transportation planning requirements a provision requiring that transportation projects funded by federal aid are reviewed, commented upon, and found to be in accordance with the goals and objectives of a comprehensive statewide development plan, including its transportation component, in states where acceptable functional and overall plans exist Certification of such plans shall be made on the recommendation of the governor of the state, and approved as effective by DOT with respect to the transportation plan and by an executive staff agency (e g , Office of Intergovernmental Relations).

Joint Funding

DOT should actively press for passage of the joint funding legislation pending before Congress After passage of this legislation DOT should entertain and encourage the development and submission of grant applications that propose the joint funding of state planning programs designed to relate transportation planning to overall state development planning

Consolidated Transportation Planning Grant

A consolidated grant for transportation planning should be authorized and funded. Such a grant, representing the collapsing of airport, highway, mass transit, railway and waterway planning authorizations, should be available on a formula basis to the states A specified proportion of the planning funds should be allocated to a discretionary fund and disbursed for special planning projects approved by the Secretary of Transportation

State-Level Allocation of Transportation Planning Funds

Once authorized, the allocation of transportation planning funds within the state should be at the discretion of the governor subject to review by the Secretary of Transportation Such review shall be for the basis of establishing

a The bona fide transportation-related activities supported by the funds, whether they be a state DOT, a state planning agency, a state department of community affairs, governor's policy staff, or other appropriate agency or personnel

b Periodic recertification of the allocation and/or designations of planning fund uses and agencies

c A showing by the governor that he has reviewed and approved of the transportation plan components developed under these funding arrangements

Linking Transportation Plans with Comprehensive Plans

Legislation should be proposed permitting individual states to use up to a specified percentage of federal planning funds for programatic planning purposes (airports, highways, etc) for planning efforts aimed at coordinating modal and intermodal transportation plans with comprehensive state development plans. The legislation should specify that the agency to carry out this charge will be designated by the governor and that this designation is subject to periodic review.

Since Hawaii organized the first state department of transportation in 1959, 23 other states have established transportation departments. Some of these are truly multimodal in character, but others essentially represent a relabeling of former highway departments and agencies. Regardless of the scope and integrity of the transportation

departments, it still can be argued that a SPA should be clearly placed in a policy and program development position vis-ā-vis transportation and other state departments and agencies as well as vis-ā-vis regional councils-UMJOs and other levels of governmental planning. This meant to suggest not that SPAs would take on line-operating planning and programming responsibilities but that SPAs along with other staff arms of the governor would serve to balance competing policies, programs, and priorities.

A case in point comes to mind. Had the Michigan Office of Planning Coordination and the Bureau of the Budget not become involved with public transportation issues in 1967, SEMTA and a state grant-in-aid program for substate transportation planning and programming may not have been realized within a 2-year period, if at all. As a result of these 2 executive office agencies working closely together and with external public transportation interest groups, progress was made. And, a strategic decision was made to lodge the grant program in the U.S. Department of Commerce to buffer it from traditional highway political pressures until a new constituency could develop to protect and expand it. This is the type of strategic involvement that a SPA can, and many would argue should, play to promote and foster multimodal transportation policies and programs rooted in public values and philosophies different from advocates of single modes.

Strong regional councils-UMJOs linked to SPAs can help guarantee multimodal considerations, and policy trade-offs are incorporated into statewide transportation planning. This approach suggests delays and certain general welfare or commonweal decisions that would be unfavorable to state transportation departments and single-mode advocates. Nevertheless, this approach is finding more and more supporters at every governmental level. The land mark Federal-Aid Highway Act of 1973 and policy changes by DOT at the national level suggest that we are embarking on a new era of transportation planning that will advance the art and science of multimodal policy-making and planning processes.

Table 1 (18, p. 7) gives the subject matter that statewide transportation planning should be concerned with and is a helpful reminder of the scope of multimodal considerations.

The 2-volume work plan prepared for the Pennsylvania Department of Transportation offers insights into the many difficulties associated with realizing multimodal statewide transportation planning. The report notes (19, pp. 1-2):

> A summary of the seven most critical transportation planning problems facing Pennsylvania has been developed
>
> The identification of these critical issues influenced the planning work program recommended for PennDOT If all models had equal problems, it would have been desirable to move forward on all modal fronts at the same time But all modes are not equal Highway, air, and rail problems appear to be more severe than those of other modes This tended to favor an approach that would focus on these critical problems, leaving other modes until later
>
> In the long run, a more objective and precise identification of what constitutes "severity" of a problem must be obtained To become more objective, the performance of a mode must be measured in terms of various goals (or objectives) that are commonly agreed to be important Goals form an integral part of the planning program that is recommended Measuring the performance of all the modes in relationship to the same goals will permit both a more accurate assessment of problems and the ability to do better multi-modal planning

Although certainly not applicable to all states, the following definition of statewide planning, as defined in the report for Pennsylvania (19, p. III-3), does help focus on the scope that must be addressed.

> a To attain a series of goals, or to improve performance in relationship to a series of criteria (as listed later in this section),
>
> b Of different groups people who travel, private firms that ship, private firms that sell transportation services[1], people who are in any way affected by facilities or services, and the general public,
>
> c By involvement in or recommending new, or changes in construction, operation[2], technology[3], price regulation[4], subsidy[4], and regulation of operations[4],

d For the following modes truck, rail freight, air freight, waterways, ports[5], pipelines, air passenger and general aviation[6], bus passenger, rail passenger, and highway (automobile),

e Planned by means of an orderly, objective process based on measurement, but including inputs by duly elected officials[7] and reviews by ad hoc citizen groups[7], and also including priority programming,[8]

f Closely integrated and coordinated with land use, economic, environmental, and other plans,

g For the entire state, including both urban[9] and rural areas, and

h. For time periods ranging to 20 years[10]

---

[1] Despite some disagreement within PennDOT, this group was left in the definition to express PennDOT's broad, general concern for the health of private carrier operations

[2] An overall view of the performance of each transportation mode, and selective adjustments or improvements, is needed to produce a better coordinated functioning of the entire system

[3] By technology is meant demonstration projects, or applied use of technological advances, rather than technological research and experimentation

[4] These items were left in the definition, despite some disagreement within PennDOT, to express concern about measures required to maintain a totally functioning transportation network

[5] One respondent felt that ports should not be included

[6] General aviation also supplies air taxi and business flying service, both extensions of air passenger service

[7] There was some disagreement within PennDOT on these inputs, but planning if it is to be effective, must knowledgeably reflect the views of concerned officials and the public

[8] This activity was included to bring closer a strategic, result-producing process and to avoid data-producing processes which fail to provide helpful tools for decision-making

[9] Yet state transportation planning for urban areas must recognize the intensive metropolitan transportation planning already under way, leave the details to metropolitan agencies while maintaining an overview, and seek to tie these efforts in with broader regional and state objectives

[10] None of the PennDOT persons interviewed desired a planning process looking further than 20 years into the future

The following outline of the levels of planning contained in the report (19, p. III-10) are also excellent as a point of reference.

The steps of the transportation planning process are applied at a series of different levels of planning This idea was generated in a paper by Bouchard et al [Techniques for Considering Social, Economic and Environmental Factors in the Planning of Transportation Systems Highway Research Record 410, 1972]

The levels at which statewide transportation planning are carried out are listed below, together with descriptions and examples to clarify the meaning

1 Policy Planning Policy planning is concerned with allocation of resources, principally financial, to the construction or operation of different types of transportation It is also concerned with regulation, both legislative and administrative Examples of important policy questions are.

a. How much should the state and the federal government invest in transportation as opposed to other types of governmental programs?

b How much should be invested in each of the different modes? Should operating support be provided to urban transit systems?

c Should the state concentrate more on urban transportation problems or inter-urban problems?

d Should the state spend more on interstate-type facilities, on the primary, or on the secondary systems?

e. What levels of transit service should be provided in smaller communities?

f Should the state support rail service to maintain rail access to certain areas?

2 System Planning This is long-range planning for major systems of facilities covering the entire state rail freight systems, highway systems, systems of airports, and the coordination of these systems The accent is on major facilities which are appropriate to be planned at the state level

3 Regional or Urban Systems Planning This is long-range planning for systems within urban areas, or within regions (multi-county regions) of the state The accent is on a more fine-grained approach

4 Corridor Planning. This is a special type of planning, where a corridor is being studied through which one or more modes of major facilities may be built Corridors may be urban or rural The decision to build is not firmly made, and these studies may produce evidence that no new facility should be built

5 Project Planning. This is more detailed planning than corridor planning, the decision to build has been made, and an approximate location has been fixed Project plans suitable

Table 1. Subject matter of concern in statewide transportation planning.

Subject Matter	Concerned With	Not Directly Concerned With
Highway	System design in principle for all systems (basically spacing and configuration), corridor location for primary and Interstate routes, investment levels by type, location, and timing (both intraurban and statewide)	Route location, engineering design, corridors of secondary highways in counties (unless owned by state), traffic engineering and control
Bus	Systems of routes (design and interline coordination), level of service (headways), generalized terminal location, pricing, bus size	Detailed terminal location, scheduling, internal management, operations, safety
Air passenger	Systems of air routes and airports, generalized airport location, size, and investment, airspace use, pricing, utilization of airport by type of airplane	Detailed airport location, scheduling, internal operations, air traffic control, safety
General aviation	Systems of airports, generalized airport location, size, and investment, airspace use, pricing, utilization of airport by type of airplane	Detailed airport location, scheduling, internal operations, safety, air traffic control
Rail passenger	Rail passenger systems, generalized station locations, pricing, service levels (headways), public investment, grade crossing protection	Scheduling, operations, safety
Rail freight	Extent and design of system, investment, terminals (especially TOFC/COFC), system speed and pickup frequency, rail-truck coordination, pricing, grade crossing protection	Scheduling, operations, safety
Truck	TOFC/COFC terminal locations, expressway location, truck size and pricing	Operations, details of TOFC/COFC location, safety
Canals	Investment and maintenance costs, systems as related to rail and highways, recreational use	
Ports	Investment, coordination with rail, highway, interport coordination and general location	Design, management, operations
Pipelines	Impact on rail, canals	
Land use	Relation between accessibility (by mode) and the distribution and level of economic activity, population distribution	Safety, management, operations
Environment	Preservation of natural, historical, and aesthetic resources	

Figure 1. Linked technology for highway planning.

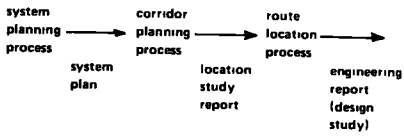


Figure 2. Experimental, flexible approach to highway planning.

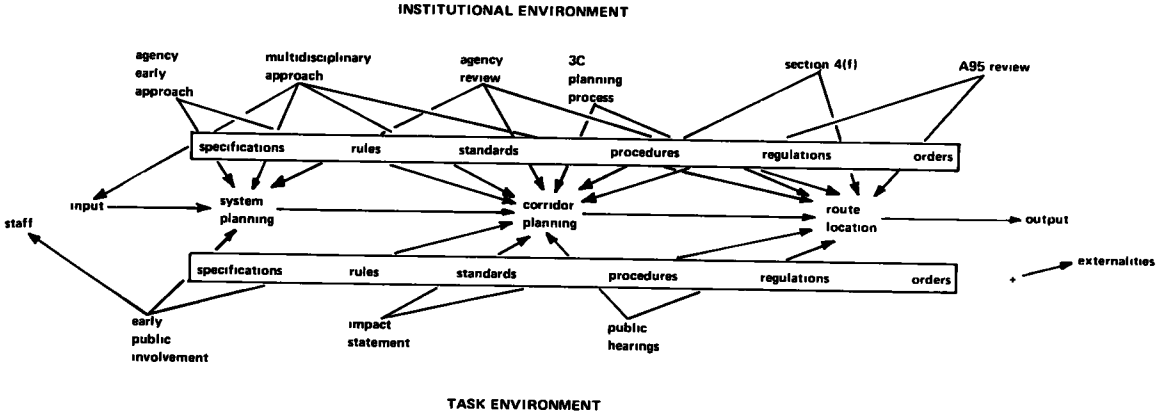
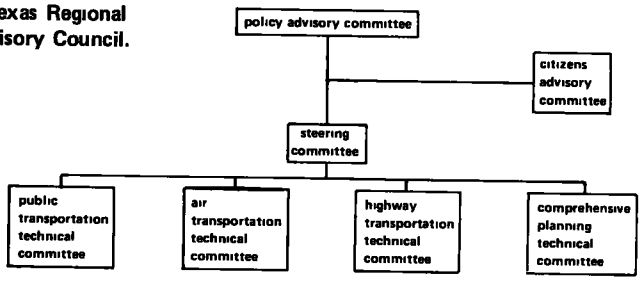


Figure 3. Organization of Texas Regional Transportation Planning Advisory Council.



for presentation at a public hearing are produced.

6 Engineering Design This is, of course, the most detailed type of planning

7. Planning for Management and Operations These are plans for improved management, maintenance and operations of all types of transportation facilities.

The consultants determined that the transportation department has a prime responsibility for levels 1 through 4 and secondary responsibilities for the rest.

The consultants were not particularly optimistic about the current status of multimodal transportation planning processes. They noted (19, p. V-1):

> A decade of steady hard work can be expected before a truly comprehensive, multi-mode transportation planning process will be established, on a continuing basis. At present, the data are insufficient and methods are not well enough developed Measures of the extent and severity of the problems in some of the modes are not available Considerable effort will have to be given to develop preliminary plans quickly, in order to have some basis for state policies and decisions, and the development of these interim plans will take manpower away from the improvement of various technical processes required by the comprehensive process.

