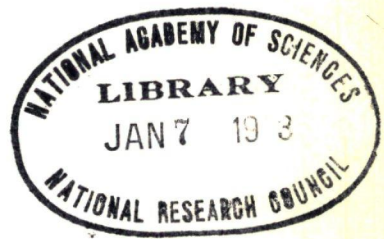


HIGHWAY RESEARCH BOARD
Special Report 72

*Planning in Highway
Administration*

Proceedings of a Conference Held
March 26-27, 1962



TE7
N3
no 72

**National Academy of Sciences—
National Research Council**

NRC. HIGHWAY RESEARCH BOARD
Special Report 72

***Planning in Highway
Administration***

**Proceedings of a Conference Held
March 26-27, 1962**

CONFERENCE OBJECTIVE

The conference objective is to discuss freely what is needed in planning for solving basic problems of State highway administrators, to explore effective ways of using the planning process for realignment of finances and improvement of administration, and to identify research needs that will improve planning functions.

**Division of Engineering and Industrial Research
NATIONAL ACADEMY OF SCIENCES—
NATIONAL RESEARCH COUNCIL
Washington, D. C.
1962**

TE7
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no72

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MARCH 26-27, 1962
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Foreword

The highway planning activity, in its initial stages, was based solidly on fact-gathering, on the collection of data regarding the nature and extent of the highway plant, the volume and composition of traffic, highway finance and taxation, and the life characteristics of highways. In contrast, city planning had its principal roots in architecture, an ennobling pursuit but one not inherently adapted to the dynamics of transportation movement. Over the years highway planning and city and regional planning have perforce grown closer together. The city planner today is much more avid in the pursuit of facts and much more inclined to accept the concept of a city in motion and continually changing. The highway planner in his turn has come to realize that he must plan in the grand manner—that he must conceive highway systems and highway structures architecturally, in the sense of fitting their forms and functions to the environment. The reconciliation in points of view is not yet complete; but the necessity of working together is gradually bringing about a full appreciation of mutual problems. One of these is that of making planning an effective arm of the executive function.

This conference was brought together to consider a single facet, but an extremely important one, of highway planning—its role in the administrative process. The relation of planning to administration is a thorny problem, whether it is a question of highway, regional, or city planning, or planning in industry. The planner is sometimes considered an odd-ball, apart from the heat and effort of daily operations and a bit impractical in his notions. And yet no substantial effort can be launched or continued in operation today without careful planning. The most successful operations are those in which the planning function is thoroughly integrated with the executive function, to the end that both day-to-day decisions and long-range commitments are based on the continuous fact-gathering, analysis, reports, and recommendations of the planning group. How this integration of planning with management of operations may be successfully brought about was the prime question before this conference.

The papers and discussions presented in these proceedings deal with a few of the problems of planning in highway administration. Some of them treat the subject broadly in terms of principles and concepts; others are more detailed in discussing particular functions and activities. There is a pardonable tendency to dwell sometimes on the technical problems of the planning work itself, rather than upon its relation to highway administration. This conference and its proceedings, however, are only a beginning. It is the intention that regional meetings be held on the same subject and these may be expected to advance materially our knowledge of the problems of planning in relation to highway administration, and the ways of successfully solving them.

G. P. St. Clair, *Chairman,*
Department of Economics,
Finance and Administration

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"Administration is the process and agency which is responsible for the determination of the aims for which an organization and its management are to strive, which establishes the broad policies under which they are to operate, and which gives general oversight to the continuing effectiveness of the total operation in reaching the objectives sought."

From *The Art of Administration*, by Ordway Tead (McGraw-Hill Book Co., 1951)

"Administrative work is composed of the responsibility for long-range planning, for consideration of overall objectives, and, above all, for the formulation and application of policies.

☆ ☆ ☆ ☆ ☆

"Planning is a basic characteristic of executive action. Planning is an intellectual process involving creative thinking and an imaginative juggling of many complex variables. Conceptual thought is at the core of the mental abilities required for planning. Skill in planning is needed by all administrators or managers. The ability to plan successfully sets the adept executive apart from those who are merely average."

From *Management Principles and Practices*, by Dalton E. McFarland (The Macmillan Company, 1958)

Paterson's Figure 1, page 122, from "The Concept of Power and the Concept of Man," by Mason Haire, in *Social Science Approaches to Business Behavior*, George B. Strother, Editor (Irwin-Dorsey Press, Homewood, Ill., 1962)

Session One—A

Monday, March 26, 1962, at 9:00 A. M.

INTRODUCTORY REMARKS

W. L. HAAS, General Chairman, Presiding

Welcoming Remarks

FRED BURGGRAF, *Director, Highway Research Board*

• IT IS A REAL PLEASURE to welcome you on behalf of the Executive Committee of the Highway Research Board to this informal workshop conference on "Planning in Highway Administration."

This conference had its inception more than a year ago as a result of a generally increasing interest of State highway administrators in the potential of planning as an aid to decision-making in the administration of an annual ten billion dollar business. The annual highway program has consequences ultimately affecting every citizen of every State in some degree. More than raw data are needed when the consequences are so significant and reach so many people. Because of this, those who are charged with highway administration, both in policy and executive decisions, are seeking among the possible choices the best course of action to satisfy the growing needs.

It is to the point, therefore, that State highway planning divisions during the past quarter century have evolved from a function of broad data-gathering to that of developing, interpreting, and relating needs in terms of pertinent action programs and their consequences to community economy and to society. During this evolution, the maturing concepts and techniques of highway planning have provided a much broader base for decision-making than has before been possible.

The planning division works as a

team of specialists, first to perceive the needs and then proceed to plan a framework for data gathering; next, to use the best suited techniques in gathering, analyzing, and interpreting the data and providing the administrator an objective quantitative evaluation of the consequences of actions stemming from his decisions. The planning division thus is a two-way avenue linking administration and engineering.

It is said that about one-quarter of a cent per highway dollar is used now in the activities of planning which bear somewhat directly on administrative decisions in the spending of the other 99¾ cents. Planning pennies are power pennies and the resulting decisions are contributing their consequences—their dramatic impact on the social and economic fabric of our country.

We challenge you with two jobs as we consider the objectives of this meeting:

First, to narrow the gap in this very specialized field between present knowledge and its general utilization. This conference provides for an examination of "what is" with a pooling of recent developments in concept and technique.

Second, this conference provides for a consideration of "what ought to be." There is a gap between "What is" and "What ought to be." Engineers must find today's answers in "What is." We hope that tomorrow's answers will come out of "What ought to be." To you, we

give this task: a statement—an inventory—of important researchable problems in the realm of “What ought to be.” We need an eye to discover changes, a method to measure the change, and a way to use the findings in administrative decisions.

Acknowledgments are due to G. P. St. Clair who was responsible for the financial arrangements and to the United States Bureau of Public Roads for fund assistance to make this conference possible. Appreciation is also extended to William L. Haas, General Chairman of the Conference, and to the presiding officers and participants. Thanks are due to Clinton H. Burnes, Chairman of the Committee on Arrangements, and members W. F. Babcock, Hope S. Wiley, Emmett L. Paige, James O. Granum, M. Earl Campbell,

and to James L. Montgomery who pre-edited the discussions for the Board.

Now in closing, I would like to say just a word about this Board Room of the National Academy of Sciences. It is a room rich in history. The skillful play of many minds has been forging concepts of scientific research in this room for nearly two score years. Problems, questions, needs, and answers, have been laid on this table. And Lincoln, who will look upon your deliberations these next two days—the man who called the Academy into being—said that, “If we could first know where we are and whither we are tending, we could better judge what to do and how to do it.” This is the planner’s challenge.

I extend to each of you a most cordial welcome and wish you every success in your undertaking.

Remarks of Department Chairman

G. P. ST. CLAIR, *Chairman, Department of Economics, Finance and Administration*

• I WOULD LIKE to join Mr. Burggraf in bidding you welcome to this Conference on Planning in Highway Administration. I do this officially as Chairman of the Highway Research Board Department that has sponsored the Conference; but I feel that I really wear two hats in joining you here at the board-room table—the second hat being that of a member of the newly formed Office of Planning at the Bureau of Public Roads.

In the Matomic Building where the Bureau is now housed the control panels of the automatic elevators have a push button marked with the legend "High Call." I do not know what this trumpet phrase means to an automatic elevator, but if I can I would like to give a lift to this Conference by emphasizing that the profession of highway planner is a high calling; that, properly interpreted and acted upon, the planning function is the most important instrument at the command of the highway executive. Many of the skills it requires are those of the practicing highway engineer; others are those of the traffic-engineering specialist; but these are not all, because the highway planner must employ the tools of the economist, the geographer, the public-finance officer, and even, to his occasional dismay, those of the city and regional planners whose attitudes and methods often seem alien to him.

Urban problems loom very large in the work of highway planning today. Contact with those who approach these problems from a different angle has, I think, induced a dilemma in the minds of many highway planning engineers. It has been our claim that in highway planning we try to give the people what they want, as well as this can be ascertained from the studies that we make. Of late, however, we often encounter those who seem determined to give the

people what they should have, according to some social, economic or moral credo, regardless of whether they want it or not. Among these groups are those who apparently hate the motor vehicle with a holy passion.

Despite our impulse to curl the lip at these feverish protesters, I believe that this conflict of viewpoints merits sober analysis. We need to be certain that the highway plans we recommend truly interpret the popular will, in terms that will be valid twenty, thirty, or forty years from now. I am afraid we cannot entirely escape the responsibility for making value judgments as to what will be of enduring worth and beauty, of lasting and peculiar benefit to the community. For the decisions of highway executives will be expressed in sturdy works of steel, concrete, and asphalt. They will have profound economic and social effects on community, State, and Nation. If intelligence and vision are not present in the planning, these effects may be baneful, or at least may fall far short of the mark. For these reasons the mistakes of the highway planner, if he makes them, are likely to be distressingly permanent.

This means, I think, that we must add a new dimension to the process of finding out what the people want. It means a very thorough study of the relation between land use and traffic demand. It means a more sophisticated approach to the forecasting of trends. It means a long and a far look into the social and economic consequences of highway locations and designs. It means cooperation on all phases of the planning complex. It means thinking and planning locally, regionally, and nationally to the end that the web of highways we spin may best serve human needs on all these levels. It means, in short, the practice of a high calling.

Purpose of the Conference

W. L. HAAS, *General Chairman*

• THIS CONFERENCE on highway planning seems particularly timely and appropriate. Because of some delays, mistakes, and a few irregularities here and there, the entire highway program has been criticized, and there is some evidence of public concern. Although the shortcomings are exaggerated, the criticism will nevertheless have served a very useful purpose if it leads to greater recognition of present inadequacies and the need for change in order to bring about the desirable conditions and results. Upon analysis, it appears that haste and inadequate preparation are at the base of the troubles, and the consensus is that better planning will do most to obtain and assure public cooperation, knowledge, and understanding, and more effective citizen participation in and support of the highway program. Above all, the prestige of the service and public trust and confidence in the highway administrator must be preserved, and good planning is one of the most effective means of doing so.

Highway planning has come a long way from its original essentially fact-gathering purpose, and very significant and substantial differences are evident. On the other hand, although there is better understanding of the planning function and greater appreciation of the need for comprehensive planning, for some reason it has failed to develop as it should have. At the moment, the highway program actually appears to have outpaced its planning.

Highway planning now is more complex and has broader implications in that highways are no longer regarded merely as ends in themselves, but as powerful instruments for social and economic good, and as a principal means of developing the States' and the Nation's resources in the public interest and for the public welfare. No longer only involved in building individual projects, we are now concerned with the design of a policy for guiding the development of all highways and streets of

the United States. Highway departments are not merely road builders. They deal in a service which intimately affects the lives and welfare of all the people. As Federal Highway Administrator Rex M. Whitton recently stated "We need to be reminded that the ultimate objective of our planning is to benefit the people."

It is significant that the Bureau of Public Roads has set up an Office of Planning to satisfy the need for systematic current and long-range planning, and broad planning in highway development. This arrangement should be very productive and useful in bringing about accelerated planning activity, and in providing encouragement and technical assistance to the States, and the necessary coordination of State planning in the Federal interest. Although Federal coordination is needed, it is hoped that emphasis will be on promoting and up-grading the State planning function. Good State planning will fit neatly into any Federal scheme and will be consistent with and complementary to it. In this way, States could more effectively participate in shaping realistic and acceptable plans for national highway development. This approach is also in harmony with the stated policy of AASHO that the coordination of planning within the States remain the responsibility of the State highway authorities.

State highway departments, however, must make a greater effort and show more initiative if they are to re-assert and maintain their traditional and proper role, and provide the positive, inventive, and imaginative leadership required. In addition to building roads their purpose is study and planning for the development of highways far-reaching in their implications, and which set a pattern aimed at maintaining and enhancing the quality of the highway service and its prestige, while undergoing the necessary expansion. Additionally, departments must make plans to halt the deterioration which inevit-

ably creeps into highway services and facilities, and thus keep themselves progressive and productive agencies. Too few States have come forward with anything resembling an ultimate highway plan designed to meet their specific needs for growth, industrial, social, and recreational requirements.

It may be true that planning of this kind has not fared well in the past with State legislatures, and it has not been accepted without question. Mere mention of it often elicits only wry and patronizing comments from "old heads" who have been through the experience of trying to sell it. Nevertheless, we should not be deterred by legislatures that approve budgets and plans which fall short of hopes and will not allow much progress toward meeting challenges that lie ahead. Eventually legislatures will appreciate the need and act accordingly, and States which have planned well will be ready to move rapidly on fulfilling their hopes and ambitions. Keep in mind that the current Interstate Highway Program took over 20 years for realization.

Currently there is talk of a \$10 billion annual highway program. If such a proposal should come to pass, would State highway departments be able to assume the additional responsibilities with the same despatch and effectiveness as they have the current program? The answer to that question may well depend on the condition and efficacy of the individual and collective planning of the States.

Also, at the moment there is much emphasis on planning in many other areas. The Federal government is promoting and supporting urban renewal, community, and rural development plans, to mention a few. A multi-billion dollar public works anti-recession program has been proposed to be composed of already authorized projects capable of prompt construction and completion within 12 months. On the State and local level there is a rebirth and expansion of planning activities. Many of the plans have potential involvements for highway agencies since highway improvements are basic considerations. Obviously, advance planning is the key

to success of these ventures. Federal Highway Administrator Whitton has strongly recommended that at least a five-year program be laid out in advance to give the needed time to execute the proposed improvements properly.

In all of these developments, a possible new role is emerging for State highway departments in the planning field in providing leadership, guidance, and coordination in these several efforts through some form of State-local collaboration. The rapid expansion and acceleration of such activities are essential to achieving effective and acceptable results, and the necessary participation of local governments in the process and the plans. Some of the frustrating experiences of the past few years will attest to the importance of the latter consideration. In any event, it is certain that the planning capabilities will be put to the test. It would be to the everlasting credit of the departments if they were able to translate this maze of planning effort into reality in an orderly and constructive way.

Because it is the key operation from which all other activities flow, the planning activity must perform at top efficiency. Also, because it is more concerned with the future than with the present and involves the definition of goals and a program for reaching these goals, planning offers the best assurance to highway departments for continuance as productive and progressive agencies. So it is clear that we must discover and explore ways and means of implementing and better organizing the planning function as an integral part of the administrative machinery. Particularly, more can be done in training and developing skilled staff to handle today's complex planning requirements, and in providing much-needed knowledge and up-dating of thinking in this important area.

Research must be intensified to assure sound and acceptable development plans, improved techniques, and more effective ways of communicating ideas and results of research. Preoccupation with fact-gathering has produced a bewildering surfeit of data and statistics which all but defies comprehension.

Planning does involve fact-gathering, but as one observer¹ noted it requires a "planned framework for fact-gathering to the end that basic problem-related facts will be gathered and in such a systematic way that they can be used in problem solving."

Recently Federal Highway Administrator stated that in recent years total funds for highway research have averaged only 0.17 percent of annual expenditures of over \$10 billion for construction. Furthermore, during the past five years \$42 million or about 20 percent of the Federal money for research and planning has not been used for these purposes. Twelve States account for 75 percent of the money not so used. There are still some States using little or none of the 1½ percent money for research and planning.

Accordingly, we need to reshape our thinking, concepts, and operations to fit the specific needs of planning. As much money as possible should be spent to advance a cooperative and coordi-

nated research effort with participation of local units. The stepped-up research and development activities of AASHO and HRB to improve the highway service is a step in the right direction. It is hoped that operation planning will not be overlooked.

This, then briefly, is the background and situation behind the calling of this conference on highway planning. During the two days of the session many of the subjects alluded to will be examined and discussed. All of you have been invited here because of your experience and ability to make constructive contributions. Although you will hear short papers or talks as an introduction to a subject, most of the time of a session is intended for open and exhaustive discussion of the matters before you so that the conference may benefit from your ideas and point of view. The worth of this conference will depend upon how actively and constructively each of you participates. It is my understanding that these sessions may provide guidance and a basis for similar regional conferences; therefore, let us strive to make this first conference on highway planning a real success.

¹ M. Earl Campbell, "Administrative Planning, What Is It?" Paper presented at a seminar at University of Kentucky, Lexington (March 23, 1961).

Session One—B

Monday, March 26, 1962, at 9:30 A. M.

HIGHWAY PLANNING CONCEPTS

W. F. BABCOCK, Presiding

Development of Highway Planning

S. T. HITCHCOCK, *U. S. Bureau of Public Roads*

• **PLANNING IN GENERAL** receives little thanks; some even have described it to be a thankless job. It produces criticism and resentment among many who are directly affected. Yet it is undoubtedly one of the most important tasks of government.

Planning can mean different things to different people. To the maintenance engineer it has a connotation for the maintenance of highways in a safe operating condition. To the design engineer it means the selection of a specific alignment within a general location, fitting the highway facility on that alignment within the standards and specifications, and good engineering judgment and practice. To the personnel officer it means the staffing of the organization so that it will have the experience to perform creditably.

The highway user has perhaps a different concept of highway planning. The trucker is concerned with route selection that will permit movement of goods in the most economical operation. The mobile home can be hauled only where facilities are available for servicing, parking, and overnight storage. Thus planning has a slightly different connotation to each, and each must do some planning within his area of responsibility, business or interest.

Planning is sometimes referred to as a European concept, and a few may still find it difficult to accept in the conventional American tradition. It is contrary to the manner in which this coun-

try has developed and to the pioneering spirit. The exploitation of natural resources that was possible and profitable in the days when there was an unexplored frontier was not planned with a view of conservation. The factor, however, which made planning necessary in Europe long ago, is now making it more essential in the United States. That factor is population. The population growth problem may be unpleasant in terms of the price of solution whether it be dollars, inconvenience, or inertia. Population is not only increasing in absolute numbers but it is changing its place of residence and employment so that much of this growth is intensified in some areas more than others.

Planning in the present context is nothing new. There is evidence of it in the system of National Parks, the development of irrigation, Central Park in New York or the Mall in Washington, D. C., to cite a few instances—some highly successful—as time alone can tell. There are now more people with more cars and more time for recreation and with better highways. So the question logically may be asked, What is being planned today for the world of tomorrow and specifically what is the position of highway planning in this over-all situation?

DEFINITION

As a general thesis and within the concept of this conference planning is

a basic characteristic of executive action. Planning is an intellectual process involving creative thinking and an imaginative juggling of many complex variables. Conceptual thought is at the core of the mental abilities required for planning. Skill in planning is needed by all administrators or managers.

According to the dictionary, planning is a scheme or a method for doing, and to a highway administrator this should mean a scheme or a method for administering the highway system. Good highway planning is essential to the effective functioning of the several aspects of highway work and usage, but the term "highway planning" includes a much broader concept than that of the maintenance engineer or the design engineer, the personnel manager or the highway user.

In 1956, when R. B. Hindle of the Roads Department of the Province of Natal, South Africa, returned after a trip, he reported on his observations of highway practice in these United States. In this report he described highway planning as a continuous process aimed at maintaining, at all times, the best balanced state of highway transportation efficiency throughout the entire system.

In order that this highway transportation can be planned in balance with the economy of the area in which it is a part, social and economic considerations must be included as well as the physical. Planning also presumes that there be goals or objectives established and under the continuing process that they be modified from time to time as conditions change.

The one purpose of highways is to provide for the safe and convenient movement of persons and goods. It is not an exercise in drafting the layout for an interchange or the balancing of cut and fill or the determination of the optimum moisture content of a particular soil, although each has its place in the process of highway engineering.

THE PROBLEM

In the last days of horse-drawn highway transportation the highway administrator had problems of mud, ruts or

dust, depending on the weather and the season. He was confronted with rough roads. As the capability of the internal combustion engine was more effectively adapted to the highway vehicle and as its efficiency improved, the problems increased in complexity with operational difficulties of sharp curves, excessively steep grades, limited and restricted sight distance, congestion and accidents. And always intermingled with these physical manifestations of problems has been the necessity of financing and administering the entire highway operation (Fig. 1).

Before 1930, improvement of the primary rural highways was the relatively uncomplicated objective of road improvement effort. Primary routes had been recognized and designated in accordance with law as State highway systems in the several States, and the more important of the routes of these systems, since 1921, had been incorporated in the Federal-aid highway system.

During the 1920's a steadily increasing expenditure by the States, with Federal aid, had gone into a pioneer improvement of these main rural highways. By 1930, the end of this initial program was in sight. Some degree of improvement had been extended to nearly the whole of the selected systems, and a situation had been created which called for a reconsideration of guiding policies.

The registration of motor vehicles had increased beyond all early expectation. The volume of traffic had grown at an even faster rate. Speed of travel had increased, and was continuing to mount. Already it was seen that much of the earlier improvement of the principal rural highways would soon be inadequate to the needs of the developed traffic, necessitating reconstruction and enlargement of the facility provided.

In the early 1930's, however, the highway departments began to find different and more complex problems. At this time the principal centers of population were connected with a system of highways—not always hard surfaced but generally considered to be of the all-weather type. The change was one in

What is Highway Planning ?

INFORMATION:

MAPS
REGULATION
HIGHWAY COST
ADMINISTRATION
TRAVEL CHARACTERISTICS
POPULATION CHARACTERISTICS
PHYSICAL INVENTORY
ECONOMIC FACTORS
TRAFFIC USAGE
FISCAL DATA
STANDARDS
LAND USE

THE HIGHWAY PLANNING PROCESS

RESULTS:

- SYSTEM INTEGRATION WITH URBAN PLANNING
- SYSTEM CLASSIFICATION
- HIGHWAY NEEDS
- PROGRAM DEVELOPMENT
- ECONOMIC ANALYSIS
- LEGISLATION

U. S. DEPARTMENT OF COMMERCE
Bureau of Public Roads December 1960

Figure 1.

the character of highway transportation. Automobile ownership increased. Traffic volumes, vehicle speeds, and the number of trucks and their weights and loads carried were far greater than could have been visualized by the engineers of the early roadbuilding years.

The studies and processes that are involved in solving these problems are highway planning. The results of such studies may take different forms but usually they find expression in a program involving location, acquisition of right-of-way, design, construction, and maintenance, with their financing and legislation. Underlying these program developments is a program of research and the management of the entire operation. The result is systems of adequate highway facilities.

THE HIGHWAY PLANNING PROCESS

The highway planning process (Fig. 2) takes any or all of such items as (1) maps that show topography, centers of population, industry, education, and religion—places that generate traffic; (2) an inventory of the physical extent of the highway facilities, mileage, surface type and condition, surface width, shoulder width, extent of grades, curvature and sight distance; (3) traffic usage in terms of volume, vehicle classification, and weights and loads; (4) travel characteristics of origin and destination, car occupancy, trip length and purpose, mode of travel, and trip frequency; (5) standards and regulations; (6) population characteristics; (7) highway costs and fiscal data; (8) land usage and economic factors; and (9) administration. After study, these produce a variety of results such as classification of highways for system administration, integration of highway systems with urban planning, development of highway improvement programs, economic analyses of route locations, studies of highway needs, and recommendations for legislation and regulation.

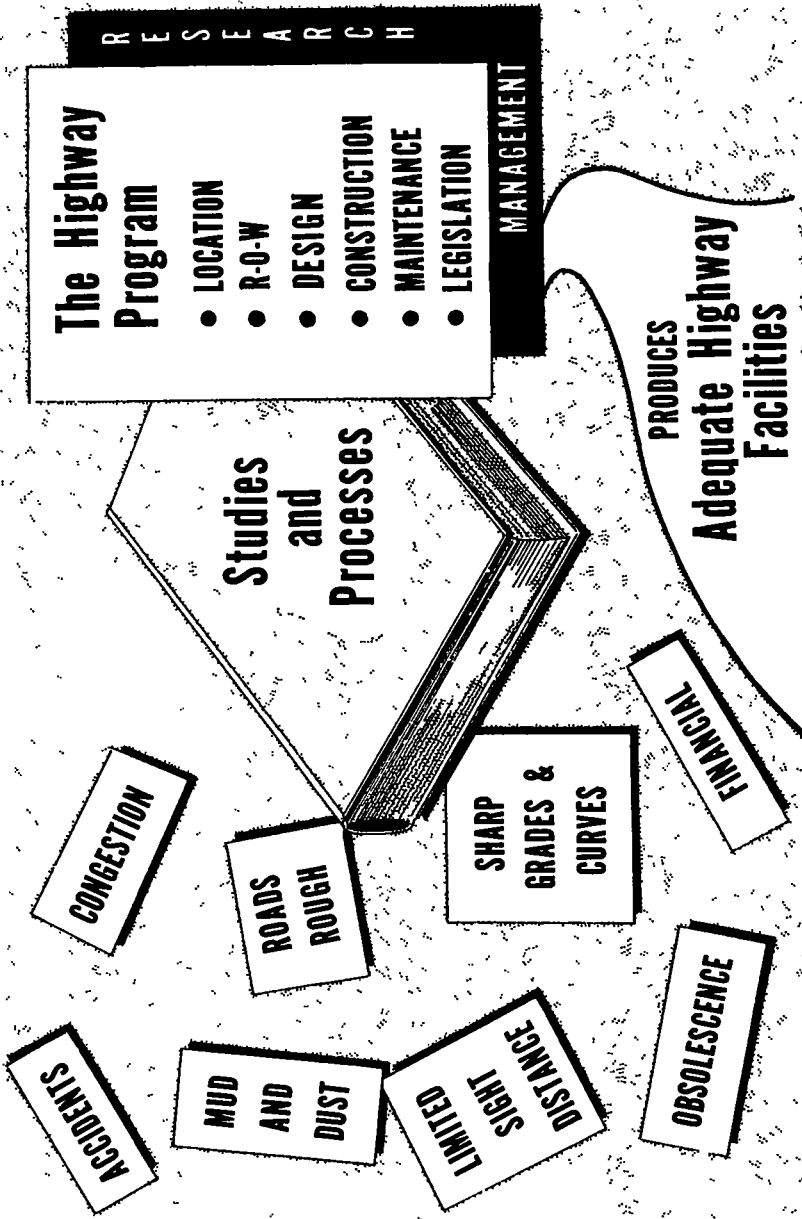
This highway planning process probably was not so clearly visioned in the minds of highway administrators when

the work was first established as a separate function in the several States. The Federal-Aid Highway Act of 1954 provided that 1½ percent of the Federal-aid funds apportioned for any year to any State might be used for surveys, plans, engineering and economic investigations of projects for future construction. Starting in the autumn of 1935, the States began to take advantage of this provision in the Federal law, and began to conduct a comprehensive highway planning survey. By 1940 all of the States had begun to participate and all are continuing to do so.