The consultants did indicate progress was being made and that a multimodal process would emerge. It was suggested (19, pp. V-3 and V-4) that the process will, among other things,

> Be coordinated with an official state policy on population location and land development, having a demonstrable degree of "goodness" along specific parameters,
>
> Have the ability to determine the impact of land development on transportation service, and vice versa,
>
> Have the ability to determine and project, for alternative plans, the distribution of passenger trips between the available modes, taking into account the service (speed, safety, price) provided by the different modes,
>
> Have the ability to determine and project, for alternative plans, the distribution of freight shipments between the available modes, taking into account the service (speed, reliability, damage rates, cost) provided by different modes, and
>
> Have the ability to evaluate passenger travel patterns of alternative plans in terms of user costs, supplier costs, environmental impact, and impact on land use

The report concluded by recommending that the single-mode simulation-evaluation approach be relied on for the statewide planning of most modes. It concluded (19, p. III-28) that "the multi-mode simulation-evaluation approach is considered to be not well enough developed at present to be productive."

Adams (20) graphically depicted the 1960 linked approach to basic highway planning as shown in Figure 1. He suggested that this approach to the basic highway planning process in about 1960 served "to buffer the planning process (the technical core) from external influences" (20, p. 4). Thus, the core was protected from 2 types of environmental influences: the institutional environment involving regulations and intergovernmental relations (including review and comment) and the task environment including public involvement, coordination with private groups, interest groups, and so forth.

Figure 2 shows the approach now being experimented with in response to assaults on the buffered core and the organizational structure of the highway planning process. The change is dramatic. It is radical. And, in Adams' opinion, more change is on the horizon. He notes that Michigan's approach to the Action Plan was to shift to a process that allows flexibility to respond to new requirements while attempting to "provide a fit between transportation systems and the community" (20, p. 17). Adams cites the following examples of the federal policies that have led to the above change: the 2 public hearings requirement, environmental impact statements required under the National Environmental Policy Act of 1969, early public and agency involvement, and the reinforced requirement of a multidisciplinary approach interpreted through the Process Guidelines for the Action Plan.

The rate and intensity of change that is making statewide transportation planning more complex and multimodal in character are causing some legitimate concerns on the part of congressional committees, single-mode advocates, and other interest

groups. The American Association of State Highway and Transportation Officials is, for example, attempting to alter public policy in favor of rebuffering the technical core, at least to a greater degree than now experienced. This brief discussion seems more appropriate to future considerations of state planning vis-ā-vis statewide and substate district growth and development.

Every state is currently grappling with the latest wave of policy and programmatic changes enunciated by DOT and HUD at the national level. DOT's 1973 order dealing with Annual Unified Work Programs for Intermodal Planning clearly indicates that regional councils-UMJOs serving metropolitan areas are to play an increasingly important role in transportation planning. The multimodal emphasis and specific references to matters such as consideration of alternative courses of action, systematic interdisciplinary approach, identification of socioeconomic and environmental impacts, public involvement, and land use planning come across clearly. So does the support for a dynamic process. The order explicitly states that unified work programs are not to be just compilations of existing work programs. They are to represent integrated programs developed through a process.

Funding changes, including the intent that FHWA and UMTA fund the same metropolitan planning organization in each metropolitan area, should strengthen the role of regional councils-UMJOs in every state. The single-agency requirement related to FHWA, UMTA, and Federal Aviation Administration (FAA) funding has led many states to begin to rethink the intergovernmental planning relation that should exist among regional councils-UMJOs, local governments, and special districts and authorities, and state governments.

The DOT-HUD decision that the unified work program be merged with the HUD-required overall program design also signals an entirely new set of involvements at every governmental level. The Ohio Intermodal Planning Group, for example, includes representatives from the Department of Economic and Community Development (DECD) and OMB, for these 2 agencies have major responsibilities vis-ā-vis HUD and regional councils-UMJOs. HUD's interaction with DOT has already been institutionalized through the Regional Intermodal Planning Group.

The above changes found Ohio in the middle of its efforts to establish a statewide system of new regional planning and development organizations (i.e., regional councils-UMJOs). To keep Ohio eligible for federal funds, the governor designated metropolitan areawide agencies currently responsible for transportation planning until the new regional structures are in place. The Ohio Department of Transportation is now working closely with DECD and OMB to assist state-designated transition organizations to qualify for federal funds while at the same time restructuring themselves into regional councils-UMJOs.

DOT is working on new joint planning guidelines and requirements for unified capital and service programs. Multimodal considerations are stressed. It is obvious that more changes are on the way. There is reason for some concern relative to regional councils-UMJOs. The favorable DOT policy and funding changes find most states yet trying to come to grips with whether they want to support regional councils-UMJOs within the framework of a statewide planning system. Even states with a strong commitment to regional councils-UMJOs, like Texas, are now feeling the pressure from strong single-mode interests at the state, substate district, and local levels to allow transportation planning to be rebuffered at the metropolitan level. It is unfortunate that DOT's new directions are not accompanied by strong corresponding actions on the part of HUD and OMB in support of SPAs and regional councils-UMJOs.

Decision-Making

The current Texas situation offers many insights into the type of battle that will be fought at the substate district level as to who is to be responsible for transportation decision-making. Texas regional councils are finding that despite the strong policy support they receive from the central SPA, the Division of Planning Coordination in the Governor's Office, and the fact that they have received almost across-the-board

state and federal designations to carry out functional planning, a vulnerability exists. The policy and program compromises hammered out at the state level by the Texas Highway Department have resulted in institutional changes within several major regional councils that may effectively divorce transportation decision-making from the normal decision-making responsibilities of the general deliberative and executive bodies.

NCTCOG is responsible for comprehensive planning within 14 counties. This regional-council-UMJO also has responsibilities for such functional planning in the areas of transportation, health, manpower aging, public facilities and works, and law enforcement and criminal justice.

As a result of negotiations among the Texas Highway Department, the governor's Division of Planning Coordination, NCTCOG, and the 10 signatory local governments (including Dallas-Ft. Worth) in the intensive study area, a new decision-making mechanism within the framework of NCTCOG emerged.

After the decision to organize a Regional Transportation Policy Advisory Committee (RTPAC), a steering committee was organized as the first step. After some initial disagreement, the 20-member committee was established and held its first meeting in December 1973. The Bylaws and Operating Procedures for Multimodal Transportation Planning was adopted at this meeting. The bylaws state (21, pp. 1-2):

> Evaluation of transportation alternatives and the determination of the most desirable transportation system can best be accomplished through a committee of elected officials, as spokesman for the citizens, of counties and cities in the North Central Texas Region Such Policy Advisory Committees should include State and Federal elected officials in order to provide proper coordination and funding of transportation systems
>
> The Policy Advisory Committee should make recommendations involving the total transportation system to the governing bodies of the counties and cities for all modes of transportation Final decision for implementing the transportation plan must rest with the governing bodies of the counties and cities in the North Central Texas Region and the State Highway Commission

The 20-member Steering Committee consists of the following officials:

Agency	Seats
Counties	
Dallas	2
Tarrant	2
Cities	
Arlington	1
Dallas	4
Fort Worth	2
Garland	1
Grand Prairie	1
Irving	1
Mesquite	1
Richardson	1
Texas Highway Department	
District 2 Engineer	1
District 18 Engineer	1
Technical Committee	
Public Transportation	1
Air Transportation	1

The Steering Committee is responsible for all day-to-day operations and possesses considerable authority. The committee's responsibilities include reviewing and periodically revising the United Work Program for Multimodal Transportation Planning. NCTCOG and the Regional Planning Office of the Texas Highway Department provide the committee with administrative and clerical support.

The RTPAC membership is as follows:

Agency	Seats
Cities and Counties	
Local elected officials in the 14-county north central Texas region	102
U.S. House of Representatives	8
Texas Senate	9
Texas House of Representatives	36

It meets at least annually to provide general guidance, review the transportation plan and make recommendations to local governments and other agencies, and take actions on Steering Committee recommendations. Figure 3 shows its relation to the Steering Committee and the several technical committees provided for in the bylaws.

In mid-January 1974, the Steering Committee approved the 1985 transportation plan stemming from the Dallas-Fort Worth Regional Transportation Study completed by the Texas Highway Department. The committee agreed to review the findings and recommendations stemming from the Regional Public Transportation Study carried out by NCTCOG at a future meeting. The Committee also approved the 1973 Unified Operations Plan and the 1973-1974 Unified Work Program, documents jointly developed by NCTCOG and the Regional Planning Office of the Texas Highway Department. The Unified Work Program covers 14 months so that the budget year will conform to that of the Texas Highway Department. The committee also agreed to consider taking a position in support of a provision relative to regional operating agencies for public transportation in conjunction with the current Texas constitutional revision process. NCTCOG staff was asked to prepare a presentation. And, the committee endorsed the comprehensive car-pool program developed by Dallas along with an application for funding for submission to the Texas Highway Commission.

A similar approach to organization and structure has been taken by the Houston-Galveston Area Council (HGAC). A 21-member steering committee composed principally of local elected officials has been provided for along with a loosely defined policy advisory committee. Draft bylaws and operating procedures indicate (22, p. 1):

> Invitations to membership on the Policy Advisory Committee shall be extended each year to the following. the county judge of each of the counties, and the mayor of each of the incorporated cities in the Gulf Coast State Planning Region All state senators, state representatives, and U S congressmen serving from districts located wholly or in part within the Region will be invited to serve . Those accepting the invitation shall be voting members

The fact that local elected officials have been given a strong role in the approaches being used by the 2 Texas regional councils is encouraging. The discouraging aspects revolve around the fact that transportation plans and programs will be approved outside of the framework of the general deliberative and executive bodies of the councils. Even more important, transportation plans and programs will not be acted on by local elected officials in their capacity as "regional policy statesmen" on these bodies relative to comprehensive regional development plans and programs. Perhaps what we are seeing is the development of a new form of "buffering", one that buffers transportation decision-making from overall regional decision-making and the visibility associated with comprehensive plans and programs that allows diverse interest groups and citizens to react to given functions (e.g., transportation) within a broader perspective. Policies, priorities, and dollar resource allocations may well be distorted by the processes chosen by state and local officials in Texas. The burden rests fully with local elected officials to barter and trade within the processes to minimize or prevent distortions that would imbalance modes and work against the regional general welfare or commonweal.

Significantly, NCTCOG's transportation staff has posed the following issues to the RTPAC and the Steering Committee relative to comprehensive multimodal transportation planning and decision-making (23, p. 6):

What is the proper role and combination of travel modes to achieve the desired development in the North Central Texas area?

What transit projects need to be implemented to achieve the public transportation role of the total transportation plan? What priority should be assigned to each transit project? How should each project be implemented?

What airport projects need to be implemented to fulfill aviation's role in the total transportation plan? What priority should be assigned to each project within the Airport System Plan? How should each project be implemented?

Is an area-wide operating agency for transit needed? What characteristics should it have, and what is required for its creation?

What impacts will each alternative transportation system have on the social, economic, and environmental aspects of the area?

What will be the effect of an extended energy crisis on the transportation system? What transportation system can be planned and developed to allow for energy crisis?

Citizen involvement and participation require special consideration. Confusion still exists relative to these approaches. A satisfactory process for citizen involvement and participation in public policy-making has not emerged despite sincere efforts on the part of every governmental level, especially federal departments and agencies. Federal interagency task forces have failed to clarify how such a process might be developed and implemented. There remains considerable latitude for subjective judgment and interpretation at every governmental level.

Citizen participation and involvement at the substate district level has generally come to mean advance notification, public hearings, citizen advisory groups, and the appointment of citizens to policy and technical committees. Some regional councils-UMJOs provide for the election or appointment of citizen representatives to their general deliberative and executive bodies. For the purpose of this paper, citizen participation will mean advance notification and public hearings. Citizen involvement will mean a direct opportunity for citizens representing different socioeconomic groups and classes to advocate policies, recommend programs, and engage in decision-making within the institutional framework and processes of regional councils-UMJOs.

Citizen participation and involvement are difficult to realize at the state level, particularly in conjunction with long-range planning that affects basic policies, plans, and programs. How are citizens to be involved? What is expected of them? Are they to be a sounding board? Do they present alternatives? Do they formulate goals? Do they settle disputes? Are they to educate the statewide community? How are they to be selected? Does the state provide support services such as meeting facilities and secretarial assistance? Is this expecting more than the system can give?

State transportation agencies usually limit citizen participation to advance notification and public hearings to obtain citizen responses and reactions to proposals. Many states still rely on multiheaded policy boards and commissions to guide and direct transportation agencies. Even in the case of single-chief-executive forms of organization, policy and advisory boards or commissions are often required by state statutes or constitutional provisions. The weight of decision-making tends to be on the side of the providers and producers rather than on the side of the citizen in the role of consumer. The New York experience is of interest (18, p. 19):

In each of the ten regions of the state (excluding the metropolitan New York City area, which used different procedures) public meetings were held These meetings were co-sponsored by the New York State DOT and the Regional Planning Board, and were held in the region Prior to the meeting DOT mailed out information on the meeting and asked for responses to questions dealing with facility priorities, changes in regulations, transportation services that were needed, directions and form of regional growth and development, and so on These were directed to public agencies in the region, Chambers of Commerce, freight carriers, manufacturers, and others. Written responses in advance of the meeting were encouraged When the meeting was held, it was fairly unstructured, but covered issues raised before the meeting and developed some additional issues The meetings were taped and a report, cross referenced by speaker and issue, was prepared. New York expects to publish and circulate these reports for each district and then to hold public hearings Then, and only then, will statewide plans be finalized.