In the initiation of this cooperative undertaking Public Roads proposed the studies, developed the procedures, rendered technical assistance, and consolidated data for use in the study of national problems. At the same time, and as part of the continuing nature of this program, the States have proposed additional studies where needed for State problems, set up work programs, made the field surveys and summarized and analyzed the results. The programs and reports have been subject to approval of the Bureau in the discharge of its responsibilities with respect to the expenditure of Federal funds.

The problems of the administrators in the several States vary to some degree and extent because of differences in natural attributes of climate and topography, differences in the economy and social characteristics of the population and differences in laws and regulations under which the individual highway departments must operate. Fundamentally, however, certain basic elements of work are common in all States and it is around this common interest that a fairly uniform pattern of methods and techniques could be developed and were applied. Within the cooperative framework of the Federal-aid concept it was possible for the individual States to utilize the information for studying its problems and recommending solutions and for the Federal Government to utilize the same information for studying its problems and recommending action without duplicating data collection and assembly processes. In this manner decisions of local

Problems Planning Programs



U.S. DEPARTMENT OF COMMERCE, Bureau of Public Roads, December 1960

Figure 2.

and Federal authorities are based on the same data.

Highway planning studies, although organized and conducted differently in some particulars in the several States, have, on the whole, followed a uniform pattern which is briefly described in the following paragraphs.

This is fundamentally the same functional type of work as would be found in a planning operation in business or industry—an inventory of the physical plant, an inventory of its usage or production record, and an audit of the fiscal situation, income, and expenditures.

Highway Facility Inventory

Initially, a complete inventory was made of all rural roads which were publicly traveled to determine in detail the extent and dimensions of the road facilities. Observers drove over every mile and recorded the width, type, and condition of roadway surfaces; the type, dimensions, and condition of structures; the location of dwellings and other cultural features which are sources of traffic; and the physical characteristics of railroad grade crossings. On the important routes they measured the location and degree of curvature of sharp curves, the location and rate of steep grades, and the location and nature of restrictions to road visibility which might present a traffic hazard.

The inventory data were summarized in tables, and in addition a series of county maps were prepared in accordance with standards which show all public roads and their surface type in relation to the adjacent dwellings and other improvements. Several series of maps have been prepared showing school bus routes, postal routes, and regularly scheduled truck and bus routes. State maps were also prepared showing the principal highways but not the cultural features. The maps constitute, in themselves, an extremely valuable tool for the use of the State highway organizations in their regular work, and in addition they supply information which is valuable to other State agencies, to Federal agencies, and

to private agencies, business, industry, and individuals. They are generally sold by the States at a price approximating their reproduction cost, and the demand for them has been large and continuous.

Traffic Usage Inventory

An inventory of traffic usage was made to determine how the several highway systems are being used, the total travel, and separately for predominant vehicle types and loads carried—vehicles, loads, weights, and dimensions.

It is impractical to observe traffic usage on all road sections. With a knowledge of sampling techniques of standard statistical procedures, however, it is possible to make estimates within reasonable limits that can be predetermined according to the accuracy required for the problem.

A continuing function of these studies obtains additional information each year so that trends in these characteristics are known. Traffic trends have been determined by the operation of continuous-count machines at selected points and extensive traffic counts have been made periodically by these sampling procedures. State traffic flow maps have been prepared and generally revised annually, and county traffic maps at less frequent intervals—graphical representations of the usage of the several highway systems.

Trucks were weighed and measured at a large number of locations representative of the more important highways. The information obtained included the type and some measure of the capacity of the vehicle; the total weight and the load on each axle; the width, height, and length; the axle spacing; the commodity carried and, when possible, the weight of the carried load; the origin and destination of the vehicle; and other pertinent facts. The weight information has been kept current by trends established through annual weighings at selected points during comparable periods. In addition, most States have occasionally made more extensive weight surveys to deter-

mine variations in different hours and in different seasons, and on different classes of roads.

Financial and Motor-Vehicle-Use Studies

A complete highway planning survey program includes a group of financial studies to determine the relation of street and highway finances to the finances of all other governmental operations within each State, to determine the ability of the State to finance the necessary highway maintenance, replacements, and improvements, and to indicate an equitable base for the assessment of highway-user taxes.

One of the studies in this group was the road-use survey in which a representative sample of motor-vehicle owners were interviewed to determine their annual travel and the class of roads and streets used for that travel. The data obtained made it possible to determine the proportional amount of travel on each of the road systems of the State, originating in the respective governmental jurisdictions. This information, correlated with that obtained in the other studies, indicated the relation between the contributions to highways and the benefits obtained from their use. Most of the States made this study in the early period of the planning surveys and 23 of them have repeated it recently under somewhat modified procedures, known as the motor-vehicle-use study.

A fiscal study comprised an analysis of the financial reports of the State and its various political subdivisions. This analysis indicated the source of all revenues and classified expenditures as to whether they were made for highways (or streets), education, public welfare and services, or for general government. The highway finance data are being kept current from year to year.

Another study of this group, called the road-cost (or road-life) study, involves studies and research on highway investment, service lives and depreciation of various road types on the State highway system. Over the past 15 or

20 years, a group of States have built up a continuing record of the mileages constructed and retired. A number of States have also recorded their construction cost and analyzed salvage values, thus permitting determinations to be made of the highway investment in terms of grading, surfacing, and structures.

With the information thus obtained it is possible for highway departments to estimate the rate at which highways wear out and the cost of making needed replacements. Such information is extremely useful in scheduling long-range highway construction programs and in determining the rate at which highway needs will be met under various highway financing alternatives.

EVALUATION

General

Broadly speaking, the fundamental purpose of the highway planning survey activity is to place highway financing on a sound continuing basis under which the cost of supporting the systems might be distributed as equitably as possible among the users and other beneficiaries and to provide facts on which the administrative and engineering officials might plan, construct, and operate the highway systems efficiently and in the best public interest. It is very doubtful that any State highway department or the Bureau of Public Roads would feel that the millennium has arrived. Each decade brings technological developments that modify and change the usage of highway transportation. In many localities the United States has not yet caught up with the "lost-ground" demand for highways that may be traced as far back as the depression of the 1930's and World War II. Then there are the demands caused by needs of replacement and of expansion and of the increased quality of service. The ingenuity of individuals living in an atmosphere of freedom finds new uses for old areas and old facilities. So it is difficult to find a permanent satisfaction for any program accomplishment. There are a few generalities that are evident, and then there are some

specific areas in which it is possible to demonstrate the accomplishment of planning in relation to highway administration.

Highway planning is now an operating function in all highway departments with adequate funds available for normal programs and in some States with enough additional funds so that some research work is also included in the program. It is handicapped as are all highway functions by staffs of insufficient size and, in some areas of work, with lack of trained personnel.

Although highway planning in some aspects was done in the several highway departments and in the Bureau of Public Roads prior to the passage of the Hayden-Cartwright Act in 1934, it was lacking in comprehensive scope in any State, and there was no reasonably accurate way of creating a regional or national study for guiding or recommending administrative decisions.

Following the passage of the act in 1934, most of the States took advantage of the provisions of the act and initiated programs to conduct highway planning surveys. By 1940, all States had begun to participate and all are continuing to do so.

The Bureau of Public Roads has assembled the data collected by the several States and analyzed them to develop information of nationwide significance. It has frequently incorporated in these analyses information and data assembled by other governmental agencies to obtain as complete and comprehensive an analysis as possible so that highway transportation may be properly positioned in relation to other forms of transportation and the economy of the nation as a whole.

Prior to World War II, the States began using the results of these highway planning survey operations, as soon as the information could be analyzed, in the setting up of construction programs, determining priorities, designing individual projects, and in many other ways. The results have been used in reports to legislatures on many subjects such as route locations and developments, the need for funds, the allocation of funds to systems, the extent of

the systems, size and weight limitation of vehicles, and road-user fees—especially license fees for trucks of different sizes. These results—and it takes time for survey operations to show results—are the manifestations of highway planning.

Since World War II, traffic volume trends, data on vehicle-miles of travel, ton-mileages hauled by trucks and frequency of gross weights and axle loads of various magnitudes have been computed and published regularly. One of the important trends pointed out in these publications was the alarming increase in frequency of heavy axle loads that took place between 1936 and 1948. Partly as a result of these findings, stricter enforcement and other measures taken by the States and truck operators have resulted in reducing the frequency of heavy axle loads considerably below the 1948 peak.

The third decade of highway planning is well under way. Looking back, the first half of the first decade was spent largely in the assembly of basic facts and laying the groundwork for keeping them up to date. World War II virtually put a stop to efforts to plan ahead, but it did serve to focus attention on the importance of what had already been accomplished. Many will recall the important uses made of traffic and other data already available or quickly supplied by the highway planning divisions during that period. They demonstrated the essentiality of highway projects so that the slim supplies of critical material that could be spared were made available to the highway departments. They aided in the routing of military convoys and war material shipments. They supported the need of gasoline and rubber to keep highway transportation alive. The war forced highway planning, like other highway functions, into a hand-to-mouth basis. But the war also brought to the attention of highway administrators the idea that facts that would convince rationing officials could be equally useful in developing the continuing peacetime programs.

In recent years the program of highway planning employs some 4,745 persons in the 50 States, District of Colum-

bia, and Puerto Rico, together with about 140 in Public Roads. These numbers do not include those persons working under consultant contracts either with 1½ percent Federal-aid funds or Federal administrative funds, nor some of the larger transportation studies.

This program for both highway planning and research during the past five years has averaged \$51.6 million a year, including both Federal-aid and State matching funds.

It is more significant, however, to realize the uses that have been and are being made of this information and the reliance that is being placed on the highway planning work at both the State and the Federal levels.

A review of highway planning in terms of significance to the total planning program indicates that the work can be generally grouped as follows:

1. Program authorization and expenditures;
2. Current planning and operations;
3. Advance planning;
4. Urban planning; and
5. National planning.

Program Authorization

An analysis of the highway planning programs since they were first started in 1935, under the Hayden-Cartwright Act, could well be grouped into three time periods recognizing the differences in programs that were developed according to legislative changes: the first from 1935 to 1945 and the passage of the Federal-Aid Act of 1944, when funds were first made available for highway work in urban areas; the second from 1945 to 1956, when funds for the construction of the Interstate System were first authorized; and the third, for the period subsequent to 1956. Table 1 shows the apportionments for each year since 1936, together with the total amount of the highway planning and research programs and Federal and State shares. In the years prior to 1945, the actual amounts of Federal and State participation have not been totaled by years, since the method of fiscal control is difficult to assign to any 1-yr period. In

total, however, for the 10-yr period, highway planning surveys and highway research programs approximate \$52.8 million, or \$5.3 million a year with about equal amounts of Federal-aid and State funds with all apportioned funds programmed.

In the 1946-56 period, a total of \$79.0 million of Federal-aid funds were apportioned, an average of \$7.2 million a

TABLE 1
ONE AND ONE-HALF PERCENT FEDERAL-AID
HIGHWAY FUNDS APPORTIONED, PROGRAMMED,
AND RELEASED TO CONSTRUCTION, BY YEARS
(Millions of Dollars)

Year	Appor- tion- ments	Work Programs			Released to Con- struc- tion
		Federal	State	Total	
1936	3 0				
1937	1 8				
1938	3.0				
1939	2 9				
1940	2.0				
1941	2.4				
1942	2.0				
1943	2 0				
1944	7 3				
1945	0 0				
Total	26 4	26.4 ¹	26.4 ¹	52.8 ¹	0.0
Avg.	2.6	2 7 ¹	2.6 ¹	5 3 ¹	0 0
1946	7.3	1.3	1.3	2.6	2.5
1947	7 3	4 9	4.7	9 6	2.5
1948	7 2	5 9	5 7	11.6	2.5
1949	0 0	5.1	4 9	10.0	2.5
1950	6 5	7.7	7 1	14.8	2.5
1951	6 5	4 7	4 6	9 3	2.5
1952	7.3	6 3	5 9	12 2	2 5
1953	7.2	7 8	7 7	15 5	2 5
1954	8 4	8.0	8 4	16.4	2.5
1955	8.4	11.5	9 5	21.0	2.5
1956	12.9	11 6	9 2	20.8	1.0
Total	79.0	74 8	69 0	143 8	3.5
Avg.	7 2	6.8	6 3	13.1	
1957	29 8	28.1	12 9	41 0	1.0
1958	38 2	31 1	11.7	42 8	5 6
1959	46 9	40.6	13 2	53 8	11.6
1960	50.7	41 6	15.4	57 0	13 1
1961	40 6	47 2	16 3	63.5	10 8
Total	205 2	188.6	69.5	258.1	42.1
Avg.	41.0	37.7	13 9	51 6	8.4
Grand total 1936-1961	310.6	289.8	164.9	454.7	45.6
26-yr avg.	11 9	11 1	6.4	17.5	
1962	46 1	46 1 ¹	15 9 ¹	62 0 ¹	
1963	49.2	49.3 ¹	17.0 ¹	66.3 ¹	
Total	95.3	95.4	32.9	128 3	
Avg.	47.6	47.7	16.5	64 2	
Grand total 1936-1963	405 9	388 2	197 8	583.0	
28-yr avg.	14 5	13 7	7.1	20 8	

Note: In addition to normal program funds, a total of \$11,820,024 (Federal funds) was expended from 1955 to 1961 for the Illinois Road Test (AASHO).

¹ Estimated

year, and work programs \$143.8 million, an average of \$13.1 million a year with both State and Federal funds. During this period a total of \$3.5 million was released to construction upon a showing by individual States that an adequate planning program was under way and that Federal-aid funds were in excess of those programs.

Since 1956, the authorization of Interstate funds has made a larger amount available for Federal-aid programs, including the program of highway planning. In these last years a total of \$205.2 million of Federal-aid funds has been apportioned for highway planning purposes, an average of \$41.0 million a year. Work programs have totaled \$258.1 million, an average of \$51.6 million. During this same period an average of \$8.4 million a year has been released to construction under the same terms as in the previous period.

In 1962 and 1963, work programs are estimated to be \$62.0 and \$66.3 million, respectively, with Federal-aid funds of \$46.1 and \$49.2 million.

The current highway planning and research program is shown in total in Table 2, broken into amount and per-

cent for each of the principal divisions of work. There has been an increasing amount of work in transportation planning studies with some 25 percent now programmed for this work in comparison to about 16 percent in 1957, and research work at 14 percent now in comparison with 3 percent in 1957.

In many States the use of the 1½ percent funds is almost completely budgeted for highway planning and research purposes, but in other States there is some question as to whether this allocation can be fully utilized under present personnel policies and restrictions. In some States special items such as urban transportation studies are a sizable proportion of an annual budget. As these studies are completed or are moved into a continuing status, they will become less of an expense, and it is probable that more of these 1½ percent funds will be available for other planning and research problems. A thorough examination of the program should be made to determine what the planning and research needs of the State are so that in future years recommendations and answers will be available to the administrators and to the legislatures for use in establishing long-range programs through advance planning and urban planning operations.

Current Planning

During the past year there has been more contact among State and Public Roads personnel on highway planning matters in conferences than in any previous similar period since World War II, excepting for the preparation of Interstate System cost estimates. The WASHO Factual Surveys Committee and Public Roads Regions 1 and 3 have had joint conferences on highway planning matters at which 30 States participated. Meetings were held in 6 of Public Roads regions involving 38 States at which the various kinds of traffic counting equipment were discussed. It is this latter type of meeting that is particularly helpful because the personnel at the working level have the opportunity to participate. The devel-

TABLE 2

CURRENT HIGHWAY PLANNING AND RESEARCH PROGRAMS CONDUCTED BY STATE HIGHWAY DEPARTMENTS USING 1½ PERCENT FUNDS¹
1961-1962

Type of Work	Amount (millions of \$)	Percent
Planning surveys		
Inventory and mapping	7.9	12.4
Traffic counts	6.5	10.2
Finance and statistics	2.2	3.5
Loadometer studies	1.8	2.8
Road life studies	1.0	1.6
Special studies	7.3	11.5
Subtotal	26.7	42.0
Transportation and urban planning		
Origin and destination studies	1.4	2.2
Route location studies	5.3	8.3
Urban transportation	9.0	14.1
Special studies and miscellaneous	9.5	15.0
Subtotal	25.2	39.6
Research projects (other than planning)	8.9	14.0
Administration	2.8	4.4
Grand total	63.6	100.0

¹ Includes State matching funds: \$16.3 million, 25.6 percent.

opment of more of these workshop type conferences should be planned for the purpose of discussing problems in specific areas of work.

Generally speaking, the mapping program (actually a remapping program) is being accomplished at far too slow a rate to be of greatest value and use to the highway departments, the Bureau Public Roads, and others among whom the maps have widespread use. In 1960, 358 county general highway and traffic maps were revised or redrawn in 31 States, together with the preparation of 10 State general highway maps, 27 State traffic maps, 327 city maps, 64 city traffic maps, 114 county traffic maps, and 333 urban area maps. Inventory operations were a continuing function in 44 States and Puerto Rico.

Traffic counting programs generally should be strengthened, particularly in urban areas. When the highway planning work was started (1935-1939) the counting, classification, and weighing of vehicles was largely a rural operation. Now with the decided shift in population from rural to urban areas, and the shifting of population and economic activities within the urban horizon, there is a definite lack of information for determining the usage of highway facilities within this horizon—volumes and trends of total traffic; proportion of commercial vehicles; proportion and trends of heavy loads; and distribution of usage on expressways, arterials, feeders, and local service streets. This weakness is particularly noticeable when information is needed for design-hour volumes, directional volumes, truck volumes, and support for forecasting and assignment analyses.

Some 23 States have reviewed their traffic counting programs in rural areas in the past 5 to 8 years and have improved their efficiencies or extended coverage at no added expense by recognizing standard statistical sampling techniques and the limits of accuracy required.

Some 20 to 25 regularly scheduled annual statistical reports are prepared each year by each State—State and local finance, mileage, motor-vehicle registra-

tions, motor-fuel consumption—an estimated 1,250 tabulations plus others of special nature to answer immediate and nonrecurring problems.

Over the period of time since the several elements of the highway planning program have been active, the initial manuals and guides under which the work was done have been modified from time to time by memoranda and instructions on individual problems to the point where now there is no one source of instruction. A few States have issued a consolidation of instructions eliminating obsolete or superseded methods and techniques. This should be a more general practice.

Some uses of the highway planning information were entirely unforeseen—incidental in some instances, more fundamental in others. But these uses could not have been made had there not been a highway planning operation. It is a rather interesting listing:

1. Hours of driving, requested for use by ICC;
2. Locations and length of winter and spring road damage;
3. Transcontinental traffic;
4. Traffic on selected U. S. numbered routes;
5. Trucking information for National Bituminous Coal Commission;
6. Cabbage shipments by highway (pilot study for commodity study feasibility);
7. Movement of commodities from seaports;
8. Trucks with ICC plates;
9. 1938 and 1952 Traffic Flow Maps;
10. Toll bridges, ferries, and tunnels; and
11. Highway facility data for Industry Evaluation Board.

Advance Planning

Advance planning might be considered as the development of practicable means of carrying out the findings of the statewide and systemwide needs studies by means of long-range construction programs that will give first priority to the projects that are, in fact,

most urgent—well ahead of actual work. Adequate advance planning is based (a) on an accounting of existing road facilities, (b) on thorough studies of the kind and volume of traffic, and (c) on systematic grouping of similar roads into classes. With this foundation, programming can be established with the development of a financial plan, and the assignment of priorities to work projects and the scheduling of them into long- and short-range road improvement programs to meet the needs of travel growth (Fig. 3).

Classification of roads and streets is a procedure whereby roads and streets that have similar characteristics are grouped into distinct classes. An adequate classification recognizes which government agency should have responsibility for which roads. This is usually based on the service performed by each road. Some roads are intercity routes carrying a relatively large proportion of long-distance movements. These are important to the State as a whole. Some roads may serve as collectors or distributors to and from communities or the intercity routes. These are of principal importance to a small segment of the State. Other roads are dominantly of land use service only and hence of local service and access only. These three types are generally identified broadly as of arterial, feeder, and local character. A good classification recognizes reasonable distances and intervals between roads of the same class to serve the population of the area adequately.

It is also the key to determining improvements in each road class—the next stage in advance planning. There is evidence that some roads now on a secondary road system have all the characteristics of a primary road and have, in fact, been improved with secondary funds to primary road or expressway-type standards. This tends to make a farce of separate apportionments for primary and secondary systems. In the opposite manner, some roads formerly classed as primary roads are continued in this class although the characteristics are no longer of that class because of other road de-

velopments or changes in the local economic conditions.

In another aspect some system classification changes are submitted for administrative decision in segments of routes rather than on an entire well-integrated system of routes. In one instance, for example, the expansion of the Federal-aid secondary system is initiated by county judges without reference to or benefit of a statewide long-range plan.

With the construction of the Interstate System there may be reason to consider the primary route which it parallels or replaces to no longer be a primary road in fact. Some are close enough to be absorbed by it, some far enough away to function independently.

It is important that the most critical needs be satisfied first and this can be done by sorting out projects in a priority sequence. There are several methods for doing this and many States are doing it in one form or another. Generally, a road is measured according to its importance in terms of service rendered and usage. A second factor is the consideration of condition. A combination of these serves to rank projects consistent with urgency for improvement.

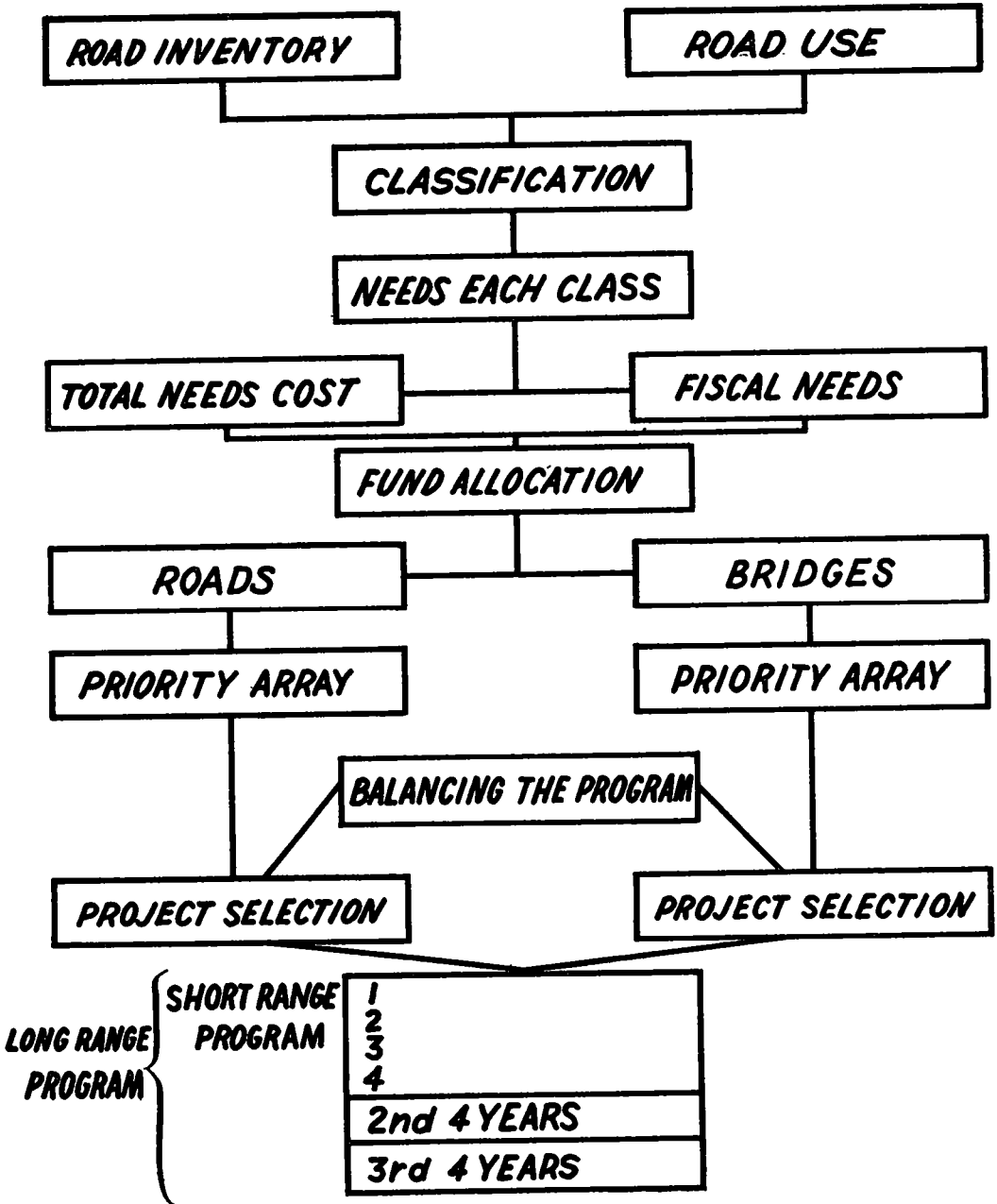
The lack of advance planning and the long-range program which is its product indicates that either information is lacking as to what the needs are and what the systems are, or that if the information is available it is not used.

Too often a Federal-aid program is submitted just prior to advertisement for bids and usually this must be handled by Public Roads at the same time as the PS and E review and authorization. Often construction projects are submitted in a program on a year-to-year basis with no long-range program worked out or finalized. There are also programs that are formulated by a rather random selection of projects and others influenced by public pressure. This is not advance planning.