New York State has begun to deal realistically with the problem. However, citizen participation still breaks down at the local and substate district levels. It is difficult for citizens to influence decisions at the state level through existing processes.

Regional councils-UMJOs can play a major role in a statewide communications process, and SPAs can play a coordinative role at the state level. SPAs, directly responsible to governors as chief state planning officers, can provide the focal point for the exchange of information and the negotiation of differences. A vertical and horizontal process is needed that allows citizens to express their concerns and desires at the substate district level and through regional councils-UMJOs to SPAs, state transportation agencies, and state legislative committees. Citizens and interest groups can work within the existing institutional arrangements and still keep all their options open for direct pressure on local elected officials, governors, and legislators. At the same time, governors are directly brought into the process through their SPAs. A process that can lead to negotiation and policy trade-offs and in which SPAs and regional councils-UMJOs play the central roles seems to have real merit. Two-way communication involving SPAs and regional councils-UMJOs before and after decisions are made is essential if citizens are to be given an opportunity to take timely preventive and remedial actions.

Direct citizen involvement seldom exists at the state level except in the form of advisory committees and task forces and through the legislative process. Regional councils-UMJOs capable of mounting a state legislative program that represents "regional consensus" offer a way for citizens to extend their influence at the state level.

Federal policies and requirements have added to the confusion that surrounds citizen involvement issues at the substate district level. For example, throughout the 1960s, EDA encouraged the establishment of regional councils with policy bodies composed of local elected officials and representatives of diverse socioeconomic groups. HUD, on the other hand, favored regional councils with policy bodies composed of 50 to 100 percent local elected officials. Although HUD has encouraged socioeconomic balance on policy bodies, there is a growing trend for regional councils to reorganize in favor of policy bodies composed of at least two-thirds local elected officials.

The selection of citizens to represent socioeconomic groups and classes is difficult at best. Yet, despite the many problems associated with democratic selection and equity, there is an inherent value associated with the direct involvement of such citizens on the policy bodies and standing policy committees of regional councils-UMJOs. This approach gives members of groups and classes the opportunity to key on someone who can at least ensure that their views are made known in a forceful manner.

States have reflected many levels of compliance and cooperation with federal directives. Maryland has taken very positive actions to ensure citizen involvement and participation within the planning processes carried out by regional councils-UMJOs. Maryland's guidelines and requirements exceed those of federal agencies and are rooted in Article 66B of the Public General Laws of Maryland.

An innovative approach to citizen participation relative to transportation is contained in a bill introduced by a California assemblyman in 1973. The bill would create a Bay Area (San Francisco) regional planning agency to be the comprehensive transportation agency as defined in the proposed statute. Citizen participation is ensured through a public hearing process required in conjunction with the approval and revision of the comprehensive regional plan. Thus, the mandatory transportation element would be reviewed and acted on within the context of the total plan. This suggests that many new opportunities for policy, priority, and resource allocation trade-offs would exist. At the same time, provision is made for citizen involvement during the early stages of planning through citizens appointed to advisory committees. Since the proposed agency would have the authority to enact regional ordinances to secure cease and desist orders to prevent actions, the policy bodies would be composed of local elected officials or their representatives selected by member governments.

Adams of the Michigan Department of Highways and Transportation has, in reference to open planning processes, suggested (20, p. 16) "A solution to many of these problems is the use of multidiscipline teams which do provide for the involvement of all disciplines in the process as workers as well as reviewers, as public involvement op-

erators, as well as project developers." The process he suggested would include the following (20, p. 30):

> Establishment of citizen advisory groups through regional or local government agencies Citizen advisory groups should represent a cross section of interests within the study area
> Public Opinion Surveys–questionnaires either by mail, interview, or public meetings to test public attitudes
> Leadership Basemapping–identification of the formal and informal leadership in the study area. Identified leaders can then be contacted and interviewed concerning their opinions of the study issues. Improved contacts can be made with the general public through the identified leadership.

The above process marks an exciting departure from the past by a highway department noted for its powerful and rigid professional highway planning and engineering.

HUD and other federal agencies have attempted to ensure citizen participation and involvement for all social and economic groups. DOT has taken the following approach in its requirements (24, p. 1):

> Public Involvement. The planning process should provide for broad political and citizen participation and involvement Interested parties should be afforded adequate opportunities to express their views early enough in the process to influence the course of actions and decisions Reference should be made to methods by which information on the existence, status and results of planning studies are made available to the public

This relatively weak statement by the Department of Transportation has allowed states and regional councils-UMJOs considerable latitude—perhaps too much latitude.

The Bylaws and Operating Procedures for RTPAC (21) contain very weak references to citizen participation and involvement. The RTPAC and Steering Committee "may" choose to involve citizens through a citizens advisory committee. The word "may" is repeatedly used to retain as much flexibility as possible. The bylaws contain the following provision (21, pp. 14-15):

> CITIZENS ADVISORY COMMITTEE
>
> Section 5 The following rules shall govern the procedure, membership and records of the Citizens Advisory Committee
> A Membership. Members of the Citizens Advisory Committee shall be appointed for an indefinite term by the Executive Board of the North Central Texas Council of Governments. Members may be added as necessary.

The 1973 Unified Operations Plan approved by the Steering Committee contains the following explicit statement of intent (25, p. 22):

> It shall not be the purpose of the Citizens Advisory Committee to provide representation of all minorities or interest groups Input from these groups will be obtained through community involvement programs developed by the individual local governments Membership on the Citizens Advisory Committee shall initially be 27 members with expansion as required Appointment of the Citizens Advisory Committee shall be by the Texas Highway Department and the Executive Board of NCTCOG The Chairman shall be appointed for a term of two years beginning on January 1, 1974

Thus, while some states and regional councils-UMJOs move forward and recognize the validity and need to speed up increased citizen participation and involvement, others take a more cautious approach. Innovation is required.

The Metropolitan Fund, Inc., a Detroit-based nonprofit research organization, launched an innovative project in 1972. The project provided the impetus for an effort within the 7-county southeast Michigan region to establish a process that would yield a regional constituency. The final report outlined a blueprint for action to develop and establish a regional citizenship organization capable of taking policy positions and advocating courses of action at the local, substate district, and state levels.

Considerable progress has been made in establishing both the process and a formal institutional arrangement. Work on a regional agenda is under way. If this organizational approach is successful, it offers a new way for citizens representing different groups and classes to form political coalitions that can hammer out regional goals, analyze critical issues, set priorities, and take direct action. This regional organization can be expected to work closely with both SEMCOG and SEMTA. Transportation has already been identified as a major item on the regional agenda.

Implementation

The implementation of multimodal transportation plans and programs within the framework of statewide and substate district comprehensive plans and programs will continue to pose many difficult problems. For the near future, states and local governments will continue to have the primary responsibility for implementation. It does appear, however, that the concept of an enforceable regional plan and program, as suggested by California Tomorrow and outlined in the proposed California legislation to create a Bay Area regional planning agency, will continue to find support. Short of regional government, this approach seems to have the most merit in the long term. The short term will probably see more states taking a positive role in financing and in establishing transportation authorities directly linked to regional councils-UMJOs. In other cases states may, like California, link state financing to regional councils-UMJOs to provide them with more authority through regional policy-making that can directly influence or direct fiscal resource allocations.

State legislative action in 1970 was impressive in terms of the many departures from traditional approaches to transportation. Maryland became the first state to set up a comprehensive transportation trust fund. The fund draws revenue from the corporate income tax, highway user taxes and charges, and other transportation-related sources. The fund supports multimodal transportation, including transit. Pennsylvania established a state transportation authority that can help finance transit programs through bonding.

Seven states, including New York and California, took action in 1970 to allow local governments greater authority in establishing multijurisdictional urban transit agencies. Kentucky also enacted legislation in support of multijurisdictional transit agencies, and Ohio authorized transit authorities to include air, water, and land transportation.

States have continued to take actions to provide greater multimodal financial support downward to the substate district and local governmental levels and to authorize new institutional arrangements. In 1972 California established a comprehensive transportation fund and Florida enacted the Regional Transportation Authority Act. The Florida statute authorizes multijurisdictional authorities to develop multimodal public transportation systems.

It is important the regional councils-UMJOs be directly involved in state actions related to comprehensive transportation funding and the establishment of new substate district agencies. To ensure this involvement, state transportation departments, planning agencies, and legislative committees must initiate opportunities by establishing and maintaining close working relations with regional councils-UMJOs. Having regional councils-UMJOs look after their own interests will not suffice, particularly if one supports the position that the use of substate districts and regional councils-UMJOs is in the general interest of states.

The Twin Cities Business League (Minneapolis-St. Paul) recognized the keystone position of state government when it recommended that the legislature take action to strengthen multijurisdictional and multimodal transportation planning. The comprehensive planning and designated transportation planning agency, the Metropolitan Council, would benefit from the proposal. The league recommended (26, p. 13):

> The legislature should spell out that automobiles, public buses, private buses, school buses, taxis, rent-a-cars, car pools, and other ways used to move people around the metropolitan area shall come within the scope of transportation policy making. For the first time, an integrated approach to all modes would be possible. . . For example, all vehicles, including those used for goods movement, rather than (just for) passengers, would be included. . .

It is suggested by the authors that DOT take action to encourage every SPA working in conjunction with the appropriate state transportation agency or agencies to develop a specific implementation program as part of the now required joint DOT-HUD overall work program/program design. These documents should clearly indicate how regional councils-UMJOs are to be involved in implementation as well as functional and financial relations with other governmental agencies. The following excerpt from the North Central Texas Unified Operations Plans suggests a good point of departure for other states and regional councils-UMJOs (25, pp. 59-60):

> FUNCTIONAL AND FINANCIAL RESPONSIBILITY
>
> Accomplishment of all activities under this Unified Operations Plan shall be the responsibility of the North Central Texas Council of Governments and the Texas Highway Department All specific responsibility will be delineated in each Unified Work Program General responsibilities are described below
>
> A Functional Responsibility
>
> North Central Texas Council of Governments. The North Central Texas Council of Governments will be responsible for a portion of data maintenance activities for socioeconomic and transportation planning data, all strategic and operations planning for public transportation and air transportation, and for coordinating the multimodal planning decisions with the appropriate local governments
>
> Texas Highway Department. The Texas Highway Department will be responsible for a portion of the data maintenance activities for socioeconomic and transportation planning data, and for the strategic planning for highway transportation.
>
> B. Financial Responsibility
>
> Inasmuch as regional multimodal transportation planning requires close coordination and vital input from professional staffs of local governments, the parties to the continuing phase agreement will provide in-kind services in the form of review and evaluation during the planning process. In addition, the Dallas Transit System and Citran of Fort Worth will provide in-kind services through transit expertise and evaluation of operational alternatives.
>
> Financial contributions, both federal, state, and local, stratified by mode are as follows.

Transportation Mode	Federal	State	Local Cash Contributions	Local In-Kind Contributions
Public	UMTA	None	NCTCOG	Dallas and Tarrant counties, cities of Arlington, Dallas, Fort Worth, Garland, Grand Prairie, Irving, Mesquite, and Richardson, Dallas Transit System, Citran of Fort Worth
Highway	FHWA	Texas Highway Department	None	None
Air	FAA	None	NCTCOG	Dallas and Tarrant counties, cities of Arlington, Dallas, Fort Worth, Garland, Grand Prairie, Irving, Mesquite, and Richardson

> Specific cash contributions and in-kind contributions by agency and by work program element will be submitted annually in each Unified Work Program

Findings

1. **Intermodal and multimodal transportation processes remain inadequate despite the progress made during the past 10 years.**
2. **Participatory decision-making involving broad constituent interests needs to be**

increased relative to fundamental transportation policy choices at the state level are through the development of citizen input processes, and UMJOs should be responsible for providing citizens with factual information and convening appropriate hearings within the context of "regional" plans and programs.

3. Existing policy execution and program-project implementation vehicles at the multistate and substate district levels are inadequate on a statewide basis in every state.

4. Underfinanced and constituent weak modes should not be assigned to state transportation departments or "lead transportation agencies" until they have been ensured "competitive status" through policy support, financial support, and other actions.

5. Existing multijurisdictional comprehensive planning agencies with major transportation planning responsibilities are seldom directly linked with comparable multijurisdictional implementing agencies (e.g., metropolitan transportation authority).

6. State departments of transportation are desirable, but whether transportation policy, planning, programming development, financing, construction, maintenance, and operation can be coordinated and balanced in these agencies is doubtful unless broad-based constituent interests (e.g., transit) are represented on policy bodies (e.g., commission) or otherwise have direct and meaningful input into policy in the case of departments having a single executive.

7. Effective multimodal programs and linkages can probably best be realized by the federal and state governments choosing not to integrate modes until such time as each mode enjoys a position of "equalized modal competition" in terms of public policy support, financial support, and the ability to effectuate transportation trade-offs at the multistate, state and substate district levels.