With respect to the Interstate System the routes have been designated and, except for minor changes, the system is firmly established. Its needs have been estimated in response to Section 108 (d)

ADVANCE ROAD PROGRAMS

SEQUENCE OF ACTIONS



Source: National Association of County Engineers
Figure 3.

of the Federal-Aid Highway Act of 1956 and Section 104(b)(5) of Title 23 U.S.C. Its financing seems assured under the operation of the Highway Trust Fund.

In 1960, a review was made of the practice in use of "ratings" among the several State highway departments. Methods of rating vary considerably. The term "sufficiency rating" is used most generally to describe these methods but other terms have been used such as deficiency ratings, service ratings, congestion warrants, priority analysis and adequacy ratings, in a few instances. Thirty-eight States rate the rural primary system. Thirty States also rate the secondary road system, and 17 make ratings on urban primary extensions. Seven State highway departments are required by law to make ratings. The use of these ratings varies considerably from "very limited" to "guide in priority determination."

Generally speaking, the use of ratings is considered to be of value in guiding the judgment of the administrators and most of the States that make adequacy ratings supplement these studies with other analytical methods for priority considerations.

Before a State can develop a 5- or 10-yr program of road improvements there must be a determination of highway needs. When each road is studied, a determination can be made of its adequacy to serve present and foreseeable traffic. From this study comes a total, when all roads are put together, of the nature and extent of physical improvements, the cost of making the improvements, a financial plan, and the length of time necessary to make them.

Some 32 States have made needs studies and 8 States have followed these up with a second study or have kept the study current as to improvements and changes in needs. (2)

It is difficult to evaluate the results of highway needs studies. Generally the studies are made at the direction of a legislative study commission, and this is indicative of the importance attached to studies and the problems before the legislature and the highway administrator. But what happens after the

report is made and accepted by the commission is fundamental and most important.

Without question the staff of the highway department has gained some experience in the development of the study and in knowledge of the needs of the highway systems.

The legislative commission members gained an insight into the nature of the highway needs, the engineering appraisal, and the financial requirements. Usually groups of local citizens and officials at city and county levels also participated in the formulation of the parts of the study relating to those local areas. In this way the development of a highway needs study educated a segment of the highway users in the needs of the highway systems so that they could exert their influence in support of a financially feasible highway program.

But if the recommendations of the study are not acted upon, then the true objective of the study is not served. To some extent each study presumably was used within the department for internal planning. In one State the legislature adopted a majority of the recommendations but the highway department disregarded the needs data. In a couple of other States practically the opposite situation developed. In California, Oregon, and Washington, to cite three instances, tangible results came in the form of legislative interest—revenue bills and interim commission studies.

The importance of highway planning is receiving increasing attention in the area of advance planning. In North Carolina, a statewide commission has been established staffed with personnel of several disciplines in addition to engineering. Funds are allocated for highway improvements based on relative statewide needs rather than on any formula. This advance planning unit makes long-range improvement plans based on over-all statewide needs, keeps the public informed as to the plans, and makes certain that proper integration of land and building developments are included. It cooperates with local authorities for local and secondary roads and discusses advance plans with local

authorities for their consideration and recommendation.

It holds meetings in various sections of the State, holds public hearings on major projects, is responsible for keeping the public informed, and develops public relations and considerations of property owners.

Specifically, the advance planning section is responsible for the selection of a statewide "trunk-route" system, the study of every proposed major improvement project, and the justification for such projects, including benefit-cost ratios, general location and geometric design, and traffic service and operation. It works with cities and towns on local long-range transportation and traffic plans, prepared a 5-yr needs study of the trunk-route system, and coordinates the programming of approved projects with the chief engineer and with the Bureau of Public Roads.

The organization of this advance planning unit is under the direction of an advance planning engineer and includes on the staff urban traffic specialists, a regional planner, a highway engineer, a geographer, several highway planning engineers, draftsmen, trainees, and secretarial personnel.

Urban Planning

One of the more important groups of studies financed with 1½ percent funds is the origin-destination, travel habit, parking, and transportation studies in urban areas. It is not surprising that this is so. The increase of total population, coupled with the shift of the population to urban areas, has created problems in those areas that neither Charles Duryea or Pierre L'Enfant could possibly have envisioned. Highway engineers and city planners alike need more information for the best planning possible to fit these changing conditions.

Although a few studies of the origin and destination of traffic had been made prior to 1944, it was not until Federal-aid funds were made available in the highway act of that year for projects in urban areas that more extensive studies were made in urban areas.

At that time there was a lack of in-

formation on travel in urban areas which could be used as a basis for the planning of highway facilities that would best serve the public. In fact, the same could be said for the planning of transportation in general. No comprehensive survey methods had been developed which would give the needed information, and the tremendous volume of data obtained even with low-rate sampling procedures made the analysis a time-consuming operation. The complex nature of the city street network and the shifting of travel from route to route in search of the most favorable, or least unfavorable traffic volumes on existing streets, are not a satisfactory guide to needed improvements. A study of origin and destination of trips and the basic factors affecting travel was needed.

Studies of travel habits have since been made in more than 800 different cities varying in size from places of less than 5,000 to cities of several million as in Chicago and Detroit. The scope of these studies varied from several hundred of the relatively simple screenline and cordon-type traffic studies to 150 of the comprehensive metropolitan area transportation studies. (3) In 31 of these cities a second study has been made to update the information obtained earlier and in 4 cities the work is being established as a continuing function.

These urban travel studies have been used in the planning of highway facilities, particularly expressway systems, and in determining the design features for these facilities. To be of maximum use for these purposes, the travel data must not only be brought up to date, but they must be projected into the future.

The development of the high-speed computer has made it possible to attempt research work and statistical analyses that previously could not even have been attempted.

This urban work can be generally described as being of operational or research character depending on its immediate use, and much of the research involves the use of results on actual problems. There is no laboratory

for small-scale tests or models. Factors dealing with such items as land uses, sociological aspects, levels of income, distances from home to work, cannot be put in a test tube but require city-size laboratories for realistic observations.

It is not easy to appraise the value of these studies that have been and are being done in urban planning. Quantitatively, studies have been made in 800 cities with a total population of perhaps 50 million people. Qualitatively, however, a better concept of the scope of the work that has been done and the kind of knowledge that the urban planner and highway engineer of today should have or should be looking for as he is confronted with his daily tasks can be obtained.

The listing of the elements of the studies reveals the scope of activities. It indicates that analyses of these elements, either as independent elements or in correlation, should be of fundamental value in the guidance of the planner and the engineer.

With respect to transportation, these studies develop the number and frequency of trips, car ownership, the mode of travel—sometimes referred to as modal split—and the purpose of trip. Analyses of particular significance to engineers are the forecasting of trips, the distribution of traffic approaching cities, the distribution of traffic within cities, the generation of traffic with respect to distance from destination—such as the central business district and other commercial and shopping centers. Information and results of particular significance to planners revolve around land uses, rental groups, income levels, ratio of characteristics, occupation, sex, employment centers, residential area characteristics, population density in relation to geographic locations within the area, and the volumes of traffic involved in the interchange of travel.

These factfinding origin-destination trip studies, coupled with information available from Census statistics on population, personal income, and retail trade, analyzed by engineers, planners, and geographers, are beginning to reveal relationships between travel and

such factors as land use and employment. From these relationships methods are being developed for traffic forecasting and trip assignments to route locations, street and highway systems, and entire networks, including the probable proportioning of trips between private automobiles and public transit. These are new techniques that are being developed and will be strong aids to orderly, practical planning. However, not enough is known about the city organism and its probable future behavior under the many factors that affect it. The availability of information from these travel habit studies makes it possible for the first time for urban and regional planners to attempt to study the factors involved in the coordination of transportation and over-all planning. No group of regional or urban planners has ever before had access to so much statistical information on which to project growth for the future. These techniques promise to contribute much as a scientific tool for this planning process.

The use of high-speed computers now makes it possible to analyze many more alternatives of route location and systems of transportation than were ever possible in the past, both in terms of transportation systems and land-use alternatives. While these computers are being used more and more for this kind of work, they also make it possible to extend research into areas that were impossible a few years ago because of the sheer volume of data. Only now are some of the empirical relationships that exist between transportation and the economy of the community, its land uses, and its social structures being recognized.

These new techniques that can help the highway planning processes can now be talked about with some assurance. There are the "treebuilding programs"—the calculation of minimum paths of travel from an origin to all destinations which when delineated has resemblance to the trunk-branch-limb-twig characteristics of a tree. Similar trees would of course be built for all other origins for a complete analysis of an entire area. Then there is traffic

forecasting based on growth factors with an iterative approach—the so-called gravity model, the opportunity model, and multiple regression.

At the present time there is no computer program that is established to handle land-use forecasting from beginning to end. Some steps have been “programmed” but some of the steps are done on a manual basis.

The presentation of travel-habit data is an adaptation of these programs. Computers have been useful in development of data showing desire line-of-travel contour maps, for composite desire-line charts, and for the cartographatron which plots maps electronically. It utilizes an electronic analog device displaying dots or lines on a cathode-ray tube and recording the traces on a photographic negative. Most recently the Penn-Jersey Transportation Study is finding that the results of the study can be plotted directly on charts with an automatic data plotter.

Although much has been learned about the influence of highway facility improvements on traffic distribution, there is need for more research to be done and probably what is much more important to the highway user is the translation of this knowledge into an economic system of transportation. This will require the training of many engineers and planners in the use of these new facts and how they can be used in any local or regional community. It is encouraging, however, that there will be a more satisfactory solution to the very complicated problem of urban transportation when the results of such studies as those described (or similar, more extended studies that are now under way) are obtained.

National Planning

From time to time it has been possible to study and to report on problems of national scope because information is available in each of the State highway departments as a product of its highway planning program. In some instances it has been necessary to obtain some additional data for these studies but this has been possible, and greatly facilitated, because there is an

existing organization in each State with personnel trained to do this kind of work. These studies and reports have been utilized to recommend Federal legislation and policy, and to make statements relating to situations of national scope.

One of the first of these was the “Toll Roads and Free Roads” report of 1939.(4) It emphasized the need of a special system of direct interregional highways, with all necessary connections through and around cities, designed to meet the requirements of the national defense and the needs of a growing peacetime traffic of longer range. It showed that there is need for superhighways, but made it clear that this need existed only where there is congestion on the existing roads, and mainly in metropolitan areas. Improved facilities, needed for the solution of city street congestion, were shown to occupy a fundamental place in the general replanning of the cities.

“Highways for the National Defense”(5), a second report of significance, recommended two general programs of highway improvement. The first and more urgent was directed to program highway improvements for military reservation roads, access roads and tactical roads. The second program recommended improvements of a strategic network connecting important centers of defense industry and all military and naval concentration points including all routes of the interregional highway system previously recommended in “Toll Roads and Free Roads.”

“Interregional Highways” (6), submitted to Congress in 1944, recommended the designation and improvement to high standards of a national system of rural and urban highways totaling approximately 34,000 miles and interconnecting the principal geographic regions of the country.

The recommended system followed in general the routes of existing Federal-aid highways, and when fully improved will meet to optimum degree the needs of interregional and intercity highway transportation. Its development will also establish a transcontinental net-

work of modern roads essential to the future economic welfare and defense of the Nation.

Continued development of the vast network of rural secondary roads and city thoroughfares, which serve as feeder lines and provide land-access service, likewise was considered to have an important place in the over-all program, together with the repair or reconstruction of a large mileage of Federal and State primary highways not embraced within the interregional network.

As a result of this report Congress authorized in the Federal-Aid Highway Act of 1944 the designation of a 40,000-mi Interstate System of highways.

"Highway Needs of the National Defense" (7) reported on the status of improvement of the National System of Interstate Highways. Of this system 37,800 miles was determined to be of greatest strategic importance for service of the highway necessities of war. The conditions of the system were weighed against standards, deficiencies were found and an estimate made of the cost of needed improvements. Federal participation in cost of improvements in a ratio greater than the normal 50 percent seemed appropriate. It was recommended that Federal-aid appropriations for the Federal-aid primary, secondary, and urban system should be continued. Provision for emergency construction and repair of roads and bridges was considered desirable together with the stockpiling of materials and equipment.

These four reports resulted in the setting up of what is now known as the Interstate System, authorized in 1944. It is estimated that this 41,000-mi system (including an additional 1,000 mi added under the authorization of the 1956 act), constituting slightly more than 1 percent of the road and street mileage, will carry 20 percent of the total traffic upon completion.

Other reports to Congress have had important effects on Federal legislation. The report of the Local Rural Road Problem (8) was summarized in a letter from the Board of County Consultants to the Bureau of Public Roads.

"The Factual Discussion of Motor-truck Operation, Regulation and Taxation" (9) was made in response to a request of the Committee, Senate Resolution 50.

The report was developed from data that came largely from the highway planning programs of the several State highway departments and from the long continuity of records, studies and statistical analyses which matured from the operations and research of the Bureau of Public Roads. The report discussed the growth of motor vehicle registration and use, the effects of size and weight of vehicles on the geometric design and traffic capacity of highways, axle loading—its effect on roads and legal limitation—the weight of vehicles and its effect on bridges, the character of overloaded vehicles and their payloads, highway-user tax payments in relation to highway revenues and expenditures, and the allocation of highway tax responsibility.

The recommendations of "Progress and Feasibility of Toll Roads" (10) were (a) there should be no Federal participation in toll roads; and (b) toll roads should be included in the Federal-aid system when they meet the standards for that system, and when there are reasonably satisfactory alternate free roads on the Federal-aid primary or secondary systems.

The "Needs of the Highway Systems, 1955-1984" (11) estimated the cost of needed construction, designed to modernize the Nation's roads and streets over the 10-yr period, 1955-1964, and was based on information obtained from the highway planning studies.

The Congress, in passing the Federal-Aid Highway Act of 1961, placed the highway program on a firm financial basis. The establishment of the Highway Trust Fund guarantees that imposts on road user for motor fuel, tires, and other automotive products shall be deposited in the Highway Trust Fund and shall be expended only on the Federal-aid highway program. The research work in vehicle distribution and use is accepted as authoritative, and Congress based its establishment of tax rates on automotive products on these

forecasts. A continuing study of these revenues makes it possible to recommend action, if necessary, to take to accomplish the program on schedule.

Section 114 of the Federal-Aid Highway Act of 1956 directed that a study be made to determine whether or not the Federal Government should equitably reimburse the States for toll or free highways on the Interstate System built between 1947 and 1957. A report (12) was submitted to Congress in 1958, "Consideration for Reimbursement for Certain Highways on the Interstate System." This report indicated that in this nearly 11-yr period improvements were made in varying degrees on 10,859 mi of the Interstate System at a cost of \$6.1 billion. Twenty-six States reported construction on 1,950 mi of toll roads incorporated into the Interstate System. All States, except Delaware, Alaska, and Hawaii, reported construction of free roads totaling 8,909 mi. The report summarizes the Federal-aid and other funds used in making these improvements. It also made a distribution by cost items essential to computing depreciation.

The report "Maximum Desirable Dimensions and Weights of Vehicles Operating on the Federal-Aid Systems" (13) was submitted to Congress in accordance with the provisions of section 108(k) of the Federal-Aid Highway Act of 1956.

The purpose of this study was to make specific recommendations with respect to weights and dimensions of vehicles permitted to operate on the Federal-aid systems in order that the Federal investment in the National System of Interstate and Defense Highways shall be protected.

The final report will be made upon the completion of the series of tests known as the AASHO Road Test at Ottawa, Illinois.

Section 104(b)(5), Title 23, U.S.C. provides that the Bureau of Public Roads, in cooperation with the State highway departments, make periodic detailed estimates of the cost of completing the Interstate System. Such estimates, when approved by the Congress, are used in apportioning Federal-

aid funds for the Interstate System among the States. The first such estimate was reported to the Congress in January 1958 (14) and was used as a basis for apportioning the Interstate funds authorized for the fiscal years 1960-62. The first revised estimate of cost undertaken during the fiscal year 1960 was used for establishing factors for the apportionment of Interstate funds authorized for the fiscal years 1963-66. (15)

The preparation of these estimates utilized the wealth of information available in the Division of Highway Planning in the several State highway departments. The organizational units responsible for these programs in the States were, for the most part, the manpower sources used in preparing the estimates. The principal role of highway planning in this undertaking is the forecasting of 1975 design hourly volumes of traffic for each road section. This involves a study of traffic diversion, generation and growth under anticipated conditions. Although these determinations are difficult because of lack of experience with an extensive network of freeways, as the system is developed these factors can be studied, evaluated, and modified, to reflect actual developments so that future estimates can be more accurately made.

The Highway Cost Allocation Study, conducted pursuant to Section 210 of the Highway Revenue Act of 1956, has been completed except for a supplement which is being prepared to reflect the final results of the AASHO Road Test in Illinois.

The purpose of the study concerning highway cost allocation is to make available to the Congress information on the basis of which it may determine what taxes should be imposed by the Federal Government, and in what amounts, in order to insure, insofar as practicable, an equitable distribution of the tax burden among the various classes of persons using the Federal-aid highways or otherwise deriving benefits from such highways.

Five reports (16) have been presented, the first four of which were in the nature of progress reports.

The first progress report of the highway cost allocation study described the nature of the problem of taxation for the support of the Federal-aid highway program, on which the Congress sought the aid of the Secretary of Commerce under the terms of Section 210. This report also described the proposed methods of approach to the problem and outlined the series of component studies that would be necessary to the completion of the task. The second progress report was very brief, being concerned chiefly with a narrative of the work on the several phases of the project during the preceding year.

By the time of the third progress report, several of the major data-producing studies had been completed, or at least brought to the point where some results could be published. This report gave the essential facts of a detailed classification of motor-vehicle registrations in 1957 by visual types and registered-gross-weight groups; and a similar breakdown of 1957 travel by vehicle types and road and street systems. Making use of forecasts of population, vehicles and travel prepared in the individual States, it projected the registration and travel figures to the year 1971, with extrapolation of the travel total to 1991. This report also included a digest of a series of studies undertaken in order to develop the story of benefits derived from highway improvements by others than the direct users of the highways.

The fourth report gave a short but sufficient account of the work done on the project during 1959 and an indication of the work remaining to be done. The final report brings together the results of the entire study including results of work completed in the last year on studies of the economic and social effects of highway improvement.

A supplemental report presenting the results of the cost allocation by the incremental method will be made to revise the preliminary analysis of the earlier reports by using the final results of the AASHO Road Test. This same supplemental report will also contain a revision in the differential benefit analysis of the cost allocation study.

Another significant advance in highway engineering during recent years has been possible because of the highway planning studies and processes. More exact information concerning road usage in relation to the physical dimensions of highways has made it possible to evaluate highway design elements that directly affect highway capacity in the movement of vehicles. Knowledge of travel characteristics, *i.e.*, trip length and trip purpose, distribution of driver population in age groups, mode of travel, proportions of the several vehicle types, and distribution and frequency of loadings, is necessary for adequate planning and design. With proper consideration of the interrelation of these characteristics and engineering elements, needs can be developed, cost estimates made, and financing arranged which will produce an improvement program that is logically planned and based on fact.

Some 25 years have now passed since these highway planning studies were first formally initiated. The preceding statements are but brief expressions of what has been involved in the collection of data, in its analysis, in its usage, and its gradual acceptance and growth as an administrative function. It should be evident that the scope of work is wide and that the uses have been and are many and varied. Although much of the work in the initial years was fact-gathering and factual reporting, it is now apparent that highway planning is being utilized as a tool in the administration of highways. In fact this administration would have been severely handicapped without these facts.

The Highway Research Board some years ago compiled a most impressive list of applications that had been made of the results in all parts of the country. They were not and are not confined to highway departments and the Bureau of Public Roads. Many commercial organizations, whose business is dependent for its market on the highway user, find the information on highway usage and financing most fundamental for their planning.

Since this listing was compiled, much planning information finds its way into

highway needs studies, truly a highway planning function in contrast to the assembly of factual information. There is also the increasing amount of work that requires coordination with other planning agencies, particularly with city and regional groups and the Federal HHFA offices. This problem of urban highway development is assuming increasing significance in development of highway programs—programs that should not be decided by highway engineers alone, or in areas that are themselves unprepared for the future.

It should be apparent that as the workload changed from one of data collection to one having considerable analytical and research responsibilities, so may these conditions change again to reflect our changing economy and technical developments in transportation. The highway planning function should anticipate these changes with continuing studies so that facts will be available for administrative decision when the time comes to accommodate these newer or changed elements in their proper place in the highway program.

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APPENDIX

SUPPLEMENT TO HIGHWAY RESEARCH CORRELATION SERVICE CIRCULAR 287, AUGUST 1955

HIGHWAY NEED STUDIES

PART 1. BASIC NEED STUDIES

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DISCUSSION

Hill.—Mr. Hitchcock's chart (Fig. 3) showed funds allocation on one side, and allocations to roads, and another allocation to bridges. Why would you make a separate allocation to roads and bridges? In the needs study, would not you consider bridges a part of roads and allocate funds to the section of road which would include bridges as well?

Hitchcock.—Yes. However, bridges sometimes have to be built earlier than roads, and it seemed best to show the development of a bridge program separately from the highway program and then have it come together at the end. They have to be considered together, but the studies and estimates will be made separately.

Hill.—Mr. Haas mentioned that funds for planning and research have been utilized to the extent of only 0.17 percent.

I cannot believe that this is a realistic figure. I know that in Michigan we have spent much money for research which has never been allocated against the Highway Planning Survey (HPS) funds. It sounds like the highway departments are spending very little money for research. However, we are spending much more for research and planning than that 0.17 percent. I do not think the figure should be used as often as it is.

Holmes.—Mr. Campbell of the Highway Research Board is the source of

that figure. But I interrupted when you said that more than that is being spent for research and planning. There is, I think, a misconception in terminology. I think you are referring to total amounts spent out of the highway planning funds for planning and research. This 0.17 percent pertains to research only and does not include the amount spent for planning.

However, it does include, so far as the Special Committee on Highway Research priorities of the HRB was able to determine, every nickel that is being spent for highway research in the country by State highway departments, the universities, and the Bureau of Public Roads.

It includes everything that the Bureau spends, everything for research that is spent by the States out of the 1½ percent funds, everything the States themselves spend that is not matched in any way by Federal-aid funds, everything that is spent by universities. This was determined by a questionnaire that went to all States and universities, and the total amount of that was 17.8 million dollars or 0.18 percent of the total direct expenditures for highways in the United States, in 1958. So I believe that figure is not subject to serious question.

Campbell.—We attempted to find out in each State what was being spent for research, not only in the Highway Plan-

ning Division but in the entire State highway department and also the total amount spent for highway-related research in each of the universities and colleges having a research program.

This included not only the 1½ percent HPS funds but all of the funds that were being spent out of the State revenues and from private sponsorship.

Insofar as could be ascertained, the figure for the amount of money spent out of each highway dollar on research was the best that could be gotten at that time.

That does not mean that some States do not spend more than the average—Michigan and some other States do. But as an average, spread across the 50 States, I think this figure of about one-sixth of a cent out of each dollar is about as reliable as possible for 1958.

Oliver.—Perhaps that does not relate all to road research.

Holmes.—We have been troubled by the question of whether planning can be separated from research when it gets into a study like the Penn-Jersey Study, which is one we use for an example, or where in fact the study itself is developing the methods. You might say it is all research. But when you get through with the research you have the planning. You might call it all planning or all research, and how would you divide the two. I just do not know. I think we may be called on to make such a division some day, however.

Campbell.—We asked each State to use their own judgment as to what they would call research. But we did suggest that routine studies, those studies which were resulting in manuals, and routine studies which have been continuing for years, were not to be regarded as research. But studies which were set up as special projects for research or newly developed studies in practices and procedures would be classified as research.

There is still a good bit of gray area. But judged by the best ability of each State highway department, this is the figure we got.

Telford.—In the Los Angeles Regional Transportation Study we most certainly are engaged in research. We are also engaged in things that are perhaps

specifically planning. In the research phase of it, there might be some that is classified as pure research—some of it that is specific. It would be difficult if not impossible to say what part should be charged directly to research and what part to long-range planning.

Froehlich.—When you said this was only research money, you were then ruling out these various transportation studies which are really pioneering in some of these areas of research.

Holmes.—The Chicago Area Transportation Study produces reports about every month of special studies of one sort or another. Certainly those are research studies. I don't know whether any attempt was made to separate costs.

Campbell.—The States were given the opportunity in the canvass to include as research any special studies that were going on at that time. It is probable that the work in Chicago was included, but not all of it would be called research. For example, the origin-and-destination study that preceded the analysis would not be included as research because that technique has become routine continuing work. But a great many of the studies that were incorporated in the CATS work would be included as special research studies.

Generally, replies of the State highway departments varied quite a bit as to percentage figures on research done but in the aggregate about 10 percent of the work done in highway planning divisions was reported as research. In some cases it might not have been more than 3 or 4 percent, and in some cases it might have been as high as 20 percent.

Shaneman.—If continuing traffic studies are excluded from the definition of research you will be excluding a great amount of our expenditures. To me these traffic studies are a phase of research. Maybe they are not research in the same sense as the AASHO Road Test was but it is certainly the gathering of information and it is the seeking of knowledge in this particular field. Excluding traffic studies certainly excludes a large amount of money that should have been counted.

Granum.—Mr. Hitchcock, in Figure 2 showing the functions of the planning surveys, collection of all the facts on the left and the objectives they seek on the right, I notice that finance was omitted from the list, unless it could be contained in the legislation item.

Yet you did make the point that one of the prime purposes of the planning survey or planning functions is to finance the highway systems on a sound and continuing basis in an equitable way. Is there any particular reason for that omission?

Hitchcock.—This would presumably be included under program development. In the development of a program there has to be a consideration of the financing of it. Highways needs and fiscal data would also go into the development of a highway needs report.

Granum.—Is your concept that the highway planning function includes the development of a fiscal plan, along with a physical plan?

Hitchcock.—Yes, those two things go hand in hand. You can't have the one without the other.

Granum.—You said at the outset that highway planning, or planning per se, means different things to different people, and you cited examples of a number of people in the highway field, each of whom I consider was doing highway planning.

By reverse logic would you also think that these people are in fact doing highway planning and are contributing to the objectives of highway planning? If so, what are the interrelations between the highway planning survey or highway planning functions that you are particularly concerned with and the highway planning thinking of these other people?

Hitchcock.—What we had in mind is that any person has to do planning for his job, but the maintenance engineer, in planning for maintenance work, is not doing highway planning. He is doing maintenance planning. The design engineer is not doing highway planning. He is planning for the operation of his design department—for a design problem. It is not highway plan-

ning in the sense of the definition of this paper, but the work that each does contributes to it when you bring things together such as the highway needs study or program development, because each of those persons, the maintenance engineer or the design engineer, contributes something in making the cost estimates, for example, in those programs.