8. Effective multimodal programs and linkages can probably best be encouraged by heavy "front-end" federal and state financial planning, program development, and program implementation assistance dedicated (i.e., earmarked) for transit, existing railroad branch lines, experimental nongas private vehicles, and other types of transportation alternatives.

9. It is unrealistic to expect a mission (i.e., line operating) department or agency at the federal or state level to advocate the mix of policies and programs required to realize balanced multimodal transportation.

10. It is the exception, not the rule, for Congress and state legislatures to specifically require that transportation policies, plans, and programs be directly linked to comprehensive planning at the state and substate district levels.

11. Substate transportation planning usually focuses on land use, public works, public facilities, and services without giving priority attention to recommendations intended to affect public and private sector transportation policies at every governmental level.

12. Railroad abandonment illustrates the type of transportation planning issue that comprehensive statewide planning agencies and UMJOs should routinely focus on relative to development programs and investment plans.

13. Consolidations of public and private transportation operations (e.,g., bus service) can be achieved by UMJOs with statutory authority and fiscal capacity using options such as the establishment of new public multijurisdictional transportation agencies, regional service authorities, or direct ownership and operation.

14. Direct state acquisition, ownership, and operation of multijurisdictional transportation agencies offer a fundamental alternative to substate district agencies established by, or with the involvement of, UMJOs.

15. UMJOs are in a keystone intergovernmental position to determine and present the facts relative to transportation questions associated with equity concerns (e.g., guaranteed accessibility to jobs and services for certain minority groups) and general welfare financing (e.g., pricing public transportation below true cost and then subsidizing to realize broader objectives such as energy conservation, reduced pollution, and congestion relief).

16. To be viable partners in transportation planning, UMJOs must have access to continued funding that is not totally dependent on local decision-making. In short, a

flow of state and federal funds in support of multimodal transportation policies, plans, programs, and projects must be available to UMJOs.

17. Although admittedly difficult to perfect and sell, the concept of a multimodal regional transportation trust fund or an omnibus regional transportation trust fund directly linked to transportation planning carried out by an UMJO warrants further research.

18. Clear and consistent federal and state transportation policies are required to ensure that every local general-purpose government is discharging its transportation responsibilities based on its fiscal capability and effort. This approach can help even out the extreme disparities that now exist within states, especially between central cities and suburban communities and between metropolitan and rural areas.

Recommendations

1. OMB should encourage all federal executive branch departments and agencies to discard references to "metropolitan" and "nonmetropolitan" areawide planning and agencies and rely on the general term "areawide" as defined by the latest official version of Circular A-95, as amended.

2. The Transportation Research Board should assume a leadership role and encourage every state transportation department or lead transportation agency to develop and publish guidelines or procedures [e.g., the California guidelines (16)] that set forth precisely how regional transportation processes are to be carried out and the role of UMJOs and other interested parties in the processes.

3. The Board should work closely with DOT and other interested parties, including the Council of State Governments and the National Governors' Conference, to amend the requirements and procedures relative to action plans for consideration of social, economic, and environmental effects (SEEE) to mandate a stronger role for comprehensive statewide planning agencies and UMJOs in the process.

4. DOT, especially the FHWA, should require that (a) the environmental action plan called for by the National Environmental Policy Act of 1969 be the responsibility of the comprehensive statewide planning agency in conjunction with the state transportation department or transportation lead agency and (b) the above state agencies include a clear and definite role for UMJOs.

5. The Transportation Research Board should work with selected comprehensive statewide planning agencies, the Council of State Governments, and the National Governors' Conference to design and carry out demonstration projects to determine how multimodal transportation programs and linkages can best be realized under different forms of state government organization and structure.

6. OMB in conjunction with DOT and other federal executive branch transportation mission agencies should employ incentives and sanctions to encourage governors and state legislatures to establish a single state multimodal department of transportation or, at a minimum, to legally designate a single state transportation lead agency as the focal point for federal agencies, UMJOs, local governments, special districts and authorities, and all other interested parties.

7. The Transportation Research Board should design and carry out several research and demonstration projects in conjunction with DOT and NARC to document how federal and state policies and programs could be strengthened to encourage UMJOs to take on the responsibility of implementing transportation programs and projects or to establish compatible subsidiary transportation multijurisdictional organizations (along the holding company model) to implement programs and projects in accordance with policies set through UMJOs.

8. The Board should design and carry out several research and demonstration projects with selected comprehensive statewide planning agencies in cooperation with state transportation agencies and UMJOs to determine how program and project implementation can be directly linked to UMJOs under various legal, organization and structure, financial, and local governmental circumstances.

9. The Board should design and carry out a research and education project in conjunction with the major national public interest groups to develop alternative state legislation that would strengthen the capability of UMJOs to engage in transportation planning and to ensure program and project implementation (e.g., the proposed Colorado Service Authority Act of 1972; the California Assembly Bill 2040, May 1, 1973, that would create the Bay Area Regional Planning Agency; and the California Assembly Bill 2648, August 27, 1973, that would create the San Diego Metropolitan Transportation District with mandated responsibilities assigned to the Comprehensive Planning Organization).

10. The Board should work with selected UMJOs (e.g., ARC) to document how multimodal transportation planning can be carried out by such agencies through formal (e.g., statutes, by-laws, memoranda of understanding, service contracts) arrangements with substate district transportation operating agencies and state transportation departments or agencies.

11. DOT should work closely with other federal executive branch transportation mission agencies to provide states with incentives and, if necessary, to impose sanctions on states relative to the use of state regulatory powers to integrate all types of privately provided public transportation into statewide transportation systems.

12. At least 6 national research and demonstration projects should be mounted in conjunction with selected UMJOs to determine the probable consequences of alternative land use patterns on minimizing multimodal transportation demands through changes in economic relations and life-styles.

13. At least 6 national research and demonstration projects should be mounted in conjunction with selected UMJOs to determine the probable consequences of alternative regional (i.e., substate district) transportation policies related to regional and community development goals and objectives in terms of future resource requirements and allocations for multimodal transportation.

14. National land use planning policies and programs should contain explicit reference to a strong role for UMJOs within statewide land use planning and management systems with emphasis on how transportation and other functions can be used to stimulate new patterns of growth and development (e.g., new communities) rather than merely respond to, or justify, existing trends.

15 OMB should work with the Federal Energy Administration (FEA) to develop a strong role for comprehensive statewide planning agencies and UMJOs relative to energy allocations for all transportation modes within and between official substate districts

16. DOT should design and carry out in conjunction with other federal executive branch transportation mission agencies, including HUD and FEA, several research and demonstration projects with selected UMJOs to alter consumer demand for various types of transportation works, facilities, and services. Appropriate state agencies and NARC should be provided the opportunity to directly participate in these projects.

17. At least 6 national research and demonstration projects should be mounted in conjunction with selected UMJOs to educate both employers and employees relative to the effect of alternative work (e.g., hours and days) and transportation (e.g., car pooling and park-ride) arrangements on congestion, accidents, pollution, energy, multimodal demand, costs, and other considerations.

18. DOT in conjunction with NARC should work with selected UMJOs to design and carry out special demonstration projects designed to inform all citizens of the facts associated with travel by the various modes (e.g., energy consumption of buses compared with private automobiles) and the options that are available and could be made available.

19. DOT should provide incentive funding to a selected group of UMJOs in conjunction with state transportation departments and agencies to systematically examine all alternatives and conduct cost-benefit studies to determine the best ways to halt the abandonment of railroad branch lines and in certain instances to resume commuter and freight services on abandoned lines.

20. The Transportation Research Board should in conjunction with DOT and other

interested parties, including NARC, design and carry out a research and demonstration project to determine alternative ways for state transportation agencies to strengthen the roles of UMJOs in nonmetropolitan (i.e., rural) substate districts or, lacking an UMJO, ways for states to ensure broad-based constituent participatory decision-making with the comprehensive statewide planning agency assuming the responsible leadership role.

21. OMB should work closely with federal executive branch transportation departments and agencies and comprehensive statewide planning agencies to establish a federal-state process that will enable all citizens and interested parties to hold both federal and state transportation departments and agencies accountable for transportation policies, plans, programs, and projects of regional significance through UMJOs.

22. OMB should assume a leadership role in conjunction with major national public interest groups, including NARC, to encourage Congress to amend the Transportation Act of 1973 and other relevant statutes in order to require that transportation planning undertaken at the multistate and substate district levels be directly responsible to executive and general deliberative bodies of UMJOs and that such bodies be composed of at least 51 percent local elected officials.

23. The Transportation Research Board in conjunction with selected state transportation departments should develop alternative approaches to ensure that broad-based constituent interests are guaranteed a direct and meaningful input into transportation policy at the multistate, state, and substate district levels.

24. OMB should seek clear statutory authority from Congress to require that advance public notice be given and at least 2 public hearings be held by appropriate UMJOs or state transportation agencies in conjunction with all modes of transportation planning.

25. The Transportation Research Board in conjunction with DOT should work with private and public service broadcasting networks to promote for television, school, and community usage the development of documentaries that indicate transportation alternatives and are designed to raise the level of awareness of all citizens and stimulate them to communicate their preferences to appropriate elected officials and interested parties in a position to take action.

26. DOT should work with state transportation agencies to develop technical criteria and factors that can be used in conjunction with court actions stemming from open-system participatory decision-making.

27 OMB should work closely with federal executive branch transportation departments and agencies to (a) encourage and strengthen comprehensive statewide planning agencies relative to making all special transportation or multifunctional (including transportation) districts and authorities responsible for submitting their policies, plans, programs, projects, and financial portfolios to UMJOs for review, comment, and disclosure to all citizens and interested parties; (b) ensure that all public funds, direct or indirect, made available by the federal government to all special transportation or multifunctional (including transportation) districts and authorities be linked to areawide planning requirements covering areas such as land use, energy conservation, environmental protection, and minority group benefit that are administered by, or through, UMJOs; and (c) provide all public funds made available by the federal government to such districts and authorities on a priority and incentive bonus if these entities are discharging multimodal responsibilities.

28 Congress should annually appropriate general federal revenue funds in support of multimodal transportation planning and programming through a transportation special revenue sharing with specific provisions made for fund allocations to comprehensive statewide planning agencies and state-certified UMJOs.

29. Single modal trust funds (e.g., highway, airport) should continue to be relied on by the federal and state governments, but there should be mandatory diversion of a fixed annual percentage for the support of all modes.

30. Federal policies and programs should be overhauled or developed to stimulate states to annually appropriate general-fund state revenue funds in support of multimodal transportation planning and programming on a statewide and substate district basis.

31. DOT and HUD should encourage counterpart state agencies to use federal planning funds to in turn encourage UMJOs to carry out cost-benefit studies and develop intergovernmental and multijurisdictional financial programs relative to the continuing costs for the operation and maintenance of certain types of public works, public facilities, and services (e.g., bicycle and pedestrian paths).

32. The Transportation Research Board in conjunction with DOT and other federal executive branch transportation agencies should design and carry out a research project with several states to determine how problems associated with multimodal trust funds and omnibus transportation funds at the federal, state, and substate district levels might be overcome.

33. The Transportation Research Board should design and carry out several research projects with selected UMJOs to determine alternative ways to strike a balance between user charges and general welfare subsidies, taking into account the probable economic impact of alternatives on consumers, suppliers, and every governmental level.

34. The Transportation Research Board in conjunction with several selected comprehensive statewide planning and multimodal state transportation agencies should design and carry out a research project to determine how single- or double-mode special transportation or multifunctional (including transportation) districts and authorities might be encouraged to assume multimodal responsibilities through cross-modal direct and indirect public subsidies provided through single or combined federal, state, and regional financial assistance programs.

35. DOT should design and carry out research projects in conjunction with other federal executive branch agencies to determine how the cross-subsidy process and federal transportation regulations applying to all types of publicly and privately provided public transportation might be used to ensure balanced multimodal transportation on a national, statewide, and substate district basis.

REFERENCES

1. Federally Sponsored Multijurisdictional Planning and Policy Development Organizations. Council of State Governments et al., Dec. 29, 1972.
2. Toward A National Growth and Development Policy: Legislative and Executive Actions in 1970 and 1971. Congressional Research Service, Sept. 21, 1972.
3. Humphrey, H. H. A Proposal For Achieving Balanced National Growth and Development. Government Printing Office, Feb. 26, 1973.
4. Democracy in the Space Age: Regional Government Under a California State Plan. California Tomorrow, San Francisco, 1973.
5. National Regional and Area Development Act. Task Force on National and Regional Development Policy, National Governors' Conference, Washington, D.C., Nov. 12, 1973.
6. Multistate Regionalism. U.S. Advisory Commission on Intergovernmental Relations, Washington, D C., April 1972.
7. Wright, D. S., and Beyle, T. L. State Planning and Intergovernmental Relations: A Report to the Department of Transportation. Univ. of North Carolina, Jan. 1970.
8. The California Tomorrow Plan. William Kaufmann, Inc., Los Altos, Calif, 1972.
9. Draft Operating Manual for Developments of Regional Impact. Division of State Planning, Florida Department of Administration, Tallahassee, Sept 24, 1973.
10. Final Report and Recommendations for The Big Cypress Area of Critical State Concern. Division of State Planning, Florida Department of Administration, Tallahassee, Oct. 1973.
11. Final Report. Florida Environmental Land Management Study Committee, Tallahassee, Dec. 1973.
12. Regional Decision Making: New Strategies for Substate Districts. U.S. Advisory Commission on Intergovernmental Relations, Washington, D.C , Oct. 1973.
13. Memorandum of Agreement. Atlanta Regional Commission et al., Dec. 20, 1971.

14. Hearings on Substate Regionalism. U.S. Advisory Commission on Intergovernmental Relations, Washington, D.C., Oct. 1973.
15. Bay Area Regional Planning Agency Law. California Legislature, Assembly Bill 2040, May 1, 1973.
16. Regional Transportation Plans Guidelines. California State Transportation Board, April 1973.
17. Special Report on Multi-County Planning and Area-Wide Service Delivery. Florida Commission on Local Government, Tallahassee, Feb. 28, 1973.
18. Statewide Transportation Planning· Needs and Requirements. NCHRP Synthesis 15, 1972.
19. A Work Plan for Statewide Transportation Planning. Creighton, Hamburg, Inc., Bethesda, Maryland, Vol. 1, June 1973.
20. Adams, G. R. Organizational Theory as Applied to the Action Plan Process. Michigan Department of State Highways and Transportation, Feb. 6, 1974.
21. Bylaws and Operating Procedures, Policy Advisory Committee for Multimodal Transportation Planning in North Central Texas. North Central Texas Council of Governments, Arlington, Dec. 19, 1973.
22. Bylaws and Operating Procedures for Multimodal Transportation Planning in the Gulf Coast State Planning Region. Houston-Galveston Area Council, Houston, Dec. 13, 1973
23. Condensed Status Report on Public Transportation and Airport System Planning. North Central Texas Council of Governments, Arlington, Dec. 19, 1972.
24. Annual Unified Work Programs for Intermodal Planning. U.S. Department of Transportation, Order DOT 1130.2, Attachment 1, March 16, 1973.
25. Unified Operations Plan. North Central Texas Council of Governments, Arlington, Dec. 19, 1973.
26. Engelen, R. E. Meeting the High Price of Transportation. Planning, ASPO, Vol. 40, No. 2, Feb. 2, 1974.

Discussion of Resource Paper

Thomas H. Roberts, Atlanta Regional Commission

Before making specific responses to various statements in Thomas' paper, let me open with a few general observations:

1. The paper stresses a great need for comprehensive planning so that transportation and other functional planning can be related to comprehensive planning. A major problem here is that there is an insufficient willingness to fund comprehensive planning. Some of the functionally oriented federal agencies are willing to fund their pro rata share of comprehensive work, others are willing but unable, and still others are unwilling. Adequate funding for transportation and other functional planning must be accompanied by adequate funding for comprehensive planning—that is, we need to fund the "glue" as well as the pieces.

2. Thomas deals with federal-state-regional-local relations from a national perspective and proposes a set of procedures and relations that would work fine on a uniform national basis, except for the fact that federal agencies, states, and regional agencies vary enormously from place to place and from time to time in their respective track records, capabilities, and status. Therefore, the imposition of any national uniform system that did not take account of these differences would do enormous damage in given instances. For example, a high-quality regional agency should not be forcefitted into a weak state context until the state capacity has been strengthened. In other words, where the tail is wagging the dog, the tail should not be weakened until after

the dog has been strengthened.

3. Another problem with implementing such a uniform national system is that the federal government is not internally structured so that agencies work together. For example, from my day-to-day metropolitan-level perspective, there is no "U.S. Department of Transportation." There is an UMTA, an FHWA, and an FAA, all with their own missions, procedures, funding rules, and guidelines. During 1969-72 there seemed to be considerable initial progress toward making the department into a cohesive department, but recent progress has not been heartening. For example, even the Integrated Grant Administration (IGA) programs are only as good as the willingness of the individual federal agencies to act in uniform or consistent fashion, in the absence of federal teeth to make them do so.

The remainder of my remarks consists of a series of paraphrased excerpts from Thomas' paper (identified as NT), followed by a response from me (identified as TR).

NT: The private sector increasingly supports the need for growth and development policies at every governmental level.
TR: At the same time, federal funding for comprehensive planning is decreasing.

NT: There is a federal consensus that state governments must provide the focal point for new intergovernmental planning systems characterized by 5 tiers—national, multistate, state, substate district, and local.
TR: There is a dilemma here. States have not been noteworthy leaders in this sort of thing in the past, so why should they be expected to come forth now? On the other hand, if they do not, the alternative is even sloppier yet—e.g., ad hoc consortiums of areawide agencies in lieu of a statewide context.

NT: There is no central federal focal point where policy analysis can be carried out systematically. Rather, reliance is placed on individual "mission" departments and agencies to conduct analysis and then attempt to reach consensus through committees.
TR: True. Even federal regional councils and IGAs have failed to break down departmental barriers.

NT: The U S. Department of Transportation is making progress toward a general rational transportation policy framework to directly link transportation policies with comprehensive planning directly accountable to governors, local elected officials as members of regional councils, and local elected officials as chief executives of local general purpose governments.
TR: From the "bottom-up" perspective, there is no U. S. Department of Transportation. It is a figment of the imagination. There is an FHWA, UMTA, FAA, and so on.

NT: Differential policies must be internally consistent within a general transportation policy framework at each governmental level.
TR: Beginning in Washington.

NT: State general transportation policy frameworks that are consistent with state general comprehensive policy frameworks are fundamental since states occupy the position of constitutional middleman.
TR: What "state general comprehensive policy frameworks" are you referring to? How has the federal-state-local relation proved to be necessarily superior to direct federal-regional or federal-local relations across the board? As you point out, most such state agencies have "a limited, if any, capability and capacity . . . ."

NT: There is a growing trend linking comprehensive statewide planning agencies with

central state budget agencies so that planning coordination leads to program implementation.

TR: Good idea. Where has it worked well and survived? In addition, there is a great need to link effective state-level comprehensive planning substate areawide planning.

NT: The Transportation Research Board should encourage transportation interests to support making the Office of Management and Budget the focal point for policies on regionalism and for coordinating all federal functional planning assistance programs.

TR: Great idea. But it must have teeth. Otherwise, amorphous things like federal regional councils and IGAs will not hack it.

NT: OMB should require all federal agencies to provide all financial planning assistance and implement planning requirements through comprehensive statewide agencies.

TR: Go slow here. This should only occur after or as the state agencies are upgraded in quality. Again, the situation varies from place to place, and this would make no sense in instances where it would subject a good regional effort to a new, substandard state effort.

NT: Comprehensive statewide planning agencies should be required to develop and approve all federally assisted or required substate district programs.

TR: Same comment as above. In some cases regional substate agencies have more expertise than states.

NT: Urban highway funds should be conditioned on each state possessing a comprehensive statewide planning agency responsible for ensuring the coordination of transportation with other state functional areas such as housing and with comprehensive functional planning at the multistate and substate levels.

TR: An excellent idea.

NT: There is interest in a new generation of multistate regional organizations whose functions would include transportation.

TR. What has Appalachia accomplished? This may be needed in certain limited interstate-complex situations, but is probably not necessary or desirable if good comprehensive state planning exists and is coordinated by effective comprehensive federal planning.

NT: ACIR finds almost unanimous agreement among elected officials at all levels that they do not favor regional forms of government or greater use of special single- or multiple-purpose special districts and authorities, but that everyone—politicians and citizens alike—seems to like UMJOs.

TR: This may change in the future if UMJOs do not hack it, and citizen groups begin calling for something that works better.

NT: UMJOs are a politically acceptable means short of metrogovernment to coordinate jurisdictional responsibilities at every level.

TR: Political acceptability may change if things do not work out. Success of UMJOs depends on effective ties to state agency implementation.

NT: OMB should encourage integration of the policy boards of independent federal multijurisdictional programs into a single UMJO.

TR: Emphasis on states has helped screw this up. To make this work, the feds will have to require mandatory pass-through of funds from the state level down to the UMJO.

NT: OMB should insist that federal funding agencies recognize the priorities established by UMJOs composed of locally elected officials.

TR: Absolutely.

NT: UMJOs should be empowered to make decisions in order to resolve competing objectives and to set regional priorities recognized by both federal and state funding agencies.
TR: This is good. The trick is to get UMJO governing bodies to do this in a technical and political context. A staff effort alone is no good.

NT: TRB should propose state legislation for 1975 introduction by interested states that would mandate UMJOs to be the responsible substate district transportation planning agency for all state and federal purposes.
TR: Model legislation looks good, carrot or stick is needed.

NT: UMTA should deal with UMJOs through comprehensive statewide planning agencies.
TR: No.

NT: Federal and state governments should choose not to integrate modes until such time as each mode enjoys a position of "equalized modal competition."
TR: What is the UMJO role?

NT: Railroad abandonment is the kind of issue that the comprehensive statewide planning agencies and UMJOs should routinely focus on.
TR: True. Some state legislation might be required that will reduce somewhat the independence of railroads with regard to railroad rights-of-way.

NT: To be viable partners in transportation planning, UMJOs must have access to continued funding not totally dependent on local decision-making. A flow of state and federal funds for transportation planning must be available to UMJOs.
TR: Yes. Funds should not have annual fluctuation and not be totally dependent on the state.

NT: The concept of a multimodal regional transportation trust fund directly linked to transportation planning by an UMJO warrants further research.
TR: Good idea. How about going the next step and permitting some of that money to be spent for nontransportation solutions to transportation problems (shorten or eliminate trips through other means)?

NT: The federal government should discard references to "metropolitan" and "nonmetropolitan" areawide planning agencies and rely upon the general term "areawide."
TR: Yes.

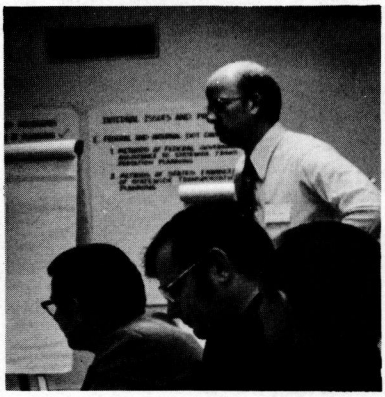
NT: TRB should encourage state transportation departments to publish procedures setting forth precisely how regional transportation processes must be carried out by UMJOs.
TR: See my earlier comments. It depends on the respective competency of state and areawide entities. Besides, other state agencies and UMJOs should be involved.

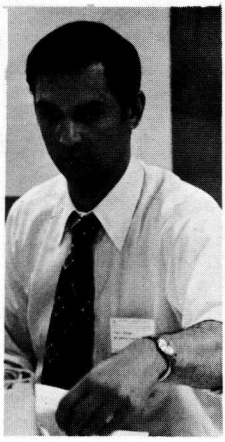
NT: TRB should conduct demonstration projects showing how states and UMJOs can be directly linked under various legal, organization and structure, financial, and local governmental circumstances.
TR: Although there are still flaws in it, the tripartite agreement between the Atlanta Regional Commission, the Georgia Department of Transportation, and the Metropolitan Atlanta Rapid Transit Authority would be a good prototype.

NT: TRB should work with the Atlanta Regional Commission to document how multimodal transportation planning can be carried out through formal arrangements with substate district transportation operating agencies and state transportation departments.
TR: Okay.

NT: Demonstration projects should be mounted with selected UMJOs to educate both employers and employees on the effect of alternative work (e.g., hours and days) and transportation (e.g., car pooling and park-ride) arrangements on congestion, accidents, and so on.
TR: We could do this jointly with MARTA.

NT: Congress should annually appropriate general federal revenue funds in support of multimodal transportation planning and programming through a transportation special revenue sharing with specific provisions made for fund allocations to comprehensive statewide planning agencies and UMJOs.
TR: Okay.





RESEARCH RECOMMENDATIONS

One of the assignments given to the workshops was to focus their discussions on needed research and to prepare proposals for specific research projects. Those proposed projects that workshop members deemed to have the highest priority were submitted at the conclusion of the conference to the Advisory Committee who assigned a priority ranking to each. The 11 priority projects are listed below according to the rankings assigned by the committee in this category.

Some of the workshops proposed other projects that are needed but were not considered to be so urgent as the 11 mentioned above. Descriptions of these projects are also given.

Priority Research Projects

Techniques for comparing alternatives in statewide transportation systems planning and programming

Evaluation techniques have traditionally been thought of in the context of "plan evaluation" (i.e., comparison of alternative system networks) or of "route evaluation" (i.e., comparison of locations for a given proposed facility). Although these evaluations and the techniques applied to them (such as user costs and benefits, balancing of travel demands assigned to a network with network capacity, and localized corridor impact anal-

yses) may still be valid for certain planning needs, they do not begin to cover the range of decisions that face policy-makers.

A number of separate influences from "outside" sources have combined to place transportation decision-makers in the position of making trade-offs and choices from among a range of alternatives and on the basis of a range of values never considered before. These influences include environmental concerns, changing social equity concerns, major decreases in available revenues, increased costs due to inflation, unified transportation funds and multimodal financial programming, energy shortages and energy cost increases, public interest in pricing mechanisms (tolls and fares) to influence travel, and federal interest in low-capital options. As a result, real-world decisions are neither so deceptively complete and elegant as choosing between system plan A and plan B nor yet so narrow and simplistic as choosing between the west route and the mid-town route. Instead, they involve multiple-option choices at the urban level and major financial programming decisions at the statewide level. No one evaluation methodology will suffice, and although some existing methodologies may be adapted for application, some new techniques may be required.