Froehlich.—Of course we are talking about planning as a concept here. That is what this whole thing is about; not the very narrow highway planning survey approach, but the over-all planning we must do in our requirements and in our operations. It comes into every phase of the department's existence.

Hager.—Planning, as you showed in Figure 3—to what point does that bring your program? How far is it from the construction stage? How far in advance is this of actual design?

Hitchcock.—Actual design follows it.

Hager.—Then it has been to the extent that it has had a public hearing?

Hitchcock.—I really do not know any public hearing aspect of it; just where public hearings would come into planning as such—probably not until you come to the presentation of the highway need study before a legislative commission, for example. Then you would have public hearings. This would be the result of planning.

Hager.—But then, fixing the corridor, going before the public, which was required by the Federal Act—that would be beyond what you would consider the planning stage?

Hitchcock.—The fixation on the corridor would be planning, but the determination within the corridor as to a location would not be planning.

Hager.—Mr. St. Clair said the purpose of this meeting is to discuss what planning is. I know what it was in our program, and I have an opinion as to what it ought to have been. We in Connecticut carry planning forward to a much broader extent than shown in that chart. We consider planning going right up to almost design. That is establishing the corridor.

Hitchcock.—With 50 organizations there are bound to be some differences

in the development of a functional organization to carry on these different aspects of highway work. What would work in one State might not be quite so good to adopt in another. The laws, the regulations, the personnel, the size of the State and its organization, would have a lot to do with how far you can carry these things.

Telford.—I feel that planning goes perhaps further back than some of us have commented here, and I think it comes on down to some point where design takes over.

There is a specific instance I have in mind in which a legislative committee sat in my office and looked at a plan, which was broad and general insofar as that part of the State was concerned. I wouldn't say the meeting was unplanned, but it was casual. A member of the state Senate, who was most influential at that time, looked at it and said, "Why can't we have this for the rest of the State?" That was planning.

I think every one of you has at one time or another had something like that develop which was effective, but it certainly was planning. A lot of work had gone into that plan, which was for the purpose of leading to a broader and more complete plan.

Then that led to legislation. Getting into this matter of route determination and route adoption, we sometimes spend several years in hammering out differences. Certainly, we do not plan without having some troubles, but we carry planning down to include the actual adoption of the route, endeavoring to hold design to a minimum, because there would never be enough money or people to completely deny all the alternatives.

Carley.—I am beginning to see a little bit of the difficulty between planners and engineers. I would like to say that planning is a process. The highway departments in this country and the Bureau could never be accused of not planning. The problem is they have been accused of not making plans but they have been planning. In my view, the laying down of an actual physical rule, is a plan and sometimes we have not had the plans where we have had the planning. The implementation of

the plan is the money factor and a lot of other things, the zoning, the subdivision orders, etc.

I think it might be helpful to think of planning as a process and the plan as a previously determined, formulated goal by which we actually lay out the physical site, the route, the highway.

I think we in Wisconsin go further with planning, with the Highway Commission as well as our own department, and that the actual laying down, the precise physical location of the highway within that corridor, is also part of the plan in Wisconsin.

So I would not only go back further, I would go further in front with this planning process.

Holmes.—Last week in discussions we were having with the housing agency, this whole question of planning was discussed. The comment was made that the city planner is an employee of a planning commission that has no administrative responsibility at all: it is wholly a staff and advisory function almost invariably. As a result, the city planner has no line responsibility and has no means to implement his plans, whereas the highway planner is a part of the executive establishment. He should be in a staff advisory position with respect to the highway administrator, rather than in a line position. Yet his plans, to the extent they are accepted, become implemented.

The planning man in housing rather thoughtfully suggested that the planners have been wrong all these years in wanting to maintain an independence, and in some sense, a position of avoiding ultimate responsibility, perhaps they would have been more successful and more effective had they been part of the executive operation and had some greater responsibility for the implementation of the plans that they developed.

William Slayton, Commissioner of the Urban Renewal Administration, talked to our engineers about urban transportation planning, HHFA, and particularly urban renewal. In that agency he has had his principal contact with the city planners and regional

planners. He expressed the thought that now, because of the 701 program and because of the highway program, as the highway plans are being discussed and referred to by the city and regional planners their plans are going to be implemented.

Suddenly they have found themselves facing the prospect of having something done about what they planned. It is turning out in some cases to be a rather disturbing responsibility that we have not had to take before.

I think there is that conceptual difference between city planning and highway planning, as we have known it, which is another facet that enters into some of these divergencies in views.

I know in setting up our office of planning we talked about the division of responsibility between the office of planning and the office of engineering, and we found there was an area there in which planning cannot operate without the engineers and in which engineers recognize that they can hardly operate without the planners.

Essentially, we are looking toward the determination of the corridor as the end of planning, but we recognize in the determination of the corridor we have to work closely with engineering. Even in the determination of the route within the corridor the engineer cannot depend wholly on costs and benefits and structural design standards, but he has to rely on a planner as to the community benefits and advantages of what he may do in an engineering way in respect to a specific route location.

We have tried to start our planning with the determination of the corridor, but we recognize there is a rather broad gray area in which we have to work rather closely with engineering; and engineering has to recognize when they take over that they cannot ignore the fact that planning enters into their work from there on.

Froehlich.—We are hearing more and more about a joint cooperative effort of AASHO and the Bureau of Public Roads in regard to encouraging planning in various States. This is urban planning, by the way. I would like to hear a little explanation of how it is

expected to work out. I was asked for some opinion about this, and observed that it was an excellent idea—but it had to be handled carefully. There was some thought about having a revival type meeting, if I can be a little extreme in saying it that way, a revival type meeting which will get the various cities together on certain population grouping, together with highway department people and possibly Bureau of Public Roads people, and encourage urban planning; and to have some kind of highway study of the particular city.

Now, there are a number of States, particularly urbanized states who have been doing this over a long period of time. The programs of the Federal Government and HHFA have more and more encouraged this on the part of individual communities.

In some cities I know that if we in the highway department came in and waved the flag regarding planning, this would probably set back urban planning quite a bit, because although we may be accepted as a partner, we may not be accepted as a leader.

Babcock.—The Urban Transportation Committee of AASHO is now in the formative stage of developing some of these conferences, and I do not believe that it has gone to a point of conclusion, yet.

There are certain formats that the committee has been putting out as to how this is taking place, and it is thought that there would be some of these regional conferences in this whole area of urban transportation planning.

When and exactly the format—I do not know when and exactly what the format will be, because I just got a copy of the format a week or so ago.

Wiley.—New Mexico does not have any big metropolitan areas. A study is being set up in Albuquerque, which has about 265,000 people in the whole area, and we have, as in a number of other places, set up a coordinating committee composed of representatives of the city, the county involved, the State, the Bureau of Public Roads, and a representative from HHFA. We are still in the very early stages but we have begun.

New Concepts and Goals in Highway Planning

DAVID CARLEY, *Wisconsin Department of Resource Development*

• THIS PAPER represents the "non-highway" point of view as well as the "non-planning" by professional planning standards. The author is a professional political scientist as well as the administrator of a State planning and development program. But with credentials stemming from the administration of a state-wide planning program rather than any evidence of professional engineering or planning talent, this opportunity is taken to importune highway people to "take the broader view."

A short resumé of planning activity in Wisconsin in the past 2½ years is of significance in a discussion of "concepts and goals" in highway planning. Since the creation of the Department of Resource Development by the State legislature in October 1959, the following planning activity has taken place:

1. Where not a single "701" Federal urban planning assistance grant program was under way previously, there are now 40 Wisconsin cities and villages in the program administered by the Department of Resource Development with at least 30 more localities on the waiting list.

2. Three regional planning commissions are now active, with two other regions having formally petitioned the governor to create such commissions. This means that over one-half of the State's population lives in areas that have, or have petitioned for, formally established regional planning commissions. In each instance, these regions became interested through the encouragement and active inducement by the governor and personnel of the department.

3. Work has begun on a comprehensive state-wide plan which should be completed by the end of 1963. The largest Federal HHFA "701" grant for a state-wide plan (\$75,000) has been received and the "first approximation" of this plan will be ready by July 1 of this year. (The transportation plan,

which is an integral part of the State comprehensive plan, has been a cooperative program between the Department of Resource Development and the Highway Commission with a well-known eastern transportation consultant firm doing the major work.)

4. The 1961 Wisconsin legislature passed Governor Gaylord Nelson's \$50 million resource development program which is one of the largest recreation and land acquisition programs in the country. The planning for this program, which involves comprehensive, multipurpose planning has been delegated to the Department of Resource Development.

These comments indicate Wisconsin's vital interest and activity in planning. They also indicate that only a comprehensive approach can adequately solve the State's economic, social and resource development problems.

What then, does one not engaged in highway administration see as important in the investigation of the role of planning in highway administration? The categorical imperatives necessary to the development of planning as a sophisticated tool of the highway administrator are as follows:

1. The recognition that highway planning and development is inextricably bound up with all of the other development factors of a given governmental unit and cannot be a distinctly separate operation.

2. The planning of highway networks can no longer be limited in scope to a single route or community but must be based on a regional or a state-wide systems concept; also, planning efforts by the many governmental units with responsibilities for highway construction must in some manner be coordinated.

3. Highway planning is more than fact-gathering, origin-destination studies, and projections of traffic. It ought to be a socially-conscious and esthetic

operation, tied strongly to careful consideration of other resources and their uses.

Many will say that these three cardinal virtues listed as requisites of good highway planning are not at all new. The Sagamore Conference in October 1958 said all of these things and said them better. The only rebuttal is that many city, county and State highway departments either never heard of the Sagamore Conference or did listen and went back to the status quo.

Wisconsin is fortunate in that over a year ago the State highway commission created an Office of Urban Planning. In addition, that bureau's staff engineers work closely with the personnel of the Resource Development office on community planning programs on the State plan and with the various regional planning staffs. Nevertheless, even with such a long-range planning function now operating, most highways are still planned on the basis of established need rather than anticipated need. This is not unlike most other States to date, of course, and it is expected that before too long the highway planning program will be developed on such an anticipatory concept.

Highway planning and development cannot be undertaken as a disparate operation. Conceptually, highway planning has taken great strides in the past few years. The new transportation studies in Philadelphia, Los Angeles, Chicago, Pittsburgh and other metropolitan centers have one common denominator; they all recognize that the piece-meal planning efforts of the past provided few lasting solutions to the transportation problem. The new approach, equally apparent in all of these studies but to date woefully lacking in all but a handful of State highway programs is a comprehensive planning approach.

A great failure of the Federal Interstate Highway program was its lack of attention to comprehensive planning. Fortuitously, it has literally forced a comprehensive planning approach on many localities and regions but the Federal program itself is almost devoid of

such concepts. Only recently has the Federal highway program demonstrated awareness of the tremendous impact of highway construction on other resource development decisions by the recognition given this concept in the 1961 Housing Act calling for Federal grants for transportation planning but only within a comprehensive plan context; and by the recent announcement of the creation of an Office of Planning in the Bureau of Public Roads. These are welcome—but long overdue—new trends.

The granting of incentives to minimize billboard blight was a commendable action but more importantly the Federal Government, in its Interstate program, should have insisted on adequate zoning in each of the highly expensive interchanges created in every State by the new system. The twin problems of potentially blighted, honky-tonk areas around each interchange, and the generation of traffic volumes much greater than those designed for, are pressing today. The Department of Resource Development drafted a bill that sought to create special interchange districts, with zoning standards set up by the State. It passed one house but failed in the other. The Federal Government could have encouraged this sort of control by granting a bonus in road fund allocation.

Wisconsin's new state-wide planning program recognizes the non-disparate quality of the comprehensive approach to planning. The transportation project could not possibly be isolated from the land use, economic, population, recreation, and State facilities project.

The dramatic increase in transportation movement, particularly motor vehicle travel, since World War II has prompted a number of travel habit studies seeking new and better means with which to anticipate future travel demands. A significant outgrowth of these studies has been the increasing realization that, in all areas studied, very significant and basic relationships exist between travel desires, land use, and other social and economic factors.

The establishment of quantitative measures of these relationships, to-

gether with the use of electronic computers, has made possible the integration of transportation and general land use planning into a comprehensive planning process. It is now possible to study the interaction that exists between transportation and economic development and land use in any region of Wisconsin. It is strongly believed that transportation systems can be planned not only to meet the transportation needs of the State, but to help shape the State and its regions along the economic and social lines most desired by the citizens. The transportation planning work undertaken in connection with the State planning program embodies these concepts. It will reveal a reliable picture of the State's future travel demands related to such items as the future distribution and extent of the population, economic and recreational activity, and land use.

The transportation phase of the comprehensive planning program is utilizing information available from previous surveys and data collected routinely by various private organizations and Federal and State agencies. The information from these sources has been assembled and a composite picture of travel is being developed. Transportation movements are broken down into two basic purposes: movement of people and movement of goods. These movements will in turn be identified by mode of transportation; that is, highways, rail, air, water and pipe line.

Several other things are being considered in Wisconsin's program, including (a) an identification of the most significant trends in transportation, (b) an evaluation of the possibility of major technological changes in the field of transportation, (c) a determination of the special and unique problems with which the State is faced in respect to transportation, and (d) an evaluation of the advantages that Wisconsin has in this field.

From these studies and analyses a model of present transportation movements will be prepared by means of which these movements can be related to current land use and economic activities. A comparable outline of such

movements will then be made for the year 1980. Trends based on both the current relationships and the forecasts of 1980 activity being developed in the other phases of the planning program will be taken into account. Thus the future travel picture will have been developed with the consideration of such factors as the future shape of the state's major recreation facilities, urban and industrial developments, agricultural operations, etc., and will be compatible with expected changes in all travel-producing activities.

Future plans for the public segments of the transportation network will then be developed from these over-all statements of needs. Finally, the implications of trends in the field of transportation, especially as they might affect needs for publicly financed improvements beyond 1980, will be studied.

The objective to formulate, in cooperation with other State agencies, an over-all plan for highway and other transportation facilities is predicated entirely on the observation that the "whole is the sum of its parts."

The largest regional planning area in Wisconsin, which includes metropolitan Milwaukee and Racine, Waukesha and Kenosha, is currently developing a regional transportation plan. That group, like the State plan directors, fully recognizes the relationship of land use planning to highway planning. Based on the premise that future distribution of land use is the major factor in projecting travel patterns, the regional group is developing an integrated transportation systems design approach that consists of the following:

1. Relating trip generation directly to land use; at present this requires the collection of origin and destination survey data.

2. Establishing the future land use pattern of the area for which the transportation system is being planned; this may be done either on the basis of a land use projection based upon a regional growth model, or on the basis of a land use plan which would use a growth model to establish ranges within which policy decisions can be made and

which would indicate not only choices that are feasible, but choices which are optimal.

3. Establishing total trip generation for the design year using the previously established trip generation factors and future land use patterns. It should be stressed that in this approach it is the future land use pattern which determines the future origins, destinations and travel linkages and not the existing origin and destination survey data, necessary as this data may be to the planning process.

4. Converting trip generation to travel pattern—future trip desire lines—by means of a mathematical model expressing zonal interchange.

5. Developing a planned network of facilities to serve the volumes and locations of these synthesized travel demands. This requires a quantitative assignment of travel demand to the proposed network, and adjustment of the network if necessary to relate planned capacities to future loads, thereby obtaining a workable system.

A second admonition to highway planners is that new highway developments not be planned within the confines of a single municipality or even a single county. Nothing less than regional concepts, and in some instances those incorporating an entire State, must prevail if new transportation systems are to achieve their optimum value.

The author is a zealous advocate of state-wide planning in transportation as in other critical areas. Some in Wisconsin have been saying that the most important planning to be done in the United States in the next 10 years is going to have to be done in the State capitals, but they are also aware that this is not a fashionable view among many professional planners, who have a low opinion of the State as a planning vehicle. Nevertheless, almost all including the planners, are in agreement that the great, unresolved problem before the public is the shaping of future urban growth. The problems are regional but the governments are local.

There is already a regional government; although State governments are

still antiquated and unacquainted with 20th century living, they can be made into viable instruments of public policy.

Because of rapidly mounting population pressures, a whole series of major, critical problems has been thrust upon the States. They are problems which were not anticipated. They are problems the States are not prepared to cope with in any planned and orderly fashion. For this reason probably the most important single problem faced by the States is the problem of preparing comprehensive plans to meet the pressure of future growth. This involves a careful evaluation of such factors as present and future needs and assets in all areas: population growth—where and how much; economic development—what kind and how much; transportation pressure—where and what kind; public institutional requirements—where and how many; recreation needs and resource assets—where located, what needed, how should they be used.

No State has yet prepared an adequate plan offering guidelines for future growth. Wisconsin now has such a plan well under way. When it is completed the State will be prepared to follow an intelligent course for the future.

The decision to launch vigorous programs of State planning comes at an appropriate time. Most States are in periods of massive transition. Among the problems are these:

1. A shift from an agricultural to an industrial base, causing imbalance in rural areas and uneconomic, oftentimes unattractive, seemingly uncontrolled metropolitan sprawl around urban centers.

2. A growing population pressing hard against the State's fund of natural resources, and particularly against water, forest, lake, wildlife and recreation areas.

3. Rapidly mounting pressures on public facilities, creating new demands for public works at both local and State levels.

Looking back, it is easy to see where the States would be better off today if they had anticipated more of the prob-

blems that inevitably arise from a growing population. Roadside developments would not have been allowed to encroach on highways near cities, clogging their traffic carrying capacity and partially destroying their usefulness. Helter-skelter housing and commercial developments on the outskirts of cities would have been prevented. Railroads would be carrying a large share of the commuters, taking a load off city streets and parking places. Waters now too polluted for swimming would still be clean; streams that once offered good fishing would still be good; ground water in some contaminated areas would still be safe for wells.

There are other unpleasant conditions that could have been anticipated and at least partly controlled: downtown decay; building of houses on river flood plains; despoilation of scenery; destruction of fish and game habitat; overdevelopment of lakeside property; construction of inefficient, hard-to-service housing developments; uneconomic distribution of airports, etc.

The social and economic forces which caused these problems are still operating. There is every evidence that the problems will get worse in some places, and for a long time to come. Although growth brings on the most dislocations, the reverse is a cause of much concern over large areas of the State where population is declining, bringing with it a host of problems of another kind.

It is believed that state-wide planning is desirable to coordinate State agency activities, to provide a framework for local and regional planning efforts, and to identify problems before they reach the crisis stage, as well as to offer solutions where possible.

Wisconsin's State planning program is founded on the principle that the best results will be achieved by taking advantage of what is already known. Plainly, this is not the time for further broad-scale, long-term, original research studies as important as they are. The facts are gathered. The various agencies of the Federal and State governments are invaluable sources of specialized learning and information. But the uses to which such resources have

been put have often been single-purpose or superficial. The big problems have been to place a deeper tap on such resources, to establish a freer flow of information, and to weld the facts into a unified system of development policies.

In addition to careful planning coordination horizontally—that is, to approach land use, transportation, capital facility and resource problems simultaneously—there is a great need to coordinate highway planning activities vertically. No longer is any single level of government capable of evolving the kind of highway system society today demands.

The most carefully engineered and designed municipal transportation system is faulty if the broader implications of the entire regional transportation system are not taken into consideration. Inter-regional traffic patterns also are in as much need of investigation as are intra-regional patterns. This obviously requires State government participation.

A last plea to highway administrators, in considering the vital role of planning in their deliberations, is to accept a new dimension not covered by slide-rules, logarithm tables and computers. It is of social-consciousness. Today's modern highway systems will have an awesome impact on the customs, habits and the directions society will take. The kind of planning, therefore, that goes into these systems bears important responsibilities. It must see that the contributions highways make to society are positive, that they are creative, esthetic, and mindful of a balanced allocation of resources.

In attempts to guide urban growth, it is time to recognize the necessity of searching for new urban ways of living as well. The problem of American culture seems to be whether the people can be motorized as well as civilized. Urban living is a collective form of living, and habits must be changed from a rural orientation to an urban one. Good highway planning can help during this critical period of transition. It will influence greatly, for good or ill, what kind of a society is eventually achieved.

New Concepts and Goals in Highway Planning

JOHN A. SHANEMAN, *Illinois Division of Highways*

• IN TERMS OF definitions given previously in this conference, planning is the process by which administration determines the method of achieving its aims.

A GAME OF HIGHWAY STRATEGY

As a prelude to discussing new concepts and goals in highway planning, the aims and objectives of highway administration or of a highway program should be examined. Theodore F. Morf, Engineer of Research and Planning, Illinois Division of Highways, has invented a game of highway strategy. In this game the player is asked to imagine himself to be the top policy-making authority—governor, legislature, highway commission, director, or chief highway engineer—all in one person. This person has complete and unrestrained authority to follow any strategy or sequence of strategies appearing justifiable to him; the only limit upon his action is the amount of funds available. The player must review the possible strategies which he may follow in spending his money, and he must make a series of choices. The strategy which appears to be most justifiable to him must be considered his first choice. On this, he may spend money until he reaches the point where the benefit of his first-choice strategy is not as great as could be yielded by his second choice. He continues making successive choices until all his money is spent.

In this game there is a sharp distinction between strategies and tactics. Strategy is defined as involving the question of what objectives are selected, and tactics are the means of attaining them. On the basis of these definitions, the strategies in the game of Highway Strategy are the administrative aim and tactics constitute the planning process.

Upon the basis of Morf's game of Highway Strategy, what are the aims and objectives of highway administra-

tion, at least in the opinion of those who have played the game?

To start with, the game lists nine strategies in no particular order of importance, and the player is given the opportunity to add one of his own. The strategies are as follows:

Safety

Each year, in the United States, automotive transportation is taking a toll of nearly 40,000 lives and results in injuries to more than a million persons. The annual economic cost of motor vehicle accidents approximates the annual capital investment in highway facilities. Investments in highway improvements, such as roads of freeway design and, less dramatically, wider surfaced shoulders, widened bridges, easier curves, and longer sight distances, can effect a substantial reduction in the number of deaths and injuries. Expenditures should be directed to maximizing the benefits of increased safety.

Existing Responsibilities

All highway departments are assigned the responsibility for a road system, in being, and have developed a technique of sufficiency rating to compare the relative deficiencies of the several parts. The needs for the continued maintenance and reconstruction of this system, in being, should be a claim on the funds of the State before any new additions supported from the same financial sources can be undertaken.

Least Freight Cost

Every article used has some element of motor freight cost in its price. It is well known that the unit cost of motor freight declines as the size of the transportation unit increases. It follows that motor freight costs would be much less than their current level if highways were provided which would withstand much heavier unit loads than are now permitted. The highway construction program should be directed to provide

for much stronger pavements and bridges than at present, and structure clearances should be revised to accommodate much larger freight vehicles than are now lawful in order that motor freight costs may be minimized.

Economic Redevelopment

While some areas of the State are flourishing and their populations and economy are booming, other areas appear to be declining or in a condition of chronic depression. In such areas the depression may stem from a depletion of a natural resource, such as exhausted soils, mines, or forests; or to technological changes similar to those which have blighted the buggy whip industry. The economic redevelopment of these areas is an important objective of the State's long-range planning, and the State's highway construction program should be directed to furthering this purpose.

Industrial.—It appears that the best ways to stimulate the economic recovery of the area are to retain the industrial workers and, through increased highway transportation facilities, make the area more inviting as a site for new industries. Or, in the case of extractive industries, to build roads to serve new mines or logging sites, connecting them with refineries, sawmills, and shipping points.

Recreational.—It appears that the best way to stimulate the economic recovery of the area is to develop its recreational potential. Large artificial lakes are to be created (by dams formed of massive roadway embankments) and roads need to be built, or rebuilt across them as well as to serve their new margins. An outstanding skiing area could be developed to sustain the winter economy by the construction of a new highway capable of serving large volumes of weekend traffic under the most adverse weather conditions.

Maximum Motor User Benefits

Practically all of the State-collected highway revenues, and all of the Federal-aid revenues, have their source in special and burdensome taxes levied upon motor users in connection with

their use of the highways. Motorists generally expect to receive benefits, at least as great as the amount of these special taxes which they pay. Road improvements create demonstrable benefits, although the ratio of benefits to the cost of the improvements may vary considerably as among a number of alternative choices to be made. Not only do these advantages result to the motorists themselves, but they also affect the economy at large, through savings in transportation charges. Highway administrators should feel impelled to spend the highway funds in such a way that the greatest motorist benefits will result.

Urban Redevelopment

In every State there have been shifts of population during recent years. Metropolitan area populations have increased greatly, while those of many rural areas have diminished. Not only has this shift in population created new needs for highway facilities, but changing modes of transportation have reinforced and magnified this need. Changing modes of transportation have made possible new patterns of urban living and new forms of industrial and commercial activities. The satisfaction of the requirement for rebuilding cities into newer forms should be a first claim on the financial resources available for State highway purposes.

Unemployment Relief

Government has accepted the responsibility for minimizing the effect of periodic unemployment, with its cyclical impact upon indigency in general, through a number of publicly financed programs. The scope of these tax-supported programs might be reduced by a time-wise scheduling of highway improvements so that the effect of highway construction generated employment would have the greatest beneficial result. The reinforcing action of unemployment relief and highway construction should not be overlooked, but instead be recognized as companion efforts, and the highway program should be held in schedule accordingly.

Least Governmental Cost

Someone, perhaps it was Thomas Jefferson, said that the least governed nation was the best governed nation. Others have said that the least taxes are the best taxes. Public highway expenditures are now running at a rate in excess of \$10 billion. Benefits which might be realized from time and distance savings or through accident reductions are illusory statistical concepts which have nothing to do with governmental highway finance. States could spend themselves and their taxpayers into bankruptcy creating these so-called benefits. A highway program should be devised which will result in the least governmental cost for the total governmental function of maintaining and operating a road system.

Geographic Distribution

Generally speaking, automotive travel is local rather than long distance. If road construction does create benefits as a result of the motor vehicle imposts that motorists pay, it then follows that highway expenditures should be made on projects geographically close to the source of the taxes collected. In almost all States, the public mind has created definite geographical boundaries, such as between a large metropolitan area and the agricultural remainder; between those areas east and west of a chain of mountains; or north and south of a major river. Lacking other well-defined geographical boundaries, a

breakdown of expenditures by counties might be used. If the benefits of road construction are to be made most available to the motorists who make them possible through their taxes, a geographical distribution should override every other consideration in devising a program.