A review of ongoing transportation decision-making at the statewide level is needed to determine which decisions could benefit most from improved evaluation techniques. Then a review of available and proposed techniques should make it possible to narrow research to those most likely to provide early usefulness. Some promising or potential techniques that should be considered for research include

1. Measures of transportation service and definition of service levels, perhaps related to land use and population characteristics, that permit comparison of service levels, either on a modal or multimodal basis, without having to go through complete network analyses [functional classification of highway and transit facilities might be a starting point for this; accessibility (travel time) measures, user cost levels, relative availability to different population strata, and travel convenience are other possible parameters];
2. Transportation "needs" criteria that are relative, rather than absolute, and that permit comparison of multimodal or single mode needs from one area to another on a common basis;
3. Transportation cost-effectiveness approaches that permit not only making trade-offs among projects but also project scoping (i.e., down-scoping of design standards) or evaluating low-capital operational alternatives;
4. Standardized criteria for economic analyses of both user and community costs and benefits; and
5. Systematic impact-evaluation techniques that permit broader scale evaluations than those now made in connection with project-level environmental impact statements.

Role of and guidelines for involving private transportation companies in the statewide transportation planning process

The impact of public transportation decision-making on the private transportation company is not now considered on a formal, organized basis. Most private operators react to transportation policy in the legislative process. This research will identify the private sector's requirements that either affect or are affected by statewide transportation policies emanating from or recommended by the state agency involved. On the basis of an appropriate role in the policy and planning process, the research project will recommend structural and organizational relationships to integrate transportation in these processes.

The purpose of this research is to identify the relations of private transportation companies and state transportation policy-making agencies and to establish structural guidelines that will effectively integrate the requirements of the private sector in public transportation decision-making. A case study is also recommended.

Sketch-planning technologies for statewide planning

Procedures for developing a statewide transportation plan have, in many respects, followed the procedures employed by the urban and regional transportation studies of recent years. These procedures suffer from a combination of high cost, low reliability of results, and an inability to respond quickly and directly to policy issues.

There is a tremendous need for the development of simplified planning techniques that can be used at the state level. A number of aggregate planning procedures are available, and applicable parts of the existing urban and regional simulation techniques could provide parts of a necessary framework. Different levels of planning (state, region, corridor) will require different modeling approaches with varying levels of complexity and specificity.

The objective of this research is to develop an overall planning methodology that will be policy-sensitive and allow the testing and evaluation of alternatives in a fashion that will produce comparable, rapid, and reasonable-cost results. This effort should focus on application to issues of statewide planning concern, but should also suggest adjustments to allow application at more detailed levels.

Simple freight-demand models

Freight-demand models are required in order to estimate the effect of policy and systems changes on the movement of freight by various modes and carriers. Such models are needed primarily for major corridor-oriented projects within a statewide system. They must be fairly simple (i.e., not data-hungry) and have a fast turnaround time. They are needed quickly and, therefore, will probably have to be based on available data and reasonably well-known relations.

The models must have the capability of estimating the flows of given commodities on competing transportation modes as a function of the line-haul characteristics such as costs, levels of service, dependability, and other variables that can be altered by public actions.

The objective is to develop a simple tool to provide approximations of the quantities of freight reasonably expected to be moved by different transportation modes under given sets of assumed conditions. This tool would consist of a series of equations, or flow functions, whose results could also be used to derive approximations of the cost-effectiveness of moving particular commodities by particular transportation modes. In effect, the development of the flow functions depends on identifying the basic advantages and disadvantages that determine why classes of goods move as they do and on assuming that this rests on some systematic logic rather than on regulatory anomalies, lack of knowledge by shippers, and other nonlogical reasons. The resulting demand models may need to be considered behavioral rather than numerically predictive.

Freight data requirements for statewide systems planning

Many state and regional agencies, including transportation departments, are now preparing or assisting in the preparation of statewide plans for highway, rail, air, and water facilities to serve existing and future freight flows. Because this is a relatively new activity, the agencies often are not familiar with kinds of freight data that are needed and available for such planning, and what their reliability, continuity, units of aggregation, costs, and so forth are.

This research project has several objectives and probably could be divided into related but separate projects:

1. Identify the minimum freight data necessary for statewide planning purposes and distinguish such data in a matrix table of attributes such as weight, cubic volume, commodity type, value, container type, line-haul and distribution characteristics, and type of origin-destination identification needed;
2. Given the data needed, catalog and describe the characteristics of the data already available in terms of how well they meet the planning data requirements;

3. For needed data that are not available, design and describe data collection surveys, methods of processing and summarization, and means for maintaining needed data banks; and
4. For a hypothetical state, design a whole work program by which a state transportation department could acquire all of the freight data needed by it for a statewide multimodal planning effort and identify the time, staff, funding, and other efforts required to carry out the work program.

In addressing these objectives, the researcher should: (a) distinguish between data on individual freight shipments and data on sequential shipments of commodities from raw materials through manufacture, assembly, distribution, and so on to final use by consumers; (b) consider the joint use of freight data by shippers and carriers and by public planning agencies; and (c) look ahead to the analytical uses of such data in terms of forecasting generation, distribution, and modal split of future freight flows.

Federal-state-local transportation funding arrangements from the standpoint of statewide planning

The impact of various funding mechanisms or devices now in use on statewide transportation programs and transportation system development should be studied. Experience with the main funding approaches should be analyzed and compared by considering mode, institutional arrangements or organization, social and economic impacts, citizen participation, incidence of subsidies, and other factors. The effect of matching funds, trust funds, degree of funding flexibility, and other aspects of funding should be compared.

This project will assess experience with and differential impact or consequences of alternative funding arrangements.

Techniques and process of statewide planning and programming

Current state programming and budgeting processes are carried out with little substantive input from planning. Existing programming procedures tend to be incremental and disjointed. The actual decision-making process proceeds with nearly total insulation from ongoing planning activities. Planning has been unable to provide substantive inputs that have any meaningful impact on the programming decision process. As a result, planning either has created static documents (master plans) that have little or no impact on the decision-making process or has been used to support and justify programming decisions after the fact. Existing planning procedures produce statements of desired levels of service, land use configuration, and the like but do not respond to questions of policy in any ongoing sense. Fiscal planning proceeds on assumptions of static models; priorities are determined on an ad hoc basis, and little consideration is given to time-staging possibilities, project interdependencies, conflicts with other articulated social policies, or ability to compare competing alternatives or uncertainties in finding levels, demands, or community acceptances.

Research is needed in the areas of developing procedures (and formats) for planning to provide substantive and meaningful inputs for the programming-budgeting decision process. Planning procedures must be developed that relate present program-budget decisions to longer range considerations of future goals and that articulate the relation and implications of present alternatives to the future state of affairs. Research will, therefore, have to center on the existing process and means of restructuring that process to link planning activities to the programming process.

This project will develop systematic procedures that provide the opportunity for substantive input by planning into the programming process. These procedures must structure a systematic interaction among all "actors" who have a legitimate role in the programming process and the mechanism for communication among actors. The actors include, at a minimum, the actual legally constituted decision-makers, the state planning agency and other state agencies, the regional planning agencies, and the regional citizen's transportation advisory groups.

The research will study institutional arrangements and inputs and constraints recognized in the existing decision process. New process guidelines will be suggested that provide for a flow of information among all participants, a recognition of basic constraints, the articulation of priorities, and the way in which an iterative, cyclical, and participatory programming process should operate.

The project will also develop methodology in several areas to provide substantive inputs by planning into the programming process. Fiscal planning procedures must be developed to articulate the trade-off between investments in the transportation sector and investments in other economic sectors; the trade-off of investments within the transportation sector between competing modes and competing alternatives; the range of uncertainty in revenue projections and the implications of alternative investment strategies and levels of funding on level of service, the land use activity system, and other social sectors; and the assignment of direct and indirect benefits and costs for proposed and existing revenue sources, and the ability to deal directly with issues of equity. Impact-prediction techniques must also be developed that are easily implemented, quick, and low-cost and give reasonable indications of the implications of policy alternatives.

Land use and transportation decision system

The land use decision system must be directive as well as protective, and federal land use policy legislation and implementing regulations should reflect this emphasis. The land use decision system also must be such that the legal basis and statutory framework produces land use plans that can be relied on for transportation decision-making.

The Transportation Research Board in conjunction with the U.S. Departments of Transportation and Interior will design and carry out this project to develop a program to establish a continuing interinstitutional capability to monitor and report on processes of state land use direction and control systems. This project involves an inventory and evaluation of the impact of federal statutes and their respective implementation requirements that affect land use planning. The end product will be a report indicating how the processes of existing and emerging state land use direction (e.g., growth and development) and control (e.g., regulatory) systems now, or might, impact the nature and characteristics of the process of statewide comprehensive transportation planning systems at the state and substate district levels. Recommendations will be presented on options for ensuring the updating and availability of comparative data and information on a national basis.

Institutional relations influencing statewide transportation

Statewide freight transportation behavior and service are influenced by decisions of a wide variety of public and private groups. These groups include state departments of transportation, regulatory agencies and promotional agencies such as port authorities and turnpike authorities, shippers, carriers and their representatives, and unions. An effective solution to any identified transportation problems must take account of these groups and their interactions.

This project will identify the public and private agencies that influence statewide freight transportation service and suggest mechanisms by which these groups (especially public agencies) may improve their communication and ultimately their ability to coordinate their policy and implementation decisions in order to reduce conflict and better resolve problems.

Appropriate ways to introduce programming responsibility into regional (metropolitan) planning agencies

The purpose of this research is to study the effectiveness of different assignments of responsibility for programming to regional planning agencies and how they relate to the state transportation agency.

This project will identify ways in which the states intend to assign programming responsibilities at the metropolitan level. For several years, it will monitor and eval-

uate the way each arrangement works and the way it impacts on plans and programs and the resulting implementation. As resource material, it will focus on the monitoring of processes set up in response to the Federal-Aid Highway Act of 1973.

Organizational implications of coordinating policy, systems, and facility planning

Creating state departments of transportation and establishing their responsibilities for multimodal transportation systems planning and policy planning have created problems regarding assimilation, coordination, and continuity with processes that have existed for some time. Transfers of responsibility and assignment of new responsibilities should be undertaken smoothly, and proper interfaces should be maintained between all involved agencies and groups so that systems planning is consistent with the state's policy plan and provides appropriate input into the detailed facility planning to follow.

This research project will (a) ascertain the proper degree of overlap for department of transportation units assigned the policy planning, systems planning, and facility planning processes and their proper relation to metropolitan transportation planning agencies; (b) investigate the mechanisms within existing state departments of transportation for coordinating the levels of transportation planning and evaluate their effectiveness; and (c) recommend alternative mechanisms and assignments of responsibilities for these levels of transportation planning, considering the differences of states in terms of size, complexity, and organizational structure of the departments of transportation.

Other Research Projects

Policy Planning

Statewide decision-making structures for transportation policy, plan, program development

The purpose of this research is to study the effectiveness of institutional arrangements within the executive branch for developing transportation policy, plans, and programs in states having different characteristics.

The project will (a) identify existing institutional arrangements and responsibilities for transportation policy, plan, and program development in state executive branches, particularly transportation departments, and (b) identify strengths and deficiencies with regard to these functions as viewed by participants and interested parties in the policy, plans, and program development process and the degree to which they correlate with arrangements in states having particular characteristics. Resource material should include National Transportation Study narrative responses and proposed environmental action plans, but most of the research should focus on in-depth studies of particular states.

Role of state transportation departments and state regulatory agencies and their impacts on transportation policy and guidelines for combining or coordinating these roles

The intent of this research is to assess the impact of state policy-planning and regulation agencies that affect transportation decisions and to combine or coordinate these efforts to achieve a uniform state transportation policy.

New York State has combined the transportation policy and regulatory function into one agency. The project will analyze the New York State approach and those of selected states that have separate policy and regulatory responsibilities and provide a discussion of alternative strategies that either combine the 2 processes under one agency or coordinate the functions through various legislative or administrative means.

◯ *User charges in state transportation systems*

The project will evaluate the potential application of user charges, discretion available to states to apply them, and their usefulness.

Many opportunities are available to the states to employ user charges for various transportation services. However, these opportunities should be systematically identified and appraised from the standpoint of their potential to aid in implementing statewide plans and funding systems. How much policy influence can be exerted in this way? Can the states effectively influence demand for service, competition among modes, income distribution, and economic growth? Can user charges be effectively employed for coordinated policy purposes, considering existing federal, state, and local user charge responsibilities and policies and the potential for change?

Systems Planning and Programming Methodology—Freight Movements

◯ *Rail freight service curtailments and abandonments*

In many parts of the United States, private railroad companies have an excess of network mileage, which was provided originally under market conditions that predate contemporary characteristics of intermodal competition. Losses of longer haul traffic to the trucking industry have prompted rail carriers to curtail or abandon unprofitable operations, primarily low-traffic branch lines. Yet the controls exercised by regulatory agencies and the resistance of vulnerable local communities have retarded such cutbacks in the interests of "public convenience and necessity."

In regions of highest rail mileage density, moreover, this problem of excess capacity extends to the trunk-line system. Apparent redundancies in various railroad corridors throughout the Northeast and the Midwest have precipitated a large-scale effort to reorganize regional rail networks (i.e., according to the Regional Rail Reorganization Act of 1973). Federal legislation now provides authority to exclude particular trunk and branch lines from regional network plans, and any lines so excluded may be retired from service. To protect against severe economic impacts, that legislation also provides for state-administered subsidies to support continuation of such services. The individual states are required to prepare priority plans that are based on comparative cost-benefit analyses and other relevant considerations.