The game has been played by a class of graduate students in highway economics and by about an equal number of highway administrators and educators. It is of interest to examine their scores to see if there is any uniformity in opinion as to the objectives of a highway program. Table 1 lists the way in which these two groups scored the various strategies.

In determining the objectives of a highway program, it is significant to note how closely these two groups compare in their evaluations. The three most important strategies, as agreed upon by the group of graduate students and by an equal number of highway administrators and educators, are:

1. Maximum motor user benefits,
2. Safety, and
3. Existing responsibilities.

It is of passing significance that although both groups agreed that providing maximum motor user benefits was first in importance, the highway administrators ranked the meeting of responsibilities on the existing highway system slightly ahead of safety while the students thought safety to be more

TABLE 1
ORDER OF IMPORTANCE OF OBJECTIVES OF A HIGHWAY PROGRAM
DETERMINED BY MORF'S GAME OF HIGHWAY STRATEGY

Order of Importance	Graduate Students	Highway Administrators and Educators	Both Groups
1	Maximum motor user benefits	Maximum motor user benefits	Maximum motor user benefits
2	Safety	Existing responsibilities	Safety
3	Existing responsibilities	Safety	Existing responsibilities
4	Economic redevelopment	Geographic distribution	Economic redevelopment
5	Urban redevelopment	Urban redevelopment	Urban redevelopment
6	Least freight cost	Economic redevelopment	Geographic distribution
7	Geographic distribution	Least government cost ¹	Other
8	Other	Other ¹	Least government cost
9	Least government cost	Unemployment relief	Least freight cost
10	Unemployment relief	Least freight cost	Unemployment relief

¹ Equal weight.

important. The two groups were fairly well agreed in their evaluation of the relative importance of economic redevelopment and urban redevelopment, placing these about midway in the scale.

There was a wider divergence as to the relative importance of providing a program that provided less freight cost; the students placed this sixth in the scale, but the highway administrators placed it last. Geographic distribution and least government cost were other objectives on which there also was a divergence of opinion as to relative importance. Both groups scored unemployment relief very low in priority. Finally, each group had about the same number of "other" suggestions.

MAJOR CONTROLS OF HIGHWAY DESIGN

At this point, it may be wondered what this has to do with "new concepts and goals in highway planning." None of these concepts is new, but then the objectives and goals of highway administration are not new. The strategies remain substantially the same today as they were 20, 30, or more years ago. However, it is the tactics that change or that must be continually re-evaluated. The manner in which the tactics or the planning changes—the new goals and concepts which must be adopted in highway planning—is directly dependent upon the objectives of highway administration and the relative importance accorded any particular objective at any given time.

Is there a common denominator in the three main objectives previously determined and can this denominator be used with respect to any of the other objectives?

One factor that appears to be common to these three objectives and to a number of other objectives, such as least government cost, urban redevelopment, and economic redevelopment, is the type of service that is to be furnished the motorist. The type of service furnished the motorist is determined by the geometrics of design used in the construction of the highway.

In the AASHO Policy on Geometric Design of Rural Highways it is stated that in a broad sense there are three major controls—traffic volume, character or composition of traffic, and design speed—that determine the principal geometric features of a highway. Other design controls and criteria, such as topography, physical features, capacity, safety, and economics, are of primary concern but are either reflected in the three major controls or have to do with the more detailed features of design which are not considered necessary for inclusion in a concise and simple design designation.

Traffic volume, the first major control in the expression for highway design designation, should include the pertinent traffic information relating to both current and future traffic volumes. This is best expressed in terms of ADT, with the current year and the future (design) year noted. Most significant is the design hour volume, a two-way value. Also of importance, particularly on multilane facilities, is the directional distribution of traffic during the design hour.

Character or composition of traffic, the second major control, should indicate the proportion of trucks (excluding light delivery trucks) in the traffic stream. Since design hour volume is the controlling volume in geometric design, it follows that trucks should be expressed as a percentage of this volume.

Design speed, the third major control for highway design designation, is basic to the over-all standards, and together with the traffic volume and percent of trucks is indicative of speeds and type of operation to be expected.

In summary, then, the factors which determine the design of any particular section of highway are the traffic volume, percent of trucks, and the design speed.

However, if maximum road user benefits are to be furnished, existing responsibilities met, and future urban and economic redevelopment provided for—all at the least government cost—

there is a more important criterion that must be considered: the determination of the level of service that is to be furnished to the road user by any particular highway.

Traditionally, highways have been classified on a functional basis (primary, secondary, or local) or by some similar category. Responsibility for the various systems has been delegated to the different governmental agencies on a financial basis, with little attention given to the type of service to be furnished by each system.

LEVEL OF SERVICE

The term "level of service" has been used by various groups and, dependent upon the group, has been given various definitions. In discussing advance planning operations by the North Carolina State Highway Commission, W. F. Babcock, Director of Highways of the North Carolina Highway Department, defines level of service as the defining of the average operating speeds which each system should provide and includes capacity recommendations and the degree of control of access to be used on the various systems.

What does this mean in terms of operation and design? How would the level of service criterion be applied and what would be the results? An example of a specific situation in Illinois will illustrate the point.

Interstate 74 has been constructed on a new location and is open to traffic between Danville (population 42,000) and Champaign-Urbana (population 77,000), a distance of about 35 mi. It is under construction from Danville east to the Indiana State line, and its construction from Champaign northwest is contemplated within a few years. Before the construction of the Interstate highway, this corridor was served by US 150. The two routes—Interstate 74, a 4-lane divided highway, with full control of access; and US 150, an old, resurfaced concrete highway, 20 to 22 feet wide with no control of access—parallel each other. There are four small communities served by US 150 in the 35-mi stretch between Champaign-Urbana and Danville, with populations of 1,210, 515, 494, and 861, respectively. Although all of these communities have access to the Interstate route by adjacent interchanges, there will still be a substantial

amount of traffic from these towns using the old route. Northwest of Champaign the situation is similar. In the first 24 mi there are three communities served by US 150 with populations of 1,367, 743, and 1,883. Again, each of these towns will have access to Interstate 74 by adjacent interchanges. But even so, estimates of future traffic indicate that the old route will continue to carry a substantial number of vehicles after the Interstate route is completed.

Upon the basis of present design concepts and in conformance with the existing system of classifying highways, the old route would warrant reconstruction to the geometrics indicated by the ADT. If the traffic is sufficient, this could mean 70-mph design speeds, 12-ft traffic lanes, 10-ft shoulders, 5 percent grades, stopping sight-distances of 600 ft, passing sight-distances of 2,500 ft, and other geometrics of design dependent upon the number of vehicles remaining on the old road.

The example cited is duplicated many times, not only with respect to Interstate construction, but also in other situations wherever the need for the construction or reconstruction of a highway occurs.

One of the concepts planning engineers should recognize is the concept of the level of service to be provided the motorist by the highways now being constructed and which will be constructed in the future. If the maximum in road user benefits is to be provided, and if the existing responsibilities are to be met—all at the least possible cost—this new concept in highway classification and design is required.

Referring again to Babcock's definition of level of service as defining the average operating speeds which each highway system should provide, and including capacity recommendations and the degree of control of access to be used on the various systems, several questions arise. First of all, there must be some criteria on which to base the decision as to the level of service to be provided by any given route.

Table 2 gives a number of factors to be considered in determining the level of service that a proposed route should provide. Obviously, these are not all of the factors to be considered, and it is possible that some of the factors included in the list should not have been included. However, Table 2 does sug-

TABLE 2
FACTORS TO BE CONSIDERED IN
DETERMINING LEVEL OF SERVICE

-
- 1 Other highway service in corridor:
 - (a) Number of routes serving essentially same origins and destinations.
 - (b) Proximity of other routes to subject route.
 - (c) Stage of development of other routes in corridor.
 - (d) Mileage and motor user cost by other routes
 - (e) Potential development of other routes in corridor in comparison with subject route.
 2. Land use in area served:
 - (a) Present land use.
 - (b) Size and spacing of municipalities.
 - (c) Potential economic development within corridor.
 - 3 Characteristics of traffic served:
 - (a) Average trip lengths.
 - (b) Volume of traffic and percent commercial.
 - (c) Potential increase in traffic.
 - 4 Economic effects of developing various routes to different levels of service:
 - (a) Comparison of cost of development of various routes in corridor to desirable levels of service.
 - (b) Computation of benefit-cost analysis on basis of developing various routes in corridor to desired level of service
 - (c) Effect of construction on value and use of property abutting highway
-

gest a basis for the development of criteria for determining various levels of service.

Although it is beyond the scope of this paper to attempt to evaluate these various factors or to assign values which would determine comparative levels of service, a review of several of the factors will illustrate the procedures involved.

One factor of importance is the average trip length on the segment of route under consideration. If the average trip is 75 mi in length, the difference in travel time between a design that will permit an operating speed of 30 mph and a design that will permit an operating speed of 50 mph is approximately 1-hr travel time to a motorist. However, if the average trip is but 15 mph, then the difference in travel time is but 12 min. Another factor to be considered is the presence of other routes in the corridor being served and the level of service already being furnished by such routes. Referring to the example given, there should be no obligation to furnish more than one route in the corridor described providing a level of service affording 70-mph design speeds, 12-ft traffic lanes, full or partial control of

access and, such other features. Other routes in such a corridor should be constructed to lesser design standards—even though on the basis of traffic volumes a higher design would be warranted.

The question also arises as to the features of design that will be embodied by each level of service. How will the highway in the highest level differ from the one in the lowest level? Table 3 gives five different levels of service to be provided and gives the pertinent design features for each level. Again, this table cannot possibly include all the features that must be considered, nor does it purport to be precise policy in each item. It is a guide to what it is hoped will be constructive thinking on this subject.

Perhaps the best way to summarize this premise is by reference to present practices. The level of service furnished by the Interstate Highway System has been determined by Federal policy, *i.e.*, a fully controlled-access highway system. The method of achieving this objective—by grade separating all intersections (highway and railroad), providing access to the through traffic lanes only by carefully designed interchange facilities, regulating the frequency of interchanges, separating the directional flow of traffic by medians, and by other carefully prescribed details of design—has been set forth in memoranda issued by the U. S. Bureau of Public Roads and has been adopted by the several States. The relative level of service of any highway constructed to such standards would be at the top of the list.

Second on the scale would be those routes designed to provide a level of service slightly below that provided by fully controlled-access highways but considerably better than that provided by the ordinary non-access controlled highway. Such routes are commonly referred to as partial (or limited) access controlled highways.

Third on the scale would be routes which would not be access controlled and which would provide slightly lower operating speeds. These highways would

furnish more service to abutting land-owners and not quite as much service to the motorist.

At the bottom of the scale would be those highways which will carry local traffic and which will be designed to provide a service commensurate with such usage.

In the discussion of this concept, the problem has been oversimplified. There are many facets that were not discussed. A complete re-evaluation of the existing highway systems is involved—not in the classic primary-, secondary-, tertiary- or State-, county-, city-, local-tradition but instead from a viewpoint of level of service to be provided. It cannot be done piecemeal. No one part of a highway system operates independently of the other segments. The classification of a route with respect to the service to be provided by such route is dependent upon all the other highways in the corridor.

This concept will require the development of standards for the determination of the appropriate levels of service to be furnished and the manner in which they are to be applied. It also will require changes in the application of design standards since the prime question will not be one of traffic volume, percent of trucks and operating speeds, but instead it will be one pertaining to the service to be furnished by the facility.

Finally, it will require careful consideration and complete planning of entire highway networks instead of routes or segments of routes.

The classification of highway systems from a level of service viewpoint, whether it is recognized as such or not, has already taken place. The authorization of the 41,000-mi of Interstate Highway System by Congress in 1944, the designation of the actual system by the States, and the enactment of legislation by the Congress in 1956 insuring the means of financing its construction constituted such a classification. Similar prior action by the Federal government and by the several States in designating and providing for the financing of the construction of primary and secondary systems have been milestones in

the road to progress in the highway field. However, after each such action there has been a lull, and during this lull more ground has been lost in meeting the highway needs than has been gained, it sometimes seems.

During the last half century, there have been vast changes in the highway networks and in the services offered the motorists.

For example, in 1905 the mileage of Illinois roads in rural areas was much the same as it is today. Of 94,000 mi of roads reported for that year, only about 7,860 mi were surfaced. On a state-wide basis, the roads of 1905 were almost uniformly unsurfaced dirt roads. In 1913 the passage of a State-aid act provided for a specialized system of county highways. This system, constituting about 25 percent of all rural roads (to be financed by the counties with State aid), was to be the backbone of the rural road network. By 1917 the need for an even better road system, of more specialized hard-surfaced roads, was recognized by the adoption of a State bond issue act. The system to be constructed with this bond issue totaled about 4,800 mi of rural highways. So immediate was the public recognition of the need for a modern system of hard-surfaced roads that, before the highways of that first bond issue had been completed, a second bond issue authorizing an additional 5,200 mi was adopted. The bond issue systems were completed during the early 1930's, and for the next 15 years, or until after World War II, road building consisted mostly of reconstructing older sections of the basic system and constructing a limited mileage of beltlines.

Although the dates may be different and the means of financing and the type of legislation enacted varied, the same sort of pattern can be traced throughout the United States. Each time a bond issue is authorized or a legislative act adopted, there is a feeling that the highway problem is solved. In highway planning this is not true. Increases in motor vehicle registrations, in traffic volumes, and in miles of travel, together with technological improvements in the motor vehicle, combine to require the

TABLE 3
CLASSIFICATION AND CHARACTERISTICS OF VARIOUS LEVELS OF SERVICE

		Dependent on Level of Service						Dependent on Level of Service and Traffic Volume							
Degree	Access Control		Entrances to Travelway	Frontage Roads	Design Speed (mph)	Max Grades (%)	Sight Distance		DHV	Traffic Lanes			Shoulders		Median Min Width (ft)
	RR Crossings	Highway Crossings					Stopping (ft)	Passing (ft)		No	Width (ft)	Surf Type	Width (ft)	Surf	
Full	Grade separate	Grade separate	At interchanges, interference to traffic kept to minimum. No private entrances	As required	70	3 - 4	1,000	2,300	Over 2,700	2	36	High	12 R 10 L	Paved	46
		Close minor roads or connect to frontage roads							800 to 2,700	2	24	High	12 R 10 L	Paved	42
									Less than 800	—	24	High	12	Paved	
Partial	Grade separate, major crossings	Grade separate, major highways	Private entrances No commercial or industrial entrances	As required	70	3 - 4	1,000	2,300	Over 2,700	2	36	High	12 R 8 L	Stabil.	42
	Protect others with automatic signals	Minor roads intersect at grade							800 to 2,700	2	24	High	12 R 8 L	Stabil.	42
									Less than 800	—	24	High	12	Stabil	
None	Grade separate, major crossings	Channelize major intersections and control with signals	Private, commercial and industrial entrances permitted Type, size and spacing controlled	None	60	5	600	2,000	Over 2,700	2	33	High	10 R 6 L	Stabil.	16 Desirable
	Protect other crossings with automatic signals								800 to 2,700	2	22	High	10 R 6 L	Stabil.	16 Desirable
									Less than 800	—	22	High	10	Stabil	
None	Protect by automatic signals or reflectorized cross-bucks	Channelize major intersections and control with signals	Entrances of all types permitted Type and spacing regulated	None	50	6	475	1,700	Over 2,700	6	60	High	10	Stone	Directional traffic divider desirable
	Only most hazardous crossings separated								800 to 2,700	4	40	High	10	Stone	Directional traffic divider desirable
									Less than 800	2	20	High	8	Earth	
None	Protect by automatic signal or reflectorized cross-bucks	Highways intersect at grade	Entrances of all types permitted Type and spacing regulated	None	30	8	275	800	Over 2,700	6	54	High	6	Stone	None
		Traffic controlled by signals as necessary							800 to 2,700	4	36	High	6	Stone	None
									Less than 800	2	18	Gravel or stone	6	Earth	

continued construction or reconstruction of the highway system.

It is imperative to examine closely the highway needs today so that preparation for the motorists' demands of tomorrow can be made. The fully controlled-access roads being constructed as Interstate Highways are as far in advance of the conventional highway of today as the hard roads constructed in the 1930's were in advance of the dirt roads of earlier days. A new level of highway service has been established. As portions of these new roads are opened, their attraction for long-distance travel has been astonishing. The shape of communities is changed, and new industrial patterns are being developed.

What will be the course when the Interstate System is complete? Will the next 20 years be spent patching that system or will progress be made?

As these Interstate Highways are being constructed, many of the States are now planning a supplemental system of freeways. However, as in the case of the Interstate System, more than State-by-State planning is required. Trips by motor vehicle are not confined to State boundaries. The pattern of highways required to meet the road user demands of tomorrow (and even today) cannot be planned on a State basis. Planning concepts must cross State boundaries—they must be nationwide in scope. As construction of the Interstate System proceeds and other highways are built within the State, it is imperative that such systems be extended so that progress will continue.

URBAN TRANSPORTATION

Within the past few years, those in the highway field have become very conscious of the need for more specialized planning in urban highway construction. Again, traditionally the role of the State highway administrator had been largely devoted to the construction, maintenance and operation of a rural highway system. The streets inside urban areas were the responsibility of the municipal officials and were largely financed by property taxes levied on the

abutting owner. Initially, the State's role was to construct a system of hard-surfaced roads connecting the municipalities and enabling the farmer or other resident of the rural area to reach the cities. The State's task stopped at the city limits—in some instances there were State laws which prohibited State highway department activities within municipalities. The increase in urban population, the growth of suburbia, and the increased reliance on the motor vehicle have made the limitation of the State highway department to the rural field archaic.

There is general awareness of the urban transportation problem, but no solution. When new problems arise, new people are attracted to the field and sometimes people already in the field see an opportunity for the solution of some of the problems they have had for many years. The influx of the city planner and the many other specialists in this field is an example. Another example is the renewed activities on behalf of the mass transit interests to enter the financial side of the highway field. Because the highway administrator and planner has been dilatory in entering the urban highway planning field, solutions offered by other experts in the field, or the solutions to some of the old problems that have been reoffered, have been overemphasized.

What part should the highway planner take in urban planning? Certainly refuge can no longer be taken in the belief that responsibility ends at the city limits. The problem today is not merely to afford highway connections between cities or to make it possible for the rural resident to reach the city. Provision must be made for handling the traffic after it enters the metropolitan area. There must be ample ways for through traffic to either traverse or bypass the area. Traffic wishing to stop must be furnished a place for storage—no longer can planning be limited to moving traffic—the parking of vehicles is as much a part of the transportation problem as is the movement of vehicles. Neither can the effects of other aspects of urban development on highway planning be ignored. Mass transportation,

where it exists, and where it can be economically justified, must be taken into consideration.

In all these phases the highway planner must work with other experts in the field. He should not endeavor to become an expert city planner or an expert in mass transportation. Neither should the highway departments assume the role of consultants in city planning. Instead, the role of the highway planner should be to coordinate highway planning activities with other urban planning so that the highway system in the urban areas will conform to the over-all plan of urban development. This is a long-range objective as well as an immediate objective and involves careful preparation and complete coordination between the city planners and the highway planners. Too often the highway planner loses sight of the basic fact that highway systems exist to serve people and in such sense also to serve communities. All too often there is a tendency to feel that a city plan should be based entirely on the highway plan. Although it is the prime purpose of the highway planner to lay out the best possible highway system at the most economical cost, it is also imperative that every consideration be given to existing and future development in urban areas so that all interests will be served to the maximum possible degree.

HIGHWAY COSTS

The need for additional freeways, the need for construction in urban areas, the need to meet the responsibilities on the existing highway system, and the cost of maintaining and operating the highway system of today all require the expenditure of vast sums of money. Without reciting statistics or without referring to any of the many studies that have been made, everyone is well aware of the rate at which highway maintenance and operation costs have increased during the past 15 years. Everyone is fully cognizant of the tremendous backlog of construction needs that exists on the highway systems of the nation today and of the needs that will occur in the future. The enactment

of the 1956 Federal-Aid Highway Act, with its provision for financing the construction of the Interstate Highway System within a fixed time period and with its promise of nominal future increases in Federal aid, has created an impression on the general public that the financial problem in the highway field has been solved. It has also tended to create an impression in many circles that Federal funds are available—at no cost to the local or State governments—to finance any and all highway (and in many cases even some very distantly related) improvements.

Prior to World War I, practically all highways were land service roads and the only source of funds for highway construction, maintenance, and operation was from property taxes. Residents living on a road desirous of improvements were expected to bear the cost of such improvements by special assessments or some other form of special taxation. The advent of the motor vehicle changed the pattern. Although the change was slow in taking place at its inception, it increased rapidly until during the 1930's a new pattern was established. Certain roads and streets were still primarily land use highways, and in general the work on such roads was financed from property taxes. Other roads were financed partly from property taxes and partly from road user taxes. Still other roads—usually termed the primary system—were financed completely from road user taxes.

Since World War II the pattern has changed. Almost all public highways are now financed at least in part from road user taxes. The distinction between road usage or service has become less pronounced as each year passes. The fact that motor vehicle user imposts, particularly the motor fuel tax, are easy taxes to collect and, once the initial shock of an increase passes, easy to levy, has led State legislatures to use them not only to finance work on all the highways within the State but also in some instances for nonhighway purposes.

The 1956 Federal-Aid Highway Act directed the Secretary of Commerce, in cooperation with the several States, to

make a study of the proportionate share of the design, construction and maintenance costs of Federal-aid highways attributable to each class of person using the highways, based on the benefits derived from the use of such highways. In keeping with the current and future needs and trends in highway usage, consideration should be given to the benefits derived from highway improvements, not only by the highway user, but also by property owners and others, and a determination should be made of the proportionate share of the cost of highway improvements that should be made by each class involved.

OTHER PROBLEMS

There are many other problems confronting the field of highway planning. There are many other concepts which must be adopted—new goals, any of

which may be more important than the few discussed. There are opportunities in the use of computers in the design of roadways and structures, in the utilization of manpower and equipment, in accounting and fiscal control, and in many other ways. There are fields to be explored in the control of traffic by electronic devices and by the installation of systems of signalization that will regulate the flow of traffic so that maximum use can be made of the capacity of the highways. Work must be done in the field of highway safety—not merely in highway design but also in driver behavior and education. These are but a few; there are many others. But the three basic goals in highway planning were named by the players in Morf's game of Highway Strategy—maximum road user benefits, safety, and meeting existing responsibilities.

DISCUSSION

Holmes.—One of the points that was raised at the Sagamore Conference by one of the planners who was there was this: "If the highway administrator could find that for \$1 expenditure of highway funds he would produce a benefit of \$2 of community benefits, would he spend that dollar?"

There was not one of the seven chief administrative officers present who would say "yes" to that. I expect I would have not said "yes," either.

But they did ask a question, in turn: "How do you figure the \$2 benefit?" The planner could not answer that, and he knew he could not. We all recognized that that is a great area of uncertainty.

But the point you make here so strongly, Mr. Carley, about regional community benefits of all sorts, as to a desirable product of the highway system, does not exactly jibe with the point that the first strategy of the highway administrator is to produce maximum highway user benefits.

Carley.—This is right. I would like to go back to a point that you made before I spoke, when you mentioned that the highway administrator, as diligent as he might be about planning requisites and planning needs, nevertheless was involved in carrying out the

responsibilities of the job that he had to do. What I am saying is that we have a great responsibility to go beyond that which is prescribed by law and by the legislature in terms of what our responsibilities are.

You say "existing responsibilities." That is black letter law. That is what the program calls for. I would say that you people are shaping our lives, and that responsibility is far greater than any black letter law or statutory prescribed law that we have.

Highway administrators are not worrying as much as I think they have in the past about geographic distribution and about where the highway is, but of serving the needs apart from what the legislature says the needs are, or what the people think they need. There can be a difference.

If the administration today became close to what the Sagamore Conference called for, you could not ask for anything more in the world. But they have gone home and retreated to the oldest refuge, the status quo.

Bill Haas was here from the Wisconsin Highway Commission, and I watched him fight for years, talking about a larger perspective than that served by engineers, by mechanics, in

terms of a highway program: a plan, a development, for a community-wide, region-wide, state-wide program.

I think that slowly but surely even the public is becoming interested and will back programs that are more than laying out ribbons of concrete.

When I see highways laid out, beautifully designed, engineered perfectly, but serving no other function than to get a car from point A to point C, it distresses me because there are far more functions than moving that car from one point to another. There are abutting land uses, the social needs, and all the other things that are there.

Highway administrators are beginning to believe that this is necessary, that they have a community responsibility, and I do not mean to a specific number of people in a local geographic spot, but to the entire region. I think this is indicative of the fact that you recognize you have a larger measure of responsibility. I don't think there is that much difference between the engineer's and Mr. Shaneman's statement.

Shaneman.—First of all, I will have to admit that this approach was made by graduate students in highway economy and by administrators. I feel quite sure if it had been made by planners, there would have been a difference. But again, we are talking about the goals and objectives of highway administration; within that framework.

There is another question, here, the use of highway funds. I know that in Illinois and most other States highway funds are earmarked. At least a good portion of them are earmarked for highway purposes.

Now, granted that earmarking is good and is correct, then how should we use those funds? I still think this is a good array for that purpose.

Telford.—Many of the thoughts expressed there have been expressed by people in my office at various times. I think, however, that the highway engineer has tended to be too apologetic. He has been to a great extent taking the lead and trying to get the planner to do some planning, and he has been shaping the future. He has been shaping it with the tools that he was given

within the legislative and financial framework. He has been building systems because, beginning with the Pennsylvania Turnpike, people demonstrated that they wanted and would pay for a better means of more vehicle transportation, and if one group did not get it for them, they would fire them and get someone that would.

I believe that we need to take the broad view, but the implication that the highway engineer alone is narrow in his point of view is all too prevalent, even among the apologetic members of our own profession.

One of our problems is that although we have many kinds of planners, very few of them have a responsibility for accomplishment; however, many of them give us the strongest and most effective support that they can.

But each of them, in the hundreds of cities that we have to deal with, has not only to plan and develop ideas, but to get them over with his own legislative organization. Many of our problems lie in the fact that the planning concept of their own people and their staff is not acceptable to the legislative group controlling it, and it is completely different from that of the next community adjacent to it, that wants some other type of service.

We have the responsibility of coordinating those things. We meet some of them head on, and somebody has to make the decision. I believe that that is where much of the conflict between the engineer and the planner lies. The engineer is very conscious of public service, but he has to get a job done. About nine planners will agree with him, and the tenth one will object and insist that a line should be swung widely afield from where it should be to meet his concept of some zone, which in five years may be completely different.

Then we have a difference—public meetings, dubious remarks in the press; and the highway engineer is the defender. I think it is high time the highway engineer pointed out that he is trying to get some sound planning, and we have, I think, supported the concept of regional development.

Certainly regional and State broad-gage planning is essential to the integrated motor vehicle transportation system that we are endeavoring to develop. You cannot take one piece of it without considering all of the rest of the pieces and the way they fit together.

St. Clair.—I think perhaps there is not as great a conflict between what Mr. Shaneman presented and what Mr. Carley spoke of. I am not shocked by the fact that responding to user needs, or conferring benefits on the user is the first item of attention of both the student engineers and the administrators, and I think even that is not in conflict with the broader view because we cannot get community benefits or regional benefits from highways other than by highway use. Practically all, stem from some form of motor vehicle use.

There is no real conflict between the broad benefits to the economy and the benefits to the motor vehicle user. Where it appears that there is, there is some wrong planning or some wrong engineering, such as putting an elevated expressway in a place where all the esthetics, all the needs of the local community, call for a depressed highway.

So I think in serving the motor vehicle, we will serve the community. It is a question of really looking deeply into the matter and making certain that the level of service to both motor vehicle and community is reconciled and worked out intelligently.

If there is a conflict or antithesis, and we say that we must follow this plan because of community needs, whereas the narrow or pure concept of user needs would follow another plan—then perhaps we do need to salt the highway revenues with a little something in the way of community contributions. However, I am not quite certain that intelligent planning can completely reconcile these two concepts.

Carley.—I am afraid that in talking about planners and engineers we raise up a dichotomy that we don't want to exist. Mr. Holmes said that planners did not have to implement their plans—that is true. But the highway engineer, who is responsible for implementing the program and thereby takes most of the

blame and very little credit, goes ahead and builds it. Inherent, here, we have a problem of a man who has to stand up and be responsible for what he has built.

I am afraid, though, that the next jump is not saying that the planner ought to be more responsible and the engineer ought to have more considerations other than just being able to show a good job per se. Why cannot highway departments incorporate both planning and engineering?

I don't want to see planners established as a profession without any responsibility for building, nor highway departments concerned about only meeting the engineering design specifications, traffic counts, projected design traffic carrying capacity of a road. Why not inculcate into the job descriptions if need be, or into at least the job description of the total performance budget, that a highway be more than just a finely engineered tool and finely attuned to engineering standards—that it be planned?

Why not hire planners with engineering degrees, if you have to hold up your profession, maybe without them, even?

Even the creation by label of an Office of Planning in the Bureau of Public Roads is a big step. I heard people say the other day: "That doesn't mean much. They are just doing that to accommodate the Congress and the President, and other people are asking for it."

So what? Labels are a good beginning, and I am sure you people plan to carry it out.

Oliver.—I am not sure where we failed in all this. I helped, from 1936 on, to collect a lot of planning information; and for the last several years I have been using a lot of planning information. Frankly, I do not think the highway engineer has done such a bad job.

Shaneman.—At the risk of being a traitor to my cause, I would like to more or less second what Mr. Carley said.

To go back to this term, "level of service," by way of illustration, I am thinking of the construction project that has just been completed in Spring-

field, Illinois. There was an existing street that was 20 or 22 ft wide, 12,000 to 14,000 vehicles a day, on a 60- to 70-ft right-of-way. Something had to be done, but all my designers could say was that we have to build to geometrics that will accommodate a DHV-20, which will be, perhaps, a 1,000, 1,500, or 1,800. And if you have to have 200-ft right-of-way, you have to have service roads, interchanges, and other things. We didn't do that.

Finally we either had a consultant do the actual design or designers looked at it again. There was a corridor here where something had to be done. But what should be done in that corridor? Certainly if we had gone in and built that to what are existing design policies, that we would adopt as engineers, it would have destroyed the entire service in that corridor. So we had to do something different. We had to build something else there; we had to adopt a different level of service.

I think that is one of the things that we miss when we start to locate routes and when we start to pick geometrics of design and that sort of thing.

The location should be examined, not with just an idea of how much traffic is going to be there in 20 years, or how many lanes are needed, or how wide those lanes will be, and how many trucks. Other factors must be considered, such as the economic development within the corridor, or as Mr. Carley said, on a regional basis, or even a state-wide basis. Another thing was the stage of development of the highways in the area.

Those things have to be taken into account, and we are just opening the door to planners and other kinds of people coming in and doing our job.

Hitchcock.—In consideration of goals, what is the position of providing some facilities for bus stops, bus operations, on expressways? A separate lane, perhaps, or a bus stop off the traveled way?

Shaneman.—Speaking again of level of service, I do not think you can permit bus stops or any kind of stopping on the freeway. Off that system, a bus stop or bus transportation is a part of the transportation picture, and it all should

be taken into consideration. It is not compatible with the features of freeway design, though.

Hitchcock.—Should we use highway user revenues to build the bus stops?

Shaneman.—I indicated that I thought the whole question of financing should be examined to ascertain what portions of the system should be paid with other revenue. I am begging the question, I know.

Carley.—I would propose that bicycle trails adjacent to expressways and interchanges be developed for recreational use and paid for out of motor vehicle fees. Or rather, I do not care if they are paid for out of these fees or not, but paid for some way or another, as a national and State policy in recreation development, that is not inconsistent with national highway planning and State highway planning activity.

This is consistent with safety, I mean. I do not know how you would do that. These areas in the 20 years ahead may represent the only areas that are stretching out into the suburban and even beyond the peripheral area of the suburbs. I think this could be paid for first of all out of public funds, and it would not hurt at all to have the payment out of motor vehicle use fees.

Granum.—It struck me while you were discussing that group of highway administrator and user decision-making gains, that really so many of the things we do in highway planning and design ought to be directed to as much multiple purpose objectives as possible. True, when you design and build a freeway, you have essentially a single purpose of moving traffic, but at the same time many of the other objectives that you outlined are being served. It seems to me that as many as possible of each one of these objectives that can be incorporated into a highway plan is a desirable thing to do.

For example, we want safety. We also want speed, and preservation of the investment. We take care of existing responsibilities.

At the same time, the multiple purpose characteristics here are served by all of the discussion that has been held about planning of a city freeway system

for the best urban development and the best concepts of city planning.

Quinnell.—The bus situation in Montana is rather bad. We have a very sparse population, large areas, and because of the sparsity of population there are not the parallel routes there are in some other States.

We take one of the primary roads and change it to an interstate route, and probably it is 20 or 25 miles to any other road. What are you going to do with buses, including the school buses? You are going to have to provide a facility in some way to take care of them. Who is going to pay for it?

Hitchcock.—The point I was leading up to is that with the same amount of money perhaps we can move more people by providing a lane for buses only, or providing bus stops on primary roads, than by building an additional lane of highway for mixed use of vehicles, particularly during peak hours.

This question has come up in a few instances, and it is going to come up more in the future. If it has come up in Montana, it is even more of a problem in some of the other States that are more highly urbanized. Perhaps, it is a new concept in the use of highway user funds.

Quinnell.—Our population being like it is, there is not really enough traffic using any one area so that you can afford an interchange or anything of that kind. There should be some other way of treating it.

Babcock.—We had that same problem, where we were converting certain existing roads into the Interstate System. This showed me that there cannot be one rigid pattern for the Interstate System. There has to be a little give and take.

Wiley.—I feel I cannot help but come to the rescue of the State highway planners to this extent: There has been some comment here to the effect that by providing highways that do the most for road users, we might be in some measure slighting other needs. I submit that when we as State highway planners do the best we can to find out what travel people are doing, where they are going, and for what reasons,

then project this as best we know how to take into account expected future development and future activities, and then attempt to provide a roadway that will carry the people to these things in the most economical and safest way, we are not only meeting the best needs of road users, which is not a foreign crowd of some kind, but it is all of us, you and me and every other person of the millions who own automobiles—then we will in effect also be taking care of these other needs.

In other words, if we properly project and provide the best facility for road users, we will have already taken into account the things that Mr. Carley was mentioning. This is what we are attempting to do, not on a local basis, but on a regional or statewide basis.

Carley.—How are you finding out, for example, 20 miles out, how fast Albuquerque is going to grow, and what future land uses are going to be, and where you need additional belt lines, etc.? How are you doing that today?

Wiley.—We are taking the best estimates we can get from city planners, in that particular instance, who are rather active in land use inventory and projection.

Carley.—They have developed a comprehensive plan?

Wiley.—They have a plan, which isn't as thorough as it should be, but in the process of doing our new urban transportation study, they are obligated to provide this for us.

Schwender.—If you undertook to hit the projected land use within that particular area, I expect you would find that about 90 percent of what goes on in an area is non-conformity to the plan that was laid down.

I think it is essential that the plan be a plan that can be put into effect, and some assurance that it will be put into effect, so that you do not find that you have made a special effort to meet a land use that is gone when the time comes to serve that area.

Wiley.—That is an important point. We are trying to make plans in advance so that this can be a continuing study, one that can constantly be up-dated, be-

cause we all know that we can sit here with city planners or any kind of planners you want to name and project land use, and it is not always going to conform. You cannot have a plan now for 1980 and know that every respect of that is going to turn out to be just exactly the thing it is going to be today. It should be flexible enough so that it can be up-dated, we believe.

Schwender.—After you have built beyond a certain point, then, there is no flexibility. You have very often bypassed land uses that have not developed, yet they were planned. And if that is changed entirely, you may have a different concept of the whole thing. But you have passed the point where you can do anything about it, even though it is a continuing study.

So the land use plan is going to have to be something that is realistic and does lead to requirements. After you go to the point of no return, you had better stick to it, if you are not going to foul it up again like it has been.

Wiley.—Of course, when you go to a certain point, beyond which you cannot make a change, you just have to incorporate that into your next plan. And that may be any phase of the development of the community.

Whitcomb.—In the planning carried on in some of our urban areas and now being carried on in the Boston area, we have published reports, and this has happened in at least a dozen different reports, each one of them incorporating three or four urban areas.

These books have been published, distributed, outlining what the plans of the highway department have been or are, and what the programing of the construction is.

In the Boston metropolitan area, we are taking into consideration now over a hundred cities and towns in developing a land use in a socio-economic report done by Professor Nash of Harvard.

Now, the development of the land use has got to be based on something. Either the development of the land has got to come first, or a highway system has got to come first. And I think it is an accepted fact that if an area has ade-

quate transportation facilities, it will develop. If it does not have adequate transportation facilities, it will stay just as it is.

The development of the area, as planned in the Boston metropolitan area, is based on a highway plan. Now, if this highway plan is built, and if it is built within a certain number of years, then a certain thing will happen, as to the development of the area and the land use.

If any part of the plan is delayed, for a period of five years or longer, then that area will not develop. It will be a sick area as far as the whole metropolitan area is concerned. It will not get to develop along with the rest because it does not have adequate transportation.

In regard to some of the other areas, we have published our report, showing what we believe is the solution. We have talked with some of the urban planners in the various areas, and the gentleman from Pennsylvania asked me earlier this morning if their highway engineer would be accepted as a partner or as an equal or as a leader. He will be accepted as a leader, just as a horse is accepted as a leader of a buggy. He can pull the buggy, but somebody else will direct it.

We have found with some of the meetings that we have had with city planners that as long as we will accept their plan, we are cooperating with them. But the minute we deviate from any acceptance of their plan, there is no cooperation. And as an example of this, in one of our cities, the planning engineer felt that a modern housing development was located in the wrong place in the city, and as far as his plan was concerned, it was in the wrong place.

His idea of the highway location was that it should go through this development for the purpose of removing it; so then he could take it and put it where he believes it should be put. And we would not do that; so we were not cooperating.

I think that cooperation is a two-way street, and certainly I think the Highway Department of Massachusetts has

shown that it will cooperate with any reasonable suggestion or plan of the city planner.

Titus.—I would like to get into this question of "level of service" unless you intend to return to that later. Just what is "level of service"? I think some of these terms we have used to describe it, such as controlled access, number of lanes, and so on, are things that contribute to a level of service but do not exactly describe what the level of service is. And I think that two of the terms that Mr. Granum used, speed or travel time, and safety, tend to describe the level of service to me.

Steele.—There is one thing that has not been mentioned that we have thought of as being extremely important in that area, and that is the level of service that can be afforded. Now, we have not talked yet about physical ability. I will probably get into that in my discussion a little later. But it seems that fiscal ability certainly has to be considered in determining the level of service that we can expect to provide in any given highway facility.

Shaneman.—What you are saying is that you do not have to buy a Cadillac every time. There will be some places where you will need a Ford. And we do not have that now in our present concept. If you want to buy a highway improvement, you have to buy this model, because the traffic says so.

Steele.—I would even go further. There are some roads where the only kind of service we can provide is a Jeep.

Shaneman.—That is exactly it. And all these other things, the design speed, the access control, are just parts of the picture. You put them together this way, and they make a Cadillac, put them together another way and they make a Ford, or maybe you just repair the car you have got.

Schwender.—I think the level of service has to be like a system. It has to be a system of level of service. Some highways should have more money spent on them in order not to spend money on some facility that can divert traffic and put it on there.

I think there should be a system

analysis of what the level of service is going to be for the whole State system, not in each individual road, and then spend some additional money on the principal arterial systems that can furnish this higher level of service, and grade down from that to other systems that are feeders.

Shaneman.—Certainly the analysis has to be made on a system-wide basis.

Schwender.—It cannot be made on each individual road when on each end there is a fairly high facility, and it may cost you twice as much to get the same type of service on some parallel facility, where this particular highway may act as the main arterial for that type of use.

Froehlich.—Let us put in the level of service that is required, and not settle for something less merely because we do not have the funds to do it at that particular time.

Wiley.—That would be real fine, except that there will be a lot of sections of the system we will never get to—that will do that.

Froehlich.—There you come into another phase of planning, and that is getting the funds.

Shaneman.—The point you made is exactly the reason we started to think about it so seriously; because we are not confronted with the improvement of a system that is 30 or more years old. The primary system of Illinois was built in the 1930's, and the late 1920's. We have primary highways now that are carrying 3, 4, or 5 thousand vehicles a day, and we are going to have to rebuild those.

Now, we build just what we have funds for, then we are committing ourselves to that improvement for another 30 years. On the other hand, perhaps on this corridor we should be building a freeway.

Well, even though we cannot build four lanes, or six lanes, and even though we cannot build all the interchanges, we should at least be making provision for the acquisition of right-of-way and the development, so that when we put the chassis there, we can put the body on later.

Session Two

Monday, March 26, 1962, at 1:30 P. M.

PLANNING NEEDS FOR EFFECTIVE HIGHWAY ADMINISTRATION

L. M. CLAUSON, Presiding

Specialized Highway Planning Information: Social, Economic, and Financial Aspects

CLARENCE A. STEELE, *U.S. Bureau of Public Roads*

• **THE WELL-BEING** of a nation is measured in terms of not only income and other indicators of material wealth, but also by the conditions of life and social relationships experienced by its inhabitants.

As a society becomes more complex, so do its problems. This is true of all aspects of national life, but especially so of those relating to a nation's needs for transportation facilities and services. Regardless of the complexity of any given social order, all of its transportation problems, whether they pertain to highways or other modes, are people-related, because the only reason for having transportation facilities is to serve the needs and desires of the people.

It is the purpose of this paper to identify and discuss some of the most pressing social, economic, and financial problems that face highway planners and administrators today, describing the types of information needed for their solution. However, the development and presentation of solutions to such problems is beyond the purview of this paper, although it will be possible to suggest some avenues by which solutions may be approached.

DEMOGRAPHIC PROBLEMS

Demography is the statistical study of human populations from the standpoint of such factors as births, deaths, and migrations. Many of the major problems perplexing highway officials now, and that will continue to bother them in the future, are directly related to the growth, decline, or migration of populations.

Before 1920 the United States was primarily a rural nation, with more than half of its population residing in what the Census Bureau classifies as "rural territory." The Census of 1920 found 49 percent of the inhabitants residing in rural territory and 51 percent in urban areas. In 1960, under a somewhat modified definition of urban territory, about 70 percent of the population of the United States was living in urban areas, and only 30 percent in rural territory.

This tremendous population shift has notably altered the nature and magnitude of the problems faced by highway administrators. In 1920 their chief concern was to get the farmer out of the mud; today it is to get the urban dweller out of the muddle.

Although the increase in the population from 1950 to 1960 of 28 million (an 18.5 percent gain) was the greatest in history, the amounts and rates of growth varied from one section of the nation to another. All Census divisions exhibited some growth, but the range of the increases was from 600,000 (a mere 5 percent) in the East South Central division, to one of 6,100,000 (40.2 percent) in the Pacific divisions, comprising California, Oregon, Washington, Hawaii, and Alaska.

Furthermore, this growth was largely concentrated in the metropolitan areas; Census statistics show that 84 percent occurred in 212 such areas. Of the metropolitan area growth, only 24 percent took place in the central cities, while 76 percent was found in the suburbs. The central cities of 14 of the 15 largest metropolitan areas actually lost population between 1950 and 1960. In fact, 85 percent of the net population growth of the central cities of all 212 areas was attributable to territorial expansion.

While the urban population of the nation was gaining by 29.3 percent between 1950 and 1960, the rural population actually declined by 0.9 percent. Although only three States and the District of Columbia showed net population losses during the 1950-1960 period, nearly half (1,532) of the 3,105 counties in the 48 contiguous States lost population.

The changes in the size, composition, and distribution of population that have been revealed by the latest Census have many obvious highway implications. Census data indicate that population is now increasing most rapidly in those areas in which automobile ownership tends to be most dense; and that low-density suburban sprawl, made practicable by the ever-increasing ownership and use of automobiles, has largely dominated population movement. There is no present indication of a decrease or reversal of this trend within the foreseeable future, unless forces not now evident come to exert an overriding impact upon the trend.

More people and more vehicles mean more traffic, but the reverse is not necessarily true. The areas where the popula-

tion is growing, especially the suburban fringes of the larger cities, are probably those where the need for new highway facilities of all kinds will be most acute, but the central cities where most of the suburban breadwinners earn their living, and the rural areas where they and their families seek recreation, are also more than likely—if past trends continue—to find their present highway facilities becoming inadequate even though their resident population is declining.

Fundamental to the planning of the required future facilities is a knowledge of the statistics with which demographers deal: births, deaths, migrations, and the age composition of the population. The 1960 Census and previous decennial censuses provide a wealth of information in all of these areas. Many States, usually with the cooperation of their local governments, collect and compile accurate statistics on births and deaths, at least. If highway planners will make full use of available population information they will be in a better position not only to measure and evaluate present highway needs but also to estimate those that will occur in the future.

Thus, by considering the age components of the 1960 population it is possible to estimate not only the approximate number of potential motor vehicle operators at the present time but also the potential eligibles over the next 15 to 18 years, since, except for migrations, all persons who will have reached the legal driving ages within their respective States during that period are already in the population. To convert these estimates of potential drivers into estimates of the number of licensed operators will require the application to the sex and age components of the population of factors which can be determined from various sources, such as State driver-license files or tabulations prepared in connection with the recent motor-vehicle-use studies.

Another application of population data that has direct value to highway officials is the use of information on births, deaths, and migrations in forecasting future population totals and distributions. Table 1 illustrates an appli-

cation of such data in evaluating nationwide population changes between 1950 and 1960. Here it can be seen that New England's increase during the period was almost exactly equal to the "natural increase" (the excess of births over deaths) that occurred in the area; while in three Census divisions—West North Central, East South Central, and West South Central—the actual increase in population was less than the natural increase, indicating a net out-migration of inhabitants from the area during the decade. On the other hand, the Pacific division experienced a net gain of 3.3 million inhabitants over the period in excess of the natural increase, clearly indicating that in-migration was the most important factor in its growth.

Similar calculations can be made for individual States and for some areas within States, the possibilities of such analyses varying with the nature and extent of the information available locally. Extensive analyses of this type have been made in connection with transportation surveys of larger metropolitan areas, such as those undertaken in the Chicago, Philadelphia, and Washington areas.

Mere projections of past trends in the total population of a State, a city, or a metropolitan area are not going to be sufficient for future highway planning requirements in most instances. What will be required to provide a reasonably

accurate base for the estimation of future needs for highway facilities and services will, in general, be the more sophisticated types of forecasts that can be made only by taking into account the demographic factors mentioned above and the social factors which are to be considered.

SOCIO-ECONOMIC ASPECTS

Other people-related factors that have an important bearing on long-range highway planning include labor-force, employment, occupation, income, and housing characteristics of the population.

The importance of population migration as a creator of major problems for all planners and public administrators, especially highway officials, has already been indicated. Among the readily recognizable results of migration are the leveling off or actual decrease of population in some areas (such as farming areas and the central cities of major metropolitan areas), and the rapid increase of population in other sections (notably the suburban fringes of the metropolitan complexes).

But mere knowledge of the magnitudes of migration, and of "from where to where" is not enough. For intelligent solution of both the present and future problems that highway administrators and their planning staffs must face, there must be an understanding in depth

TABLE 1
ILLUSTRATIVE COMPONENTS OF POPULATION CHANGE BY CENSUS DIVISIONS, 1950-1960¹

Census Division	Increase, 1950-1960		Net Natural Increase			Net Migration (1,000's)
	Number (1,000's)	Percent	Births (1,000's)	Deaths (1,000's)	Gains (1,000's)	
New England	1,195	12.8	2,218	1,046	1,172	23
Middle Atlantic	4,005	13.3	7,037	3,344	3,693	312
South Atlantic (north)	1,351	15.4	2,411	853	1,558	- 207
South Atlantic (south)	3,439	27.6	3,777	1,192	2,585	854
East North Central	5,826	19.2	8,376	3,249	5,127	699
East South Central	573	5.0	3,106	1,068	2,038	-1,465
West North Central	1,333	9.5	3,614	1,461	2,153	- 820
West South Central	2,414	16.6	4,317	1,316	3,001	- 587
Mountain	1,780	35.1	1,708	485	1,223	557
Pacific	6,083	40.2	4,384	1,594	2,790	3,293
United States	27,999	18.5	40,948	15,608	25,340	2,659

¹ Bureau of the Census; Current Population Reports, Series P-25, No. 227.

of the motivating social and economic factors that cause migration, and of the situations that will result after the migration occurs.

A major cause of migration is the desire of people to better themselves economically and socially. For example, for many years the capacity of farming areas to absorb the young-worker element of the population has been decidedly limited. Now, because of relatively low income possibilities, increasing unit productivity, mechanization, changes in the types of farm operations conducted, consolidation of farm units, and the decline of farm-related activities, it is becoming even more limited. Consequently, young people new to the labor force have continued to migrate from the rural areas to the urban areas. The general pattern has been to gravitate to the city first; later, with the establishment of family units and the attainment of reasonably good economic status, many of these young migrants join with others among the more affluent city dwellers in moving on to the suburbs.

The highway administrator must have more than a passing interest in those who are left behind by the migrants in the rural areas and in the central cities. He must also have a similar interest, along with other public officials, in the complexion of the new suburbs. Unless he possesses more than superficial knowledge about the social and economic characteristics of these people he cannot plan intelligently for their needs.

Highway officials are not unaware of these requirements. In many recent surveys, especially the excellent transportation surveys undertaken within the past five years or so in several large metropolitan areas—notably Washington, Chicago, Pittsburgh and Philadelphia—careful attention has been given to the present and probable future economic and social aspects of the areas studied. Thus, the Illinois study considered such elements of the Chicago area as land use, the importance of families as trip makers, and the nature of economic activity.

A number of the metropolitan areas are interstate in character, and proper planning requires cooperative effort on

the part of several States. Examples of interstate cooperation in studies now under way or recently completed are the Penn-Jersey, Tri-State (New York, New Jersey, and Connecticut), and the Metropolitan Washington studies. In certain areas, the volume of interstate local commuting and freight movement is increasing rapidly. In some cases, the areas may not be large but cannot be properly understood unless approached on an interstate basis. In this category are Fargo-Morehead, involving North Dakota and Minnesota; and Evansville, affecting both Indiana and Kentucky.

Unfortunately, penetrating studies such as that made in the Chicago area have usually been limited to the larger metropolitan areas. There is a great need, however, for this type of study on a statewide basis, but if such is impracticable, studies could, perhaps, be made of representative rural and urban areas, the results of which could be given broad application.

The construction of major urban highway facilities poses many perplexing social and economic problems for highway officials, not the least of which is the problem of relocating people whose dwellings lie in the path of the new construction. Even though a fair price is paid for the property taken, it does not solve the problems of many of the owners and renters involved. For example, most of the downtown projects involve construction in blighted areas whose residents find it extremely difficult, if not impossible to relocate for economic or social reasons.

In the District of Columbia, for example, it is recognized that present procedures for obtaining rights-of-way for new facilities work hardships upon both owners and tenants of property to be taken for the improvement. When a location is "pinpointed" all property within the projected area to be purchased is immediately affected, since the owners are then restrained from improving or selling it, and the licenses of businesses operating in the area will not be renewed. However, the property cannot be bought until funds for the project become available. District highway officials would like to obtain authority to

set up a revolving fund for the advance purchase of property needed for highway construction, but it will require congressional action to make this possible.

The magnitude of the problem becomes evident when it is considered that the present 6-yr program of the District for the construction of freeways and related facilities will displace about 3,800 families (approximately 12,000 persons) from 1961 through 1965. Furthermore, this is only a portion of the total long-range program of the District of Columbia for the construction of such facilities.

Provision of a revolving fund for the advance purchase of rights-of-way, such as California now has, can go a long way towards alleviating hardships to landowners and tenants, and also toward preventing the unfavorable criticism of the highway program and highway officials that often result. Advance purchase of property for rights-of-way can also save money for the highway program—it has been estimated that the California plan, which permits purchase of property as much as seven years in advance of construction, has already saved the State \$250,000,000 in increased property values that would have accrued had the purchase been delayed.

Although matters of statutory declaration and administrative policy are beyond the scope of this discussion, the needs of administration for economic and social data to carry out existing legislative directives and agency policies, for the formulation of new ones, to answer inquiries, and to achieve public support of highway programs are of great concern.

Thus, in order to be able to answer questions that arise from the public, news media, other government officials, and legislative bodies concerning the displacement of people and the disruption of business resulting from urban highway construction, highway planners and administrators need to have information available about the impact of similar projects already completed. Needed would be data that could provide answers to inquiries such as: What be-

came of the people and businesses displaced? What happened to the value of adjacent property not taken for the improvement? What happened to business establishments near to but not in the path of the improvement?