State agencies need methods for evaluating such proposals in terms of impacts on captive or competitively served shippers, local communities, overall quality of regional transportation services, and the carriers themselves. Also, any analysis of transportation property retirement should consider salvage potential as a function of various arrangements for ownership disposition—a question that requires judicious legal expertise. State agencies, therefore, must establish systematic programming procedures not only to evaluate individual lines, but more generally to provide for a comprehensive evaluation of all vulnerable truckage throughout the state in the context of prevailing property-rights institutions.

The problem of rail branch-line abandonment has drawn substantial attention in the form of several technical studies that have focused on aspects of intermodal substitution or coordination and distribution-point reorganization, import of the "34-car" rule applied as a warrant by the ICC, right-of-way reuse potential, and environmental impacts. Although awareness of these studies is not widespread, they provide a basis for developing systematic and comprehensive evaluation methodology by which state agencies can program the allocation of subsidies (or program the pattern of abandonment approvals) for particular network segments.

Further research is needed to establish an integrated methodology and ongoing process for this programming function. The results must provide for the identification and measurement of community costs (and possible benefits) associated with abandonment proposals and for economic considerations of the particular railroads involved. Economic analyses should examine costs of shipping via alternative carriers or modes, costs of intermodal transfers at some point en route if necessary (e.g., TOFC/COFC),

reductions in service levels (spotting frequency, transit time) and, more generally, procedures for determining whether the overall costs of abandonment exceed the level of subsidy required for continued operation (or for appropriate land use conversions). To develop objective analytical perspective toward the net incremental traffic and related environmental impacts of motor-carrier substitution is also important. Special circumstances such as grain production and coal mining should consider alternative transport technologies (e.g., conveyors) as appropriate. Finally, salvage value for alternative uses—within particular legal provisions for property-rights transfer—should be incorporated into the overall methodology.

That priority rankings should be developed in terms of traditional sufficiency ratings (as commonly used in highway programming) or other aggregate, scalar indexes is not a foregone conclusion. All impacts are not necessarily reduceable to monetary or otherwise commensurate terms; nor can different interest groups be assigned a priori weights of relative importance. Rather, broader procedures of participatory trade-off evaluation may be more appropriate.

◯ *Analysis of relations between freight transport and statewide development*

States have an obvious concern for economic development, and this concern has become especially deliberate with recent trends in migration patterns, environmental sensitivity, and railroad service abandonments. Contemporary policy formulation regarding investment and locational incentive programs not only must address the issue of aggregate statewide growth but also must discriminate in terms of preferred patterns of spatial distribution for such growth. Since transportation is particularly instrumental in affecting such patterns of development, statewide transportation planning must take careful cognizance of impacts on the spatial distribution of economic activity.

Furthermore, the spatial pattern of economic (and related demographic) activity is the ultimate determinant of the spatial configuration of statewide transportation demand. To the limited extent that statewide transportation planning methodology currently exists, all states (with the single exception of Connecticut) utilize techniques for zonal activity-level projection that are totally insensitive to the network configurations and service levels being proposed. This parochial approach to transportation planning is analogous to a boxer approaching a match with a prescribed scenario that assumedly can be predetermined independently of his adversary's reactions. Except for a few forward-looking studies, urban transportation planning has made the same mistake and consequently has produced inaccurate forecasts of travel demand patterns.

This action-reaction interdependency between transportation and development patterns must be embraced by statewide transportation systems planning. Although the literature has suggested some rather elegant schemes (e.g., multiregional input-output analysis) for statewide activity allocation analysis, the intent here is to develop relatively simple techniques for first-order impact projections. Such techniques will incorporate sensitivity to transportation policy through appropriate accessibility measures. Provisions for sensitivity to statewide developmental policy (e.g., as is likely to emerge under auspices of proposed federal legislation for statewide land use planning) should be considered secondarily at this time, i.e., developing techniques that may be readily extended for this purpose. A similar posture is expected regarding the treatment of residual emissions of industrial activity for purposes of environmental impact analysis.

The research should take full advantage of existing models of growth and development for urban and regional (and, in the case of Connecticut, statewide) analysis. The simpler structural features of such models (e.g., nonrecursive forms) should be identified and assembled into a readily operational model for larger states. The transferability of these structures to the statewide context will be based on (a) the reclassification of industrial activities into "unique" locators, interzonally sensitive locators as appropriate to county-level zonal systems; (b) the inclusion of natural resource endowments as a relevant attractive "activity" for selective industrial sectors; (c) the incorporation of freight network attributes into accessibility measures; and (d) the identification of appropriate time lags for such locational responses.

Environment-impact analysis for multimodal transportation system

An increased social awareness and concern for the environment have added to the complexity of transportation decision-making. The National Environmental Policy Act of 1969, the Environmental Quality Improvement Act of 1970, the Department of Transportation Act of 1966, and the Federal-Aid Highway Acts of 1970 and 1973 all have added requirements to transportation decisions. Included in these requirements is an environmental impact analysis or environmental study for most transportation projects. More recently, the Federal Highway Administration required each state to prepare an environmental action plan to indicate how the state will identify, measure, and consider environmental, economic, and social (EES) impacts at each activity level from statewide systems planning through construction and maintenance. These plans are currently being implemented by the states.

The problem is how to conduct environmental impact studies for multimodal transportation systems. As the statewide multimodal transportation systems planning process develops during the next few years, it will be necessary to consider the EES impacts at the systems planning level. Although techniques for project level impact analyses have not been perfected, they have evolved to an acceptable extent. On the other hand, techniques for considering EES impacts at the statewide systems planning level are either nonexistent or in their infancy. Yet, to be viable, the statewide transportation systems planning process must include citizen involvement and EES impact analyses.

The objectives of this research effort are to develop procedures for conducting EES impact analyses for multimodal statewide transportation systems planning. These procedures should include guidelines for identifying impacts and for measuring impacts, involvement of citizens and other public agencies, and broad considerations of multidisciplinary inputs. The desired output is viewed as a framework for conducting EES impact analyses at the statewide transportation systems level. Such a framework should be flexible enough to allow a study of energy-environmental trade-offs.

Mode-specific performance capabilities for freight transport

Statewide multimodal transportation systems planning and programming require measures of the performance of the physical system as well as output resulting from the utilization of the system. This is particularly true in evaluating alternative systems. However, before the evaluation step in the statewide planning process, relevant system performance measures must be identified and measurement procedures must be established. Since these performance measures are different for different modes, they must be developed as mode-specific measures. In a similar sense, the output or system utilization measures need to be mode-specific. Output measures such as ton-miles are not specific enough; output measures need to have service level modifications such as reliability and transit time.

Research is needed to determine which performance-output measures are most appropriate for the various modes so that, when they are combined into the multimodal statewide systems planning process, they will serve as evaluation criteria. That is, the most significant performance and output measures must be identified and used to evaluate alternatives. As indicated, these measures must be service-indicative in order to be responsive to the generation and evaluation of alternatives. And these 2 functions are the primary uses of the performance-output measures.

The proposed research will determine which of several possible performance-output measures should be used for each mode. The objective of the research is to identify and study the various mode-specific performance-output measures and to develop procedures for selecting the most significant ones to include in the multimodal statewide transportation systems planning and programming process. These measures will be useful both in generating and in evaluating alternative multimodal systems.

Policy-sensitive cost-performance functions for freight modes

State policies that are intended to influence the supply of transportation services must

often be implemented by indirect measures. These measures include actions that directly or indirectly affect the cost of these services. Improved highways and subsidies are examples of such measures. Various regulations include examples of state actions that may increase costs. To function effectively in this area, state agencies must be able to select for each mode the specific policies that will have the greatest desired impact on the supply of the affected transportation service.

The objective of this research is to develop for each mode a set of functional relations for use in predicting the manner in which a specific state action will affect the cost of the affected transportation service and the extent to which such cost changes will affect the level of the service offered to the public.

The research should examine the alternative policy tools by which the state may directly or indirectly affect the cost of transportation for each mode. It should then devise techniques by which the impact of a given state action on cost of services by the affected mode may be estimated. Finally, the research should produce a set of functions that can be used to predict how the various state-induced cost changes will affect the levels of services by the affected modes.

◯ *Physical distribution behavior of shippers*

To predict the effect of policy decisions with respect to the provision and quality of freight transportation facilities and services requires an understanding and description of the factors that influence distribution (plant and warehouse locations) and mode-choice decisions and an understanding of the manufacturing, inventory, and distribution practices of firms in selected critical industries that have a large impact in intrastate freight movement. This research involves an industry-based analysis to provide basic behavioral insight into firm location decisions that affect freight generation and policies for distribution and warehousing and the pattern of freight flows and mode choice that constitute the effective demand for the services of carriers.

◯ *Terminal location*

Changes in fuel availability, environmental impacts, and land use constraints are reshaping the need for systematic analysis of freight terminal locations and design. Recent state-of-the-art studies have often advocated large, consolidated omnimodal facilities. Operational experience has revealed this approach to cause physical and behavioral problems that negate the claimed theoretical efficiencies. Recent examples of rail-truck terminal linkages (TOFC/COFC) have given evidence of counterproductive flow patterns.

Air, water, pipeline, and rail operations and the distributive system of trucks have high capital requirements that impact the environment and dictate long-term land use. Research is needed to rationalize on a systems basis desirable freight terminal locations (intermodal and intramodal) including area of service, land use patterns and availability, transit time, and environmental and fuel considerations.

State and Regional Development

◯ *Transportation planning processes and their relations with multifunctional planning and decision-making*

A broad, explicit statewide and regional context for transportation decisions is recognized. Transportation planning resources (funding and manpower) and implementation procedures, in concert with general planning assistance funding support, should apply this principle more fully.

The federal government should require the preparation of an annual integrated program of planning at the state and substate regional levels. Each state program should demonstrate how the agency responsible for statewide comprehensive planning is realizing policy and planning coordination between state agencies, substate regional plan-

ning agencies, and state legislatures. Attention should be directed to the formulation and use of uniform ranges forecasts in the foregoing relations.

There should be a comprehensive planning focus in the Executive Office of the President and a substantial and continual base of financial assistance to statewide and substate entities. A national planning and planning coordination assistance fund should be established through an annual congressional appropriation or by authorizing a fixed percentage of major federal planning financial assistance to be allocated to the establishment of this fund.

State legislatures should fulfill their constitutional policy-making responsibilities and, to that end, provide for necessary planning responsibilities resources.

An evaluation framework for transportation decisions is needed to monitor impacts and results.

Based on these principles, research should be undertaken to (a) explore and report on cause-effect relations between transportation and other planning elements with respect to development decisions at the state and substate level, including an identification of linkages; (b) evaluate the effective use of identified linkages in transportation planning processes; (c) provide information on a wide range of impacts (development, environmental, social, economic) of statewide transportation actions; and (d) examine the relation of transportation and land use planning and its effectiveness to the functioning of the legislature.

◯ *Transportation planning, comprehensive planning, and institutional structures for decision-making*

The state role should (minimally) (a) provide a procedure that would ensure executive and legislative participation in the formulation of policies to guide the preparation and implementation of plans, (b) undertake priority programming to guide and coordinate state expenditures, (c) provide for continuity of the statewide planning process, and (d) provide for the integration of regional and functional planning into the statewide planning process.

Based on this principle, the Transportation Research Board should investigate the feasibility of establishing a "system of accounts" to guide the systems analysis process for land use and transportation planning.

Transportation planning must embrace all modes of transportation, public or private, and should take into account the role and utilization of the private sector.

Based on this principle, the Transportation Research Board should (a) inventory the types of information and information systems that statewide transportation planning requires regarding the public and private sectors in order to formulate an integrated transportation plan and (b) investigate the desirability of combining the transportation regulatory function with the agency responsible for operation activities.

◯ *Regional agencies and planning*

Regional planning and decision-making processes provide opportunities for perspectives and participation not normally included in state transportation planning processes. Whether the regional institution derives from local government or state government, state transportation planning organizations should seek out areas for planning and institutional support of regional decision-making.

The Transportation Research Board should identify alternative structures and organization of regional agencies that undertake transportation and land use planning, including the examination of responsibilities, programs, and accountability.

PARTICIPANTS AND ADVISORY COMMITTEE

Participants

DAVID AGGERHOLM, Institute for Water Resources, Ft. Belvoir, Virginia
DAVID ALSCHULER, Associate Professor, Department of Civil Engineering, Massachusetts Institute of Technology, Cambridge
BERT ARRILLAGA, Transportation Systems Planning, Mitre Corporation, McLean, Virginia

PAUL BAY, Metro Transportation Committee, Berkeley, California
SALVATORE J. BELLOMO, Alan M. Voorhees and Associates, Inc., McLean, Virginia
M. F. BRENAN, Director, Advanced Planning Division, West Virginia Department of Highways, Charleston
ROBERT BREUER, Head, Research and Applied Systems Section, New York State Department of Transportation, Albany
HORACE H. BROWN, Planning and Budgeting Division, Connecticut Department of Finance and Control, Hartford
J. P. BUCKLEY, Director, Technical Services Division, Highway Users Federation for Safety and Mobility, Washington, D.C.