Implications of Federal Housing Legislation

Highway administrators and planners are only now becoming aware of the full import of Public Law 87-70, the Housing Act of 1961. This legislation, coupled with provisions of the 1954 Housing Act, will undoubtedly have a direct and far-reaching effect on national and State highway programs. An accelerated program of comprehensive land and transportation planning is now possible. The legislation includes but is not limited to metropolitan areas. This legislation can be of great value to the highway program if highway officials are alert to the implications of all its provisions, and if the other governmental agencies affected—Federal, State, and local—are willing to cooperate with the highway administrators.

Many provisions of the housing legislation providing for urban transportation planning and research, and for urban planning generally, are new in concept insofar as Federal legislation is concerned and can have far-reaching effects. One major stated aim is to reduce urban transportation needs and to determine ways of meeting them at minimum cost, especially with the contribution of mass transit facilities where feasible. Another is to provide for more orderly and efficient urban growth through acquisition or other control of open-space land within urban areas. Area-wide urban planning is encouraged, including not only intergovernmental cooperation within one State, but also among States where urban areas cross State boundaries.

All this means that if highway officials are to be instrumental in the development and execution of highway plans in urban areas, they must participate actively with the other governmental agencies concerned in all stages of the activity from the beginning, through initial research and planning, and on to

completion. To do this they must initiate when necessary and participate actively in research in the social and economic aspects of the broad-scale area plan. Even though much of the research and planning activity may be let out to consultants, the highway departments will need to have on their staffs competent and well-qualified professionals who understand thoroughly the demographic, social, and economic aspects of urban-area long-range planning.

AVAILABLE SOURCES OF SOCIAL AND ECONOMIC DATA

There is a great wealth of information in readily available form relating to the economic and social characteristics of the population. Undoubtedly the most and best statistics are available on a national or regional basis, but much information can also be obtained on a State basis, with some variation among the States. A considerable amount of data is also available on a county or metropolitan-area basis; below the county level the amounts and types of information available vary considerably from State to State and with size of place.

Federal Sources

The best single source of such statistics is the Federal Government, especially the Departments of Commerce; Labor; Health, Education and Welfare; Agriculture; and Interior. Notable among the periodical statistical publications of the Federal Government is the annual "Statistical Abstract of the United States," to which are frequently published supplements such as the "Historical Statistics of the United States, Colonial Times to 1957," and the "County and City Data Book, 1956."

The 1960 Censuses of Population and Housing provide a wealth of information on the social and economic characteristics of the population by States, counties, metropolitan areas, and urban places, much of which was never obtained in such detail before. A brief resume of the publication schemes for the two censuses is presented in Appendix A. It indicates the nature and de-

tail of the data already available or soon to be published.

Coverage of Census Counts

As required by Federal law, the census of inhabitants was as nearly a complete enumeration (count) as it was possible to make. The information obtained included age, sex, race, marital status, and relationship to head of household of all inhabitants. For other population items, the published statistics are based upon data collected at a periodically selected 25 percent sample. Basic household information, such as tenure, color, vacancy status, number of persons, number of rooms and condition was obtained from a complete enumeration. Other items relating to housing characteristics, including availability of automobiles, was obtained from samples of 20 or 25 percent of all housing units.

Other Census Sources

In addition to the Censuses of Population and Housing, data on employment, output, and other items for trend analysis can be obtained for wholesale and retail trade and for selected service industries from the Census of Business, and for manufacturing from the Census of Manufacturers. These sources provide data by local area, including employment by place of work. The Census of Agriculture is invaluable for farm information by county for rural-area studies. Frequency of these censuses depends upon Congressional enactment.

Census of Transportation: Public Law 672 of 1948 (now included in Title 13, U.S. Code) provides that the Bureau of the Census shall make a census of transportation. Up to the present, however, the census has not been taken because funds have not been appropriated for it. A request for funds to undertake this census in 1963 was included in the budget of the Commerce Department which is now being considered by the House Appropriations Committee.

A plan for the transportation census has been developed by Census officials, and it is evident that the information

to be obtained would be of considerable value to highway planners, even though provisions in the directing legislation exclude from the census certain classes of carriers required to report to Federal regulatory bodies, and for which various statistics are regularly published. In accordance with the statutory provisions, the census plan is designed to avoid duplication wherever possible, but to provide information that will complement the data available from these other sources.

According to the plan, the undertaking would be divided into three major segments: (a) a travel survey, to be started in January 1963; (b) an inventory of trucking equipment, designed to provide information also about its use to be started in the fall of 1963; and (c) a shipper survey, to be begun in 1964, covering shipments made during 1963. Appendix B provides additional information on the coverage of these segments.

As now planned, the transportation census could not be considered in any sense a substitute for a statewide motor-vehicle-use study. It could, however, provide a valuable supplement to such a study. For example, the Census travel study will collect information on certain types of trips made, but will completely exclude others. No data will be obtained on miles traveled or routes used. Furthermore, the sample base for the travel study will not be large enough to permit tabulations of data for individual States, although it is understood that summaries will be made for each of the four Census geographical regions.

Current Periodic Sources of Information

At the national level, the most comprehensive series on economic activity is that published by the Office of Business Economics on gross national product and national income. This is supplemented by their annual series on personal income by State.

Monthly data on labor force, employment, and unemployment for the nation are collected on a sample basis by the

Bureau of the Census in the "Current Population Survey." Detailed monthly data on the number of employees in nonagricultural establishments by place of work are published by the Bureau of Labor Statistics of the U.S. Department of Labor as a part of a cooperative Federal-State reporting program. These data are available on a national, State, and metropolitan-area basis. Local employment offices are often an excellent source of information on recent employment trends, new plants, and local commuting patterns.

Regional offices of Federal agencies may also be consulted for recent studies and special analyses in which they may be engaged. Those of the Federal Reserve Board, and the Departments of Commerce and Labor (Labor Statistics) may be especially helpful.

Miscellaneous Sources

To a varying degree agencies of State and local governments publish on either a periodic or irregular basis economic and social statistics that would be of value to highway planners and economists. The data published include total population and vital statistics; and statistics on wealth, income, and ownership of real and personal property. Valuation and tax rate and income statistics, such as are usually available, are also rough indicators of social and economic conditions.

Information published by public agencies is frequently supplemented by publications of colleges and universities, research agencies, and Chambers of Commerce and similar promotional organizations. Several good compilations of economic and social statistics, with and without interpretive text, produced by various sources are available in most good libraries. An example is "Economic Areas in the United States," by Donald J. Bogue and Calvin L. Beale, published in 1961.

A note of caution should be sounded in connection with the use of "made-to-order" data sources. Good common sense, judgment, and an attitude of critical open-mindedness must prevail in evaluating and using them. It should

always be remembered that "facts" are not always what they seem, and that "if you can't know your data at least try to know your data source."

EFFICIENT USE OF RESOURCES

Much is said in these times about the efficient use of resources of all types. Under this heading may be grouped a whole host of problems that involve highway officials in one way or another. One of these problem areas has already been mentioned; the development of over-all plans for meeting urban transportation needs most effectively and economically. This is only one segment of a much larger problem area that involves the entire gamut of urban planning, in which highway officials are already involved and are certain to become more so.

There is a fundamental difference in the historical approach of many "urban" or "social" planners, on the one hand, and of most highway planners, on the other. Traditionally, the first-named group has planned on the basis of their interpretations of what should be good for man, assuming that men can be conformed to their designs; while highway planners have generally planned on a strictly pragmatic basis on which they have attempted to measure man's present and future highway needs according to his past and present behavior. Since the efficient use of many basic resources, especially land, will become increasingly important as the years go by and the population grows, it may be necessary for both groups to "give a little" in their approaches, if long-range future demands are to be met successfully.

Perhaps the most basic problem relating to the efficient use of resources as related to the highway function is that of the determination of the proper place of highway transportation in the over-all national transportation complex. Numerous all-embracing transportation studies have been made by public, quasi-public, and private groups, from the standpoint of developing a national transportation policy. To enable them to make long-range plans most effec-

tively, it behooves highway officials to be well-informed on transportation policy matters, and to be ready to undertake on a nationwide, State, or even local basis such studies relating to this over-all problem area as conditions may require.

Serious thought has already been given to the types of studies that might be worthwhile in approaching this problem. For example, Appendix B to HRB Special Report 55, "Highway Research in the United States," lists the following as highway research problems of importance:

1. Beginnings of a comprehensive study of freight transportation by motor vehicles;
2. Beginnings of a comprehensive study of passenger transportation by motor vehicles;
3. Highways and economic growth;
4. Highway charging systems;
5. Economic measures of highway needs;
6. Warranted level of improvement for roads other than primary rural highways; and
7. Studies of vehicular benefits and the quality of highway transportation.

The analyses that would be required in studies such as those listed would, of course, involve engineering approaches and the analysis of engineering data. They would also require the development, interpretation, and analysis of economic and social data. In many instances engineering-economy data and procedures would also be required.

Among the social and economic information needed for studies of this type would be population, income, economic activity, output and employment, motor vehicle ownership, and use data. Forecasts of these various characteristics and others, such as industrial and agricultural production, would also be required. Analyses of consumer expenditures for highway transportation of all kinds by income levels, and highway travel as related to income, would also need to be studied. Consideration would also need to be given to the effect of competition on highway travel; not only

competition from existing modes of transportation but also from modes not yet devised or in general use.

FINANCIAL PROBLEMS

A comprehensive statewide highway needs study, involving all roads and streets and all units of government responsible for the highway function, will consist of at least two major parts—an engineering or physical needs study and a financial needs study. The Federal Government, most States, and some areas below the State level have already had experience with such studies. They have learned that although the engineering or physical-needs determination is more or less subject to package treatment, the same is not true for the financial and tax studies. Jurisdictions that have made the long-range studies have also come to realize that a “one-shot” type of study is not sufficient, but that some updating of the findings of the comprehensive studies will be required at frequent intervals, with a major comprehensive restudy required at intervals of, perhaps, five to ten years depending upon circumstances.

The comprehensive studies require consideration of all the problem areas already discussed in this paper, and others. Among the others, the most crucial, perhaps, are those relating to the financing of a physical highway program.

The essential features, insofar as finance and taxation are concerned, may be enumerated as follows:

1. Historical evaluation of the present structure of highway financing, if such has not already been done in a recent study;
2. Evaluation of the relationship of highway financing at all levels of government to the financing of other public functions;
3. Allocation of highway costs among highway users and other groups on the most equitable basis possible;
4. Development of a financial program that will most effectively, efficiently, and equitably support the physical program; and

5. Development of a scheme of inter-governmental financing which will provide for the proper sharing of State-collected highway-user taxes with subordinate units, and such other inter-governmental participation in the financing of highways as may be appropriate.

In studying the relationship between the highway function and other functions, attention should be directed to the fiscal ability of the various governmental units responsible for the highway function. Although the concept of fiscal ability is a relatively simple one—“What can we afford?”—it cannot yet be determined to everyone’s satisfaction. In general, fiscal ability is said to be indicated by income, usually the disposable personal income of individuals, but this is not an entirely satisfactory measure. The total impact of all taxes, present and proposed, within a given jurisdiction can be estimated and offset roughly against the total income of those residing in that jurisdiction.

Pricing Highway Services

Some economists have in recent years been complaining that highways are underpriced; that is, highway users are not actually bearing their full share of providing highway facilities and services. They contend that if the prices charged for various segments of highways and highway services were set where they should be it would be found that some facilities already built or proposed would prove to be unsound economically.

Perhaps the most noteworthy example of this type of economic reasoning is the allocation by some investigators entirely to commuters of the total costs of additional highway facilities presumably required only for rush-hour commuting traffic. The obvious implications is that it would probably be cheaper to develop some sort of transit facility to handle this portion, at least, of the commuter traffic.

The charge of underpricing in urban freeways has been made with increasing frequency in recent months. By al-

locating the entire cost of a highway improvement, such as added lanes, to peak commuter traffic, and arguing that this improvement would not be required for other reasons, during the period of amortization, extremely high vehicle-mile and passenger-mile cost estimates are reached. No urban Interstate Highway is ever justified by commuter traffic alone, and the same could be said for almost any urban extension of a primary route.

This type of calculation leaves out several key considerations. It fails to take into consideration the easing of congestion on other city streets. It assumes that current capacity would be adequate indefinitely for all traffic except during rush hours. It omits savings accruing in the cost of vehicle operation, convenience, safety, and time. It ignores near-strangulation conditions in many urban areas which were the prime motivating reason for the construction in the first place. The national defense requirements which also were involved in the design of the Interstate System are also dumped on the shoulders of the commuter. The continually changing structure of the American metropolitan area, the wishes of the traveling public, and the increasing dependence on the motor truck are disregarded.

The need for a realistic and rigorous inquiry into all benefit and cost aspects of urban freeway construction must not be denied. The standard benefit-cost or engineering-economy analyses should, of course, be undertaken for each contemplated improvement, and applied to each alternate being considered. In addition broad-scale economic-impact analyses (actually another form of benefit-cost analysis) to measure both the favorable and unfavorable effects of contemplated improvements on adjacent property and businesses, on the city, its metropolitan area, the entire State (or States) immediately concerned, the region, and even the nation should be considered. These analyses must not only consider the items, such as savings in vehicle operating costs and increases in value of land, that can be measured quantitatively, but also those, such as time saved, convenience, and comfort, which are es-

entially qualitative and do not lend themselves readily to quantitative measurement.

Many of the price economists and planners who make the charge of highways being underpriced apparently fail to consider several additional factors that highway officials must consider in determining the warrant for a specific improvement. One is that not only the traffic volume but also its composition and distribution determine when congestion becomes intolerable and new or additional facilities are needed. Another is that increments of capacity, such as additional traffic lanes, become needed as soon as the capacity of the existing facility is exceeded by even a small amount, but a considerable further growth in traffic can then be accommodated without further additions. A third factor to be considered is that some of the major cost elements in urban construction, such as land, have almost infinite useful lives and should not be charged off over the relatively short amortization periods most frequently used by urban planners in allocating transportation costs.

Much of the adverse criticism leveled against the construction of urban highway facilities from the standpoints of excess capacity required by commuter demand, under utilization of all facilities during off-peak hours, etc., is equally applicable to mass transit. The existence of the latter has neither eliminated the need for the freeway, nor slowed the urban-fringe growth in the New York, Chicago, Boston, and Philadelphia areas in the past, nor is there any real prospect that it will in the future. In the final analysis, what will be done may depend as much on the kind of environment in which Americans want to live and work, as any quantification of costs and benefits which may be calculated over an extended period into the future.

Highway officials need to be apprised of and to understand what these economists and planners are talking about when they discuss the "pricing" of highway facilities and services. They also need to have readily available the right kinds of engineering, economic, and

sociological data, and to be familiar with the special analyses required, to be able to answer such criticisms intelligently.

Allocating Highway Costs

Those who have made systemwide, statewide, or nationwide studies of highway cost allocation know that much information of a social, economic, and fiscal nature is needed for these studies. Thus, the relative-use study made in connection with the recent "Highway Cost Allocation Study" by the Bureau of Public Roads, required the development of information about trip lengths, frequencies, and systems used that is available only from the motor-vehicle-use studies such as have been made over the past 10 years by about half of the State highway departments. These studies and others, such as studies of fuel consumption rates, are also necessary in the determination of the final impact of highway-user taxes upon the residents of various rural and urban areas of the States.

SOCIAL, ECONOMIC, AND FINANCIAL ASPECTS OF HIGHWAY PLANNING RESEARCH

There are many informed persons who believe that highway planning is, in general, supported by more research and better quality research than any other form of planning. Those who have participated in highway research and planning for an extended period can take pride in past accomplishments. There are available the types of information that enabled E. H. Holmes to make the excellent presentation on highway transportation that he did at the Woods Hole Conference convened by the National Academy of Sciences in August 1960. Holmes' presentation was published as "Highway Transportation" by the National Academy of Sciences. This publication is a reprint of a portion of "U.S. Transportation: Resources, Performance, and Problems." NAS—NRC 841-S (1961).

The Highway Research Partnership

For many years the Bureau of Public Roads and the State highway depart-

ments have participated in an extensive program of research and planning that involves the collection, analysis, and interpretation of many forms of financial, economic, and social data. In recent years local units of government, notably many of the larger cities, colleges and universities, and other groups have participated to an increasing degree in this endeavor. However, the coverage is by no means complete either as to subject matter or geographical area, and an increasing need for further depth in research conducted is becoming evident.

At its meeting in June 1958 the Executive Committee of the Highway Research Board adopted a resolution naming a committee of top research men in the highway field. The committee consisted of a representative of the Bureau of Public Roads, a representative of the universities, and three from the State highway departments. Its assignment was to screen available research data, set priorities, and estimate costs to get a really adequate program of highway research in action as quickly as possible. The committee went to work immediately with the assistance of officials of the departments, and project and special committees of the Board, which supplied a great deal of material. Material was also obtained from other sources. It published its report in June 1959 as HRB Special Report 55.

All highway planners and administrators should be familiar with this report, which made extensive recommendations, including specific areas in which research appeared to be most needed immediately. Unfortunately, a perusal of the recommendations contained therein will indicate that relatively little of the essential work proposed has yet been undertaken.

Recent Statements on Highway Research

During the meeting of the American Society of Civil Engineers held at Houston, Texas, in February 1962, several important papers relating to highway research were presented. A. E. Johnson, Executive Secretary of the American Association of State Highway Officials, discussed "the availability of new high-

way funds for research purposes" and outlined the history of the development of highway research in the United States. He emphasized the need for broadening and intensifying research, and described the provisions of the Continuing AASHO Research Program which was formally adopted by ballot in December 1961. The work carried on under this program will be administered by the Highway Research Board, with concurrences by AASHO as to the placement of projects and the method of handling. Specific projects can be adopted only on a two-thirds vote of the participating State highway departments. It is hoped that this program, getting under way, will produce some excellent results in non-engineering research, as well as in engineering research.

Rex M. Whitton, Federal Highway Administrator, in his address at the same meeting stated:

We can cite considerable progress so far in carrying out the highway program, but we must do more. One area in which we must step up our efforts in seeking improvements is in highway research.

* * *

We have need for much research. We need to know more about the dynamic combination of vehicle, road and driver.

* * *

The attainment of these objectives will require continuous effort on the part of highway engineers. As engineers, we will make that effort. . . . We would welcome your cooperation in working toward our mutual objective—the advancement of the science and profession of engineering.

During the same meeting O. K. Normann, Deputy Director of Research for the Bureau of Public Roads, discussed "cooperative highway research." He said, "Cooperation among the various governmental agencies, private industry, and the many associations and technical societies has probably been the most important factor in the development of our present highway transportation system and in the dynamic progress that is now being made to complete the National System of Interstate and Defense Highways."

He described the Federal and State funds available for highway planning and research, the extent of the work

done and in progress, and laid particular emphasis upon the cooperative nature of these activities. He concluded by saying, "Much of the leadership in research must come from the man close to the problem. The most effective applied research can be done by people vitally interested in finding a solution to the problems they are facing. . . ."

Compilation of Research Activity

In Normann's paper extensive use was made of a compilation prepared in the Bureau's Office of Research of highway research activity by various organizations, as indicated by participation in Highway Research Board Annual Meetings, State highway department use of 1½ percent Federal aid, and use of administrative funds of the Bureau of Public Roads. This analysis indicated that on the basis of research papers presented at the Highway Research Board meetings from 1960 through 1962, there is a heavy concentration of productive work in about one-fourth of the States and less than a dozen educational institutions.

An analysis was also made of papers presented at Board meetings in the 6-yr period from 1947 through 1953. It indicated that 188 papers presented at these meetings were prepared at colleges and universities; one institution accounted for 30 of these, a second for 29, and a third for 28. The institution producing the next highest number produced only eight.

Of 263 papers presented during the same period by State highway departments, only two departments presented 20 or more; three presented between 15 and 20, and five presented from 10 to 14. During the same period 177 papers were presented by agencies of the United States Government, of which Bureau of Public Roads employees were responsible for 115.

An analysis was made of highway department 1½ percent fund research projects in operation in the States in December 1961. Of 327 such projects, only 23 related to highway economics and finance.

Compilation by general area of research was also made of reports pre-

sented at the Highway Research Board meetings during the 3-yr period from 1960 through 1962. A total of 905 papers was included, of which 81, or 9.0 percent, related directly to highway economics, finance, and administration and 51 papers reported on various aspects of urban transportation. The urban papers accounted for 5.6 percent of the total.

It is not necessary to go further into the statistics compiled by the Bureau on the highway research program to learn that the areas of economic, social,

and financial research are being sadly neglected. It is to be hoped that this shortcoming will be quickly recognized and soon overcome by the initiation of an adequate and effective program of highway-oriented investigation and study of these critical areas. Only by this means can top-level highway officials be equipped to meet the challenges that the changing times are bringing, and be prepared to retain their positions of leadership in planning for future transportation needs.

APPENDIX A

PUBLICATION PLAN: 1960 CENSUSES OF POPULATION AND HOUSING

CENSUS OF POPULATION

Volume I, Characteristics of the Population, consists of separate reports for the United States, each of the 50 States, the District of Columbia, Puerto Rico, Guam, Virgin Islands, American Samoa, and the Canal Zone. The subject matter is compiled by "chapters," as follows: *Chapter A, Number of Inhabitants*; *Chapter B, General Population Characteristics* (age, sex, marital status, race, and relationship to head of household); *Chapter C, General, Social, and Economic Characteristics* (nativity, parentage, state of birth, mother tongue, place of residence in 1955, year moved into present quarters, school enrollment by level and type, years of school completed, family composition, fertility, labor force, employment by class of worker, industry and occupation, place of work, means of transportation to work, income, etc.); and *Chapter D, Detailed Characteristics* (mainly information presented in Chapter C, cross-classified by age, color, and other characteristics, but also including other data).

The information included in Chapter A is presented for States, counties, and their rural and urban parts; for standard metropolitan statistical areas; urbanized areas; all incorporated places, unincorporated places of 1,000 inhabitants or more, and minor civil divisions. The breakdown of information in Chap-

ter B is almost as extensive; it is considerably less extensive for Chapters C and D.

Volume II, Subject Reports, consists of approximately 40 reports devoted primarily to detailed cross-classifications for the United States and various regions and areas of subjects included also in Volume I.

Volume III, Selected Area Reports, consists of two reports showing selected characteristics of the population for (1) State economic areas, and (2) according to the size of place where the individual resided.

Volume IV, Summary and Analytical Report, when published, will present an analytical review of the results of the 1960 Census of Population for each major field.

CENSUS OF HOUSING

Volume I, States and Small Areas, consists of separate reports for the same group of areas as Volume I of the Census of Population. In the State reports, information is shown for the State as a whole and for each standard metropolitan statistical area, urbanized areas, urban place, place of 1,000 to 2,500 inhabitants, country and rural-farm and rural-nonfarm portions thereof. Subjects covered include dwelling-unit occupancy characteristics, including tenure, vacancy status, race, structural

condition, year built, equipment and facilities, value, rental rate, and financing arrangements.

Volume II, Metropolitan Housing, consists of cross-tabulations of housing and household characteristics for the United States by geographic regions, and for each of the 192 metropolitan areas with 100,000 inhabitants or more, including tabulations for each city of 100,000 or more inhabitants.

Volume III, City Blocks, consists of separate reports for cities and other urban places with 50,000 or more inhabitants in 1960, and for a number of smaller places which arranged for block statistics. The data presented by blocks are for a limited number of characteristics.

Volume IV, Components of Inventory Change, will, when published, indicate the source of the 1959 housing inventory and the disposition of the 1950 and 1956 inventories. Data will be provided on components of change, such as new construction, conversion, and demolition of units; for the Nation, broad census regional groups, and for selected large metropolitan areas.

Volume V, Residential Finance, will present information on financing of residential property.

Volume VI, Rural Housing, will show cross-tabulations of housing and household characteristics for the 121 economic subregions of the United States for rural-farm and rural-nonfarm housing units.

Series HC (S1), Special Reports for Local Housing Authorities, consists of a series of separate reports for 139 localities on characteristics of owner- and renter-occupied substandard housing units and their occupants.

COMBINED POPULATION AND HOUSING REPORTS

Some reports are being prepared in which data from both the Population and Housing Censuses are combined. The PHC (1) series consists of 180 reports, providing population and housing data for about 23,000 census tracts located in 178 standard metropolitan statistical areas and two New Jersey counties which are not in such areas.

APPENDIX B

TENTATIVE PLANS:

1963 CENSUS OF TRANSPORTATION

The Transportation Division of the Bureau of the Census advises that present plans for the 1963 Census of Transportation call for dividing the project into three major segments, the principal features of which are outlined below.

A. *Passenger Transportation Survey*:

1. Relationship to 1963 Census of Transportation: The "Passenger Transportation Survey" is often referred to as the "Travel Survey," and is one of several segments of the proposed Census.
2. Purpose: To collect data on three aspects of passenger transportation—
 - a. Selected factors of major significance to local or urban transportation.

b. The volume and nature of trips beyond the local area, as indicated by

- (1) Trips made to destinations 100 miles or more from the local area.
- (2) Overnight trips regardless of distance to destination.

3. Sample size and design: The proposed sample would be the Quarterly Household Survey which would provide quarterly interviews at about 17,500 households each quarter and form the basis for monthly mail supplementary information.

4. Data collection method:

- a. During the first 10 days in the months of January,

- April, July, and October each household in the Quarterly Household Survey (QHS) will be contacted personally by a census enumerator.
- b. "Trip Reports" for the remaining eight months of the year will be obtained in a combination of ways, as illustrated by the "Tentative Panel Rotation—Travel Survey '68."
 - c. Travel during July and August is not only higher but the travel patterns are distinctly different from other times of the year. For that reason, serious consideration is being given to the substitutes of personal interviews in place of mail inquiry during those two months for the four rotation groups involved in the 12-monthly mail reporting program.
 - d. Quality checks will be made at specified intervals during the year as well as followups for panel members who have not mailed in their forms.
5. Summary of types of information to be obtained:
 - a. Household location
 - (1) Region—State—county—city.
 - (2) Rural—urban.
 - (3) Type of residential area—as indicated by value of dwelling (or rent paid).
 - b. Family composition and characteristics
 - (1) Family composition in terms of number of persons by sex and age.
 - (2) Occupation of head of household.
 - (3) Educational status of head of household and spouse.
 - (4) Income level.
 - c. Availability of transport
 - (1) Distance to public transport to go to work.
 - (2) Distance to public transport to go to main business district.
 - (3) Automobiles owned.
 - d. Information about local transport
 - (1) Length of time taken to go to work.
 - (2) Kind of transport used to go to work.
 - (3) Kind of parking facilities available at work.
 - (4) Kind of transport used to go to school.
 - e. Information about out-of-town trips
 - (1) Type of transport used.
 - (2) Number of persons from household on trip—classified by sex and age group.
 - (3) Principal reason for taking trip.
 - (4) Seasonality—month trip started and ended.
 - (5) Major destination.
 - (6) Distance from home to major destination.
 - (7) States or countries visited during trip.
 - (8) Duration of trips—number of days away from home.
 - (9) Over-night accommodations used during trip.
- B. *Survey of Truck and Bus Ownership and Operation:*
 1. General description: This survey will be an inventory of non-government trucks and buses in active use, showing their significant physical characteristics and the nature of their ownership and use. It will have two parts, a Survey of Truck Ownership and Operation and a Survey of Exempt and Intra-state Bus and Motor Carriers. The plans for the second of these surveys are incomplete at this time.
 2. Survey of truck ownership and operation:

- a. **Sample size and design:** The tentative plan calls for a stratified sample of power unit registrations — trucks and truck tractors. The size of the sample has been set tentatively at about 100,000 out of a total of roughly 12,000,000 in the nation, an average of about 1 in 120. The specifications of the sample will be tailored to the license numbering and recordkeeping system in each State, but in general the sample will be stratified by size or by some characteristic related to size or nature of use. The sample rate will be greater on heavy trucks than on the light ones.
 - b. **Method of data processing:** Every answer on the form will be coded and a card punched to give all the information for the specified vehicle. From these it would be possible to tabulate any useful cross-classifications of two or more questions on the form, provided the data do not reveal the ownership or activities of any carrier or truck owner.
 - c. **Summary of types of information to be obtained:**
 - (1) **Vehicle description**
 - (a) Vehicle type
 - (b) Type of fuel
 - (c) Axle arrangement
 - (d) Type and size of body
 - (2) Major use of vehicle
 - (3) Type of service of for-hire vehicle
 - (4) Business or occupation in which used
 - (5) Vehicle-miles driven and typical loads
 - (6) Employment
 - (7) Area and period of operation
 - (8) Truck fleet information
 - (a) Numbers of vehicles
 - (b) Types of vehicles
 3. **Survey of exempt and intrastate bus and motor carriers:** This phase of the survey will be based on a sample of for-hire bus and truck carriers not subject to annual reporting requirements of the Interstate Commerce Commission. The information requested will be similar to that required by the ICC and will include annual revenue, number of employees, and number of buses and trucks owned or leased.
- C. Shipper Survey:**
1. **Purpose:** A survey of shipments at point of origin will measure the volume and characteristics of commodity movements by all types of transport. The data add a new dimension to production and wholesale trade data by showing the geographic relationship between supply and market areas.
 2. **Method:** The survey will be based upon a sample of establishments and will cover shipments made by various means of transportation, including rail, truck carrier, private truck, water, and air. Shippers' reasons for use of the various means will be obtained. The immediate source of the data will be bills of lading, manifests, or their equivalents, covering shipments made in 1963. The survey will be made in 1964.

DISCUSSION

Carley.—You say that planners have spent their time on how man ought to live, whereas highway engineers are pragmatic and really are planning where man, according to his previous

behavior, has been living. Let me take strong issue with you there.

If that is the concept of highway planning, that is not planning. That is prediction. It is predicting where those

cars ought to be, where that man according to his previous behavior has driven his automobile. Therefore, we are in major conflict on the two papers. It is up to highway planners to say where a man ought to live; not only where by past experience he has shown he wants to live.

It is up to you people to decide by the way you build your highways where he ought to live. You have a social responsibility, and it is more than fact-gathering and historic data that tells you that he may want to branch out in this geographic section and this location, but it is up to you to point out that population distribution is necessary. Maybe you ought to build highways to take a man away from where he is living, rather than allow him to live in a congested urban lump, where he ought not to live at all.

Steele.—I did not mean, however, to restrict that to merely a projection in predicting, but rather to take into account the forces that have been in action in the past, and project on that basis. In other words, we should not just project what has happened within an area. If we did that, for instance, we would have New York City itself over 30 million within a few years. Actually, the city has been declining now for what—40 years.

So I do not mean simply to project what we have, but to predict on the basis of what man has demonstrated he wants to do, and will do if he is permitted to.

I do say that since the efficient use of many basic resources, especially land, will become increasingly important as the years go by, it may be necessary for both groups to give a little. I am not ruling out the idea that the highway planning must change somebody's concepts.

Carley.—You cite statistics about the loss of population in the central city. We have so many thousands of speeches given every year by demographers, social scientists, and others, about metropolitan growth. It really is a picture of metropolitan change, rather than metropolitan growth. I think that the point is well taken. Not only that, but

we do have to plan for change. There is growth in various areas, but it has been a picture of change more than it has of growth.

Steele.—That is correct. There is also the fact that merely because people move away and land uses change, that does not mean that the demand for transportation increases.

For example, Washington, D. C. has lost population, but there is much more traffic into the District today than there was ten years ago. The people who live outside now have to come back here to work.

Holmes.—You mentioned highway planners would have the responsibility for directing growth in the channels in which it ought to go, or encouraging man to live where he ought to live. Who is it that decides where he ought to live?

Carley.—I say it is the elected governmental leaders who are in part responsible, and it is not man alone who decides where he will want to live. That is what we are put in office for, to decide where it will be better for him to live.

Holmes.—Would you let him choose by giving him, say, a series of alternatives on which he himself might choose, or would you in some way, through the elected officials and some governmental process, make that decision for him?

Carley.—Certainly I do not want to make his choice for him. It is up to us to provide alternatives to people living in congested Milwaukee or congested Chicago. One of the ways to provide alternatives is to provide amenities in other places and means to reach those amenities.

This means jobs, recreation, highways, and other transportation modes that will get these people there. We allow them to pick, but we have an obligation to provide them with the opportunity to make a decent choice. In the past we often have not provided man with the opportunity to make a choice.

There is a sense of oughtness to anybody that is in government. In addition to describing things as the way they are, we have a responsibility to make them better. Making them better means an opportunity to let man live in a better

way, and in a better place than he has in the past. I say this is your responsibility as highway administrators and planners.

Granum.—Mr. Steele, I was interested in your emphasis on the value of the demographer, etc., to the highway planner. Over the years we have done our best to find some of these people. We have searched among the States, and particularly among the universities and the State departments on many occasions to find those people who could give us, as highway planners working with the States and other governmental units, some valuation or prediction of where people were going to be, how many there were going to be, etc.

Regrettably, I can count the people who could really help us on fewer fingers than on one hand. I found many who would furnish exhaustive treatises about the past history, who could give all the trends 50 and 100 years back, but who regrettably would not stick their necks out to the day after tomorrow. If we can find those people who can do a better job than has been done in the past in these predictions, I think it would be very helpful.

There was a letter to the editor in the *Washington Star* three or four weeks ago that was a rebuttal to the widespread conversation about the shift to urban areas, the population growth in the urban areas, and the 70 percent in the urban areas. The writer went back to analyze the changing description of urban areas, as posed by the Census Bureau, and what portion of this 70 percent was affected by the difference in definition of urban areas over the years. Then he further stated that out of this 70 percent, a high proportion are in a relatively few metropolitan areas. We know that the problems there are really terrific.

However, there are many acres in this country that are not urban, but do have highway planning problems. Anybody that flies over that great metropolis or megalopolis, as they call it, from Norfolk to Boston knows that it is going to be a long time before some of those piney woods are built up and populated by people.

One other thing in this regard: one of our greatest finance problems in highways is that of solving the local road problem. Therefore, I think we need to have great emphasis on badly congested urban area problems, without neglecting some of the other areas.

Babcock.—Mr. Carley, I think that as I understood your comment you say that the highway planner should have something to do in the determination of where and how people are going to live. I would submit as a thesis that this is directly in opposition to all basic fundamental planning; that the highway planner's obligation is to develop a transportation system which a qualified planner can give him in terms of the total predicted future land use and in terms of how and where people will live. Also, that this transportation plan must be fitted into the over-all program in the same manner that the utility plan, the recreation plan, and all others have to be fitted in; but that the total plan has to be developed by an agency other than the highway agency.

Now, the highway has to have planners, and they probably need city and regional planners. We have three who are working with us all the time. But we would still hold to the concept that we are not going to design a thoroughfare plan for a city until it has a land development plan, and that we are not going to design a thoroughfare plan until not only they have a land development plan, but that it is an adopted land development plan with the appropriate zoning and other controls so that it will become a reality. This I hold to be an appropriate concept in this particular case.

There are two types of planners, good planners and bad planners. There are some planners that try to shape a city the way they think it ought to go without any true, realistic, factual approach. There are other planners who visualize what the people want, and the general background of the city and how it will be developed.

As a case in point, the city plan of Raleigh, a city of about 100,000, was adopted in 1958. Today I would say the city is almost 99 percent on that plan.

This is also true with the transportation plan, because it was developed with careful thought by a man of great ability working with transportation planners as well.

I hold, that the highway planner has got to work within the framework of a total plan. There has to be some agency which will develop an over-all plan. You cannot have 18 different agencies doing that, but there must be one that develops a "total" plan. I think you have to fit your transportation planning within that over-all framework.

Carley.—What do you do if there does not happen to be a planner and a planning program in a particular region in your State? Then how do you build?

Babcock.—We do not build until we have a comprehensive plan and they may have to wait a year before we are going to plow in several millions of dollars.

Carley.—What I am saying is: In these given areas where there is not planning, it is up to you people to do the planning. I am talking about a far broader conceptual arrangement.

Babcock.—In our operation, we have been doing the planning cooperatively with the city, but we still call on a planner to do a land development plan.

Now, the State cannot get into a large metropolitan area and do the basic planning. I do not think it should—it is too far removed from it. There are local problems involved and a competent planning agency within that local urban area can do a better job than we could do, primarily because they are living in that area. They know the problems better, and their long-range master flexible plan is better than our people could provide.

We work with them and give them specialists, but I still think it has to be the community itself that must adopt a master plan based on what its people want to do in that area, and how they want to develop, and what they will accept. I think that is their responsibility.

Clauson.—I believe that you are both probably closer together than you realize. However, it would seem to me that this would be an area into which a con-

sultant should come into the picture and do the planning for the city. Then the highway department does not have to defend itself because its planners went into the city and did the related or over-all city planning.

I believe that this problem has troubled us in Iowa—that in any situation such as this where we have stepped beyond our legitimate bounds, it is desirable for a consultant or specialist in that field to come into the picture and do the planning.

Babcock.—What I think you are talking about here is that the highway department should broaden its whole concept of thinking in the development of its entire highway system within a State. To this I agree wholeheartedly, that they should think more than just of traffic. They should think in terms of the development of the State, and we have had recreation problems on the Outer Banks that many of you have heard of, and we are trying to look in that direction.

But I did want to get this subject re-oriented away from the concept of the State highway department doing a comprehensive urban plan in an isolated urban complex. This I think is fallacious.

Paterson.—Mr. Carley, I think one of the big difficulties is that you put your reliance on research in a kind of negative way by saying that we have no need for further broad-scale, long-term original studies. If you skip a piece here and then go on to your statement with regard to the oughtness of planning, I do not see how you can square these two things.

In other words, if you are going to rely on the oughtness of the planner to set up the criteria by which we are going to establish where persons will be living, then it seems to me the only way these persons can vote intelligently as to whether they want the kind of legislation that the oughtness provides is on the basis of current, detailed, penetrating, broad-scale research which you are referring to. After all, the idea of planning to determine where a government group is going to tell someone to live or tell them what to do is rather old, and

in this country our policies and philosophies have turned around the Jeffersonian principles of people making their own decisions, and government providing as much information as possible so that intelligent decisions can be made.

Mr. Granum was a little unhappy with the kinds of research we get, because a good many people interviewed are fearful of giving estimates which may later prove to be very embarrassing. This is quite true. I do not think any responsible chief highway engineer or highway planning engineer will find too much to criticize if an economist, a sociologist, is to make a prediction with regard to demographic changes 10 years hence, if they are off 10 or 15 percent. The point of it is that you have to take a risky position sometimes to be of any assistance or helpfulness. We worry about it constantly. We worry about being wrong, certainly; because all you can do is give the basic reasoning and assumptions behind the forecasts, and do the best you can with it.

St. Clair.—I certainly agree with what Mr. Paterson has called the Jeffersonian principle of free choice for the American people. We believe that our planning should be interpretive rather than compulsive, so far as it can be. But I think we have to acknowledge that when you locate a highway, and when you design a highway, you or whoever has the final authority is making a decision that will determine to a degree the location of places of residence, business, and commercial and industrial enterprises.

So we are in a sense—highway planners as well as the city and the regional planner—being a reluctant dictator to that degree. What he does is to go down there and form permanent public works.

Carley.—But the important point Mr. St. Clair raises is that the highway builders have had more of an impact on where people live in this country than any other single man-made factor, and more than any other factor except the presence of river basins. I do not think there has been anything more important than the locations of river basins, but the next thing certainly is the location of highways.

These have been decisions by men. Therefore, I call on the people who lay out the highways to carry always with them the sense of responsibility of what tremendous and awesome impact they have on social and cultural change.

Babcock.—I would like to put out a point that is entirely personal with me. I am not at all convinced that in the next 20 years the greatest and the most severe restrictions will have to be placed on the individual.

I have not seen the facts, that the transportation problem in the major urban sprawls that are continuing to develop, can be solved by either automotive transportation or by any form of transportation we now know today.

It is a fact that we have gone through patterns where we allowed a city to develop as it desired, and then finally found that we had to have the severest restrictions in zoning. I believe that we are very definitely going to reach the point in planning where decisions must be made which will severely restrict the individual's desire to choose his own form of transportation and to move as he likes.

Titus.—I would like to ask Mr. Carley about highway departments implementing this planning. Does it not require more implementing, in a good many cases, than highway departments of many States have now?

Carley.—I think it is probably true that there is some great restriction in the highway department's implementing. But I would like to add one other thing. I think most of the problem and most of the lag in this field comes not so much from the lack of legislation, but the timidity on the part of the highway administrators to do what they can do, and their being willing to settle behind the facade of, "Well, we just do not have the authority to do it."

Hager.—That was almost what I wanted to say. I doubt if the administrator does have the authority in most States to construct highways to induce traffic and benefit private enterprise. I think that the highway administrator's prime function is to build the urgent needs.

Now, if, in building those urgent needs, selecting a corridor for a needed highway between points A and B, there is a comprehensive plan, we should always work towards that comprehensive plan and give traffic, or future traffic service, in an area, providing it is economical.

I think that the question is of which comes first, the highway or the development of the comprehensive plan. In the development of a comprehensive plan, who pays for it? The highway user? The developer? Or some other agency in the State which is more qualified or probably more interested in the economic development of the State?

I mean, for example, such an agency as the development commission in Connecticut, which continually invites industry into the State. They get the industry to come in, and then come to us about the building of a road. We cannot build such a road until the traffic needs warrant it, and then we have to program it along with the other needs. There is never enough money to take care of those. So those are the predicaments that some of the States are getting into in this long-range program.

I am completely agreeable with everything you have said, Mr. Carley, but it is almost an impossible thing for the highway department to take it upon itself to induce traffic and build roads which would benefit private industry at the highway user's expense.

Holmes.—I was on a road between Hutchinson, Kansas, and Kansas City Friday. I was interested in the Topeka bypass where there were a couple of bridges where there were not any other streets there. There must have been some "paper" streets on either end.

The comment was that the highway department had been criticized, particularly and specifically, for building bridges where there were no streets to connect with them. But they said as the town grows they will have to be able to get across the bypass, with limited access, so the bridges were built. It can be done in Kansas at least, if you are willing to face up to the criticism that came. I think, of course, ten years from now everyone will be glad that

they did it. On the other hand, sometimes I wonder if we overemphasize the importance of transportation in some of these determinations that are made. Some of these mathematical models presume to take into account all of the factors that determine the location of an industry or some activity of that sort.

The one I am thinking of is in Connecticut. It shows the transportation people fairly far down on the list of the derivative factors. I do not think that in any way implies that transportation was not important, but compared to other items that were important in the location of that particular industry, transportation was relatively easy to provide and could come along afterwards without any difficulty.

And in that case—and I know this has been the case in other States—industry is located on the reasonable assurance that once the plant was known to be located there, with a greatly increased tax revenue brought to the area, there was very little difficulty in getting the necessary highway connections despite what plans might have been made in advance for the highways in other places.

So there is evidence enough, that highways are extremely important in locations of industrial, residential, and commercial developments.

On the other hand, there is just as much evidence that people locate in areas where transportation is particularly horrible. Just look around any metropolitan area, and see where people build their houses. After people build enough houses, the highway department has to provide transportation.

So there is an interaction in here that should bring a word of caution toward accepting as too much of a deterrent this factor of the location of the highway in advance of development. It does not always happen as you think it might.

Carley.—Well, we have under way in Wisconsin, a stretch of interchange between Chippewa and Eau Claire and the Twin Cities. A study is being made on the economic impact of that highway

with subsequent resulting development because of the location of an interchange. This will tell in 5 to 7 years what kind of development is coming about because of the situation.

Babcock.—In my judgment, in the last 20 or 30 years, this concept of planning which has been developed has probably been developed on less research and more hypothesis than any basic development that has taken place in this country in the last 2 or 3 hundred years.

I feel that there is a fundamental need for very basic research. I have seen planners who I feel are reasonably well qualified doing work in cities and going blithely ahead and planning precisely for more of the same, which any factual understanding of history will indicate will not take place. There is a need for many millions of dollars to be spent in basic, over-all planning research. There has been a great deal more in transportation research, even if it is only 0.17 percent.

Paterson.—The difficulties we have are related to the kinds of research which highway departments themselves can legitimately support. Apparently there has to be a very direct relationship between the research study and its usefulness to the highway department. It seems to me that this hampers the planning of the highway department.

In Missouri, we have no coordination of information and statistical services of government agencies. We have no over-all studies of economic and social implications at a statewide level, although we have one just starting. An economic base study of the State should be of direct usefulness to various groups, not only the highway depart-

ment. And yet it is somewhat difficult to overcome the reticence of these departments to support such studies, because they cannot make a case that it is needed immediately.

Hager.—In 1958 Connecticut appropriated \$45 million to build 45 miles of expressway from New London to Killingly, Rhode Island. The highway department opposed this bill because there was not enough traffic to warrant a 4-lane express controlled-access highway.

However, the legislature in its wisdom passed the law, based on the fact that it would induce traffic and develop that area of the State which was a blighted area with a large amount of unemployment.

We immediately started a research project with the University of Connecticut, and they have been following this since the project was completed.

The land values have doubled. Industry is coming in there quite fast. Unemployment has gone down. There is no doubt that for the economic development of the State as a whole we should build highways or could build highways to these blighted areas and prosper.

However, I still have to go back, as an administrator, and say that I do not see how we can use highway users' funds to induce traffic or benefit private enterprise.

Shaneman.—Suppose all 50 States did that. This is the same thing you get into. Put a highway in here, and we will attract industry and get redevelopment and everything. But you do not go on like that forever.

Critical Administrative Problem Areas

HOWARD E. HILL, *Michigan State Highway Department*

• AS A MAJOR State agency concerned with the administration of a public works program that reaches annual proportions of \$260 million in expenditures, and requires 4,400 employees to administer, the Michigan State Highway Department recognizes the importance of planning and its contribution to effective administration. Michigan has a highway network of approximately 100,000 mi of which the Michigan State Highway Department administers 10,000 mi as the trunkline system.

Highways, properly planned and properly constructed, serve as the framework for the growth and development of the State and the economic and social well-being of its people—whether they live in cities or in rural areas.

The highway administrator, in attempting to develop a highway network that will contribute most effectively to the economic and social needs of the State, must, as a matter of course, understand the implications of change that are ever present and apply them to the highways currently being built. Planning is a key to this understanding.

If the highway department's "house is in order," it can act intelligently, affirmatively, and effectively to coordinate efforts with those agencies that represent regional, metropolitan, county and city interest in sound development of these areas.

In Michigan, this means that facilities must be planned now for a rapidly growing population. Michigan's population, now 7.8 million, is expected to reach 12 million by 1980. In place of today's 3.3 million motor vehicles, there are expected to be 5.6 million cars and trucks operating by 1980. The trend, which by 1960 saw nearly 74 percent of Michigan's people living in urban areas, is expected to continue. It is anticipated that an increasingly larger percentage of this urban growth will take place in Suburban areas.

As a function of management, planning offers the highway administrator

the use of a rational design as contrasted with chance, the opportunity to reach a decision before a line of action is taken—instead of improvising after the action is taken. In the Michigan State Highway Department planning is a continuous process, planning joins research to arrangements and makes them proceed together, planning takes into account both the constants and the variables in a situation; it must operate as far as possible in terms of standards which include precisely defined objectives, and precisely defined technological ways and means of achievement.

In recognition of the important role of planning in administration, the planning function has been given organizational status as one of the major units of the department. The Office of Planning was created in 1957 and the Chief Planning Engineer given a direct line of access to the Managing Director.

As a part of this reorganization, these constituent units were grouped to make planning more effective: Programming Division, Route Location Division and Planning Division.

To make this reorganization effective, these divisions were allotted additional personnel qualified to perform the tasks assigned in this comprehensive approach to planning requirements. In addition to qualified engineers, personnel with training in finance, public administration, planning and the related social science disciplines were added to the planning staff.

With these organizational changes and staff additions, the department was in a position to implement the Commissioner's policy that no major highway construction would be undertaken in any municipality until a trunkline plan had been prepared which was acceptable to the department and the municipality concerned. This plan also had to provide the municipality with an integrated system of streets and trunklines as defined in a master plan.

Through this policy the department

sought to improve already close State-local planning relations; and to give a new emphasis and scope to these efforts.

These trunkline plans seek to accomplish the following:

1. Provide a highway network adequate to relieve current and anticipated congesting by providing improved highway service.

2. Develop a plan that will promote the sound economic growth and development of the area.

3. Coordinate highway construction with other Federal, State, and local projects, *i.e.*, urban renewal, flood control, sewage disposal, central business district revitalization, and other capital improvements.

4. Establish a program from which interrelated highway, road and street projects can be selected for construction, in stages, with assurance that each project will be a part of an over-all area and State system.

5. Advance statewide and nationwide highway service by integrating the area system with national, State and regional traffic ways.

The State trunkline plan and the related major rural corridor studies serve as an important coordinating device. The report, with its documentation, brings State and local planning activities into sharp focus. It provides the local planning agency as well as the State highway department with a record of the concepts and principles that went into the formulation of the proposal. It reduces the opportunity for "intuition" and "guess," and it underscores the areas of agreement and responsibility.

Based as these plans are, upon intensive study, analysis, and consultation, the trunkline plan (a) details the highway and community planning considerations that were studied, (b) demonstrates the compatibility of the plan with existing and long-range goals of the community and the State, and (c) gives public notice of the mutual agreement that has been reached between the local community planners and the highway department planners as a proposed system of highways.

Simultaneously, with the reorganization and strengthening of the planning function, the department announced the development and made public a schedule of a 5-yr construction program. By this device, the local units of government were given sufficient notice of planning highway department activities to tie their local planning in with the impact of this accelerated program.

In 1961, a second 5-yr program was announced, this to consist largely of projects in the urban areas of the State. A detailed schedule of awards by quarters for the 5-yr period was again published.

The "lead time" provided to cities by the announcement of the second 5-yr program, has made possible the closer correlation of highway building plans with local public works improvement plans.

As an outgrowth of efforts to develop coordinated State-local highway plans, the Planning Division developed a "Highway Planning Report Checklist" which has served to formalize the procedures which have been found most useful.

This checklist stresses the planning criteria and community assessments that are needed to assure that a new highway would be a compatible part of the community's design for its growth. The checklist has found immediate acceptance in Michigan. It has also been of interest to planning agencies in other States.

The concepts expressed in the checklist are not unique or necessarily new, but they are documented in a logical sequence which reflects long-standing engineering tests and concept of community development. The availability of the data contemplated by this document, simplified analysis and makes the decision-making process more effective and a more valid one.

Although the reorganization of the department and the increased emphasis on the planning function, have achieved important advances in coordinating State-local planning activities, there are problems still remaining to be solved.

The preparation and the subsequent publication of trunkline plans has

created considerable public interest. It has also brought with it some problems that are worthy of note.

Publication in local newspapers of these plans has given some people the impression that the highways proposed were going to be built tomorrow. Others have used the schematic maps as exact locations for the new highways. Local planning agencies and the department have had to be prepared to orient the general public to the use of this document and especially its limitations.

The construction program is in process and is substantially on the established and announced schedule. From this, it could be assumed that the planning operation is satisfactory. Planning personnel are experienced and dedicated—working nights with public groups and days on the regular planning operation. However, the planning and design situation changes greatly as the program proceeds. The time needs within the department make it necessary to revise old procedures and methods.

Present procedure on urban projects is as follows:

1. The needs are determined by a highway needs study. The needs study is a function of the Office of Planning and is a joint venture with the highway department, the 83 counties, and all municipalities actively cooperating.

2. A determination is made of the amount of urban funds which will be available for the given period of time. A 5-yr construction award period has been used for planning and announcing a program.

3. Based on the priority need for the specific job and the expected time needed to prepare the job for contract, each step in preparing the job for award of construction contract is scheduled. A uniform work load award schedule, by years, is desired and established.

4. On urban projects working with the local planning organization, the Planning Division obtains a major thoroughfare plan prepared and approved by the municipality.

5. The Planning Division completes its trunkline plan to fit the urban

thoroughfare plan and obtains the approval of the planning director for the municipality.

6. The route location report is prepared and the approval of the local governing body is obtained for the highway department construction project. This requires meetings with the council to which, generally, the public is invited. In many localities, depending upon location of the route or routes selected, the sales job necessary by the Planning and Route Location Divisions is tedious and requires persistence and dedication.

7. On approval of the route and the route location report, the project goes to engineering for surveys. The route report depicts interchange types and locations; but does not generally define them in exact location, except on some major projects in the largest urban areas. Survey selects the exact location in the field; Design works out the detailed geometrics, makes additional studies on structures, establishes grades, width of ramps and all other pertinent details, including borrow and drainage requirements.

8. Road closure agreements and cost participation agreements are also a responsibility of the Engineering Division and are initiated after the project is in the design stage.

9. The Bureau of Public Roads gets copies of the route reports and of the preliminary right-of-way drawings