ALAN G. BULLEN, Associate Professor, Department of Environmental Systems, University of Pittsburgh
LEO E. BUSSER III, Management Services Officer, Virginia Department of Highways, Richmond

WILLIAM JOHN CAMERON, Assistant Secretary for Planning, North Carolina Department of Transportation, Raleigh
E. WILSON CAMPBELL, Assistant Commissioner for Planning and Development, New York State Department of Transportation, Albany
HARRISON CAMPBELL, Charles River Associates, Inc., Cambridge, Massachusetts
WILLIAM N. CAREY, JR., Executive Director, Transportation Research Board, Washington, D.C.
EVERETT C. CARTER, Professor, Department of Civil Engineering, University of Maryland, College Park
MILDRED CLARK, Associate Editor, Transportation Research Board, Washington, D.C.
KENNETH E. COOK, Transportation Economist, Transportation Research Board, Washington, D.C.
ROGER L. CREIGHTON, President, Creighton, Hamburg, Inc., Delmar, New York

LOUIS L. DAVIS, President, LEX Systems, Inc., Menlo Park, California
JOSEPH DRAKE, Department of Environmental Systems, University of Pittsburgh

ARNE GAUSMANN, Director, Bureau of Systems Planning, Wisconsin Department of Transportation, Madison
JOHN O. GERALD, Program Leader, Transportation Economics Group, National Economics Analysis Division, U.S. Department of Agriculture, Washington, D.C.
FRANK GEREMIA, Statewide Planning Program, Rhode Island Department of Transportation, Providence
GORMAN GILBERT, Assistant Professor, Department of City and Regional Planning, University of North Carolina, Chapel Hill
HOLLIS R. GOFF, Assistant Director, Planning-Research, Washington State Department of Highways, Olympia
JAMES GRANNUM, Manager, Transportation Development Department, Highway Users Federation for Safety and Mobility, Washington, D.C.
PETER J. GRAZIANO, Project Manager, Roy Jorgensen Associates, Inc., Atlanta

DOUGLAS F. HAIST, Director, Bureau of Policy Planning, Wisconsin Department of Transportation, Madison
IRVING HAND, Professor, Pennsylvania State University, Middletown
LAWRENCE J. HARMAN, Assistant Director—Planning, South Florida Regional Planning Council, Miami
JOHN HASSELL, Systems Research Chief, Georgia Department of Transportation, Decatur
PHILIP HAZEN, Office of Highway Planning, Federal Highway Administration, U.S. Department of Transportation, Washington, D.C.
FRED HEMPEL, Highway Engineer, Office of Environmental Policy, Federal Highway Administration, U.S. Department of Transportation, Washington, D.C.
JERE J. HINKLE, CONSAD Research Corporation, Pittsburgh
LESTER A. HOEL, Acting Director, Transportation Research Institute, Carnegie-Mellon University, Pittsburgh
EDGAR HORWOOD, Department of Civil Engineering, University of Washington, Seattle
DONALD HOUGHTON, LEX Systems, Inc., Haddonfield, New Jersey
JACK HOUSWORTH, Engineer of Highway System Planning, Texas Highway Department, Austin

THOMAS F. HUMPHREY, Director, Bureau of Transportation Planning and Development, Massachusetts Department of Public Works, Boston

RALPH D. JOHNSON, Roy Jorgensen Associates, Inc., Gaithersburg, Maryland
GARRED P. JONES, Chief, Bureau of Planning, Illinois Department of Transportation, Springfield

RAYMOND L. KASSELL, Deputy Chief Engineer of Planning, Iowa State Highway Commission, Ames
LOUIS J. KEEFER, Director, Bureau of Advance Planning, Pennsylvania Department of Transportation, Harrisburg
IAN KINGHAM, Projects Engineer, National Cooperative Highway Research Program, Transportation Research Board, Washington, D.C.
JACK KINSTLINGER, Deputy Secretary for Planning, Pennsylvania Department of Transportation, Harrisburg
ROBERT C. KIRK, Transportation Planning Engineer, Georgia Department of Transportation, Atlanta
FRANK S. KOPPELMAN, Research Assistant, Department of Civil Engineering, Massachusetts Institute of Technology, Cambridge

TOM LAMPHIER, Vice President, Executive Department, Burlington Northern Railway, St. Paul, Minnesota
A. S. LANG, Assistant to the President, Association of American Railroads, Washington, D.C.
THOMAS F. LARSON, Professor, Department of Civil Engineering, Pennsylvania State University, University Park
G. TERRY LATHROP, Consultant, Southern Growth Policies Board, Research Triangle Park, North Carolina
HOWARD B. LEATHAM, Engineer for Planning and Programming, Utah State Department of Highways, Salt Lake City
THOMAS LISCO, Director, Office of Research and Development, Illinois Department of Transportation, Chicago
R. C. LOCKWOOD, Assistant Planning Engineer, Virginia Department of Highways, Richmond
WILLIAM E. LOFTUS, Acting Associate Administrator, Federal Railroad Administration, U.S. Department of Transportation, Washington, D.C.

OSCAR MABRY, Metropolitan Transportation Planning Engineer, Virginia Department of Highways, Richmond
IAN MacGILLIVRAY, Director, Division of Planning, Kentucky Department of Transportation, Frankfort
HAL MAGGIED, Task Force Director, Georgia Department of Transportation, Decatur
MARVIN MANHEIM, Director, Transport and Community Values Project, Massachusetts Institute of Technology, Cambridge
CHRISTA MARDEN, Massachusetts Office of State Planning and Management, Boston
ROBERT MARDEN, Massachusetts Office of State Planning and Management, Boston
EDGAR MARGOLIN, Consultant, Chevy Chase, Maryland
WILLIAM R. MARTIN, Policy Analyst, Association of American Railroads, Washington, D.C.
PATRICK J. McCUE, Executive Director, Highway-Rail Programs, Association of American Railroads, Washington, D.C.
JOANNE McGOWAN, Federal Aviation Administration, U.S. Department of Transportation, Washington, D.C.
ROY MESSER, Federal Highway Administration, U.S. Department of Transportation, Washington, D.C.

JOHN K. MLADINOV, Executive Deputy Commissioner, New York State Department of Transportation, Albany
ARRIGO MONGINI, Chief, Evaluation and Planning Analysis Division, U.S. Department of Transportation, Washington, D. C.
BRENDA MURRAY, Office of Rail Services Planning, Interstate Commerce Commission, Washington, D. C.

WAYNE M. PECKNOLD, Assistant Professor, Massachusetts Institute of Technology, Cambridge
CLYDE E. PYERS, Director, Division of Systems Planning and Development, Maryland Department of Transportation, Baltimore

GEORGE RAYMOND, President, Raymond, Parish, and Pine, Inc., Tarrytown, New York
HARRY A. REED, Director of Transportation Planning, Minnesota State Planning Agency, St. Paul
ROBERT G. RHODES, Acting Director, Bureau of Economics, Interstate Commerce Commission, Washington, D. C.
FAUD RIHANI, Transportation System Planner, North Carolina Department of Transportation, Raleigh
PHIL ROBERS, Ernst and Ernst, Washington, D.C.
THOMAS H. ROBERTS, Director, Community Development Planning, Atlanta Regional Commission
RICHARD BOYD ROBERTSON, Senior Regional Planner, Appalachian Regional Commission, Washington, D. C.
DANIEL ROOS, Associate Professor, Department of Civil Engineering, Massachusetts Institute of Technology, Cambridge
ROBERT E. ROYER, Planning Engineer, Oregon Department of Transportation, Salem

LARRY J. SABEN, Manager, Plan Development Section, Maryland Department of Transportation, Baltimore
OWEN H. SAUERLENDER, Assistant Director, Water and Land Use Center, Pennsylvania State University, University Park
LARRY SCHULMAN, Office of Transit Planning, Urban Mass Transportation Administration, U.S. Department of Transportation, Washington, D.C.
JAMES A. SCOTT, Urban Transportation Planning Specialist, Transportation Research Board, Washington, D.C.
PAUL SHULDINER, Professor, Department of Civil Engineering, University of Massachusetts, Amherst
NAT SIMONS, JR., Chief Transportation Planner, Ohio Department of Transportation, Columbus
ROBERT E. SPICHER, Transportation Planner, Comsis Corporation, Wheaton, Maryland
MAX R. SPROLES, Vice President, Harland Bartholomew and Associates, Washington, D. C.
JOHN STAHA, Division of Planning, Texas Highway Department, Austin
RICHARD A. STALEY, Assistant to Director for Research and Transport Economics, American Trucking Associations, Inc., Washington, D. C.
BYRON D. STURM, Dalton · Dalton · Little · Newport, Cleveland
CARL SWERDLOFF, Operations Research Analyst, Office of Systems Analysis and Information, U.S. Department of Transportation, Washington, D.C.

ANTON P. TALVITIE, Assistant Professor, Department of Civil Engineering, University of Oklahoma, Norman

BILL TAYLOR, Washington Representative, Florida Department of Transportation, Arlington, Virginia
NICHOLAS P. THOMAS, Linton, Mields and Coston, Washington, D.C.
GENE R. TYNDALL, Chief, Planning Coordination Division, U.S. Department of Transportation, Washington, D.C.

JOHN WALKER, Chief, Washington Population Studies Division, Olympia
L. ELLIS WALTON, JR., Senior Environmental Consultant, enviro-pact, Washington, D.C.
THEODORE G. WEIGLE, Urban Planner, Urban Mass Transportation Administration, U.S. Department of Transportation, Washington, D.C.
D. L. WIEMAN, Chief, Division of Transportation Planning, California Department of Transportation, Sacramento
WILLIAM E. WILLEY, Assistant Director of Planning and Programming, Arizona Highway Department, Phoenix
EDGAR WILLIAMS, Aviation Planning Officer, Office of Aviation Policy and Plans, Federal Aviation Administration, U.S. Department of Transportation, Washington, D.C.
NEIL H. WILSON, Chief, Plans and Systems Branch, Statewide Highway Planning Division, Federal Highway Administration, U.S. Department of Transportation, Washington, D.C.
DARYL WRIGHT, Voght, Sage and Pflum, Cincinnati

NORBERT ZUCKER, Transportation Planner, Federal Railroad Administration, U.S. Department of Transportation, Washington, D.C.

Advisory Committee

JACK KINSTLINGER, Pennsylvania Department of Transportation, chairman
HORACE BROWN, Connecticut Office of State Planning
E. WILSON CAMPBELL, New York State Department of Transportation
ROGER L. CREIGHTON, Creighton, Hamburg, Inc.
DOUGLAS F. HAIST, Wisconsin Department of Transportation
IRVING HAND, Pennsylvania State University
LESTER A. HOEL, Carnegie-Mellon University
THOMAS F. HUMPHREY, Massachusetts Department of Public Works
ROY JORGENSEN, Roy Jorgensen Associates, Inc.
WILLIAM LOFTUS, Federal Railroad Administration
ROBERT MARDEN, Massachusetts Office of State Planning and Management
WILLIAM R. MARTIN, Association of American Railroads
ROBERT McMANUS, Urban Mass Transportation Administration
MILTON MEISNER, Federal Aviation Administration
WILLIAM L. MERTZ, Federal Highway Administration
CLYDE E. PYERS, Maryland Department of Transportation
PAUL W. SHULDINER, University of Massachusetts
MAX R. SPROLES, Harland Bartholomew and Associates
CARL SWERDLOFF, Office of the Secretary of Transportation
WILLIAM C. TAYLOR, Michigan State University
JOHN WALKER, Washington Office of Program Planning and Fiscal Management

JAMES A. SCOTT, Transportation Research Board staff

THE Transportation Research Board is an agency of the National Research Council, which serves the National Academy of Sciences and the National Academy of Engineering. The Board's purpose is to stimulate research concerning the nature and performance of transportation systems, to disseminate information that the research produces, and to encourage the application of appropriate research findings. The Board's program is carried out by more than 150 committees and task forces composed of more than 1,800 administrators, engineers, social scientists, and educators who serve without compensation. The program is supported by state transportation and highway departments, the U.S. Department of Transportation, and other organizations interested in the development of transportation.

The Transportation Research Board operates within the Division of Engineering of the National Research Council. The Council was organized in 1916 at the request of President Woodrow Wilson as an agency of the National Academy of Sciences to enable the broad community of scientists and engineers to associate their efforts with those of the Academy membership. Members of the Council are appointed by the president of the Academy and are drawn from academic, industrial, and governmental organizations throughout the United States.

The National Academy of Sciences was established by a congressional act of incorporation signed by President Abraham Lincoln on March 3, 1863, to further science and its use for the general welfare by bringing together the most qualified individuals to deal with scientific and technological problems of broad significance. It is a private, honorary organization of more than 1,000 scientists elected on the basis of outstanding contributions to knowledge and is supported by private and public funds. Under the terms of its congressional charter, the Academy is called upon to act as an official—yet independent—advisor to the federal government in any matter of science and technology, although it is not a government agency and its activities are not limited to those on behalf of the government.

To share in the task of furthering science and engineering and of advising the federal government, the National Academy of Engineering was established on December 5, 1964, under the authority of the act of incorporation of the National Academy of Sciences. Its advisory activities are closely coordinated with those of the National Academy of Sciences, but it is independent and autonomous in its organization and election of members.

TRANSPORTATION RESEARCH BOARD
NATIONAL RESEARCH COUNCIL
2101 Constitution Avenue, N.W. Washington, D.C. 20418

ADDRESS CORRECTION REQUESTED

NON-PROFIT ORG.
U.S. POSTAGE
PAID
WASHINGTON, D.C.
PERMIT NO. 42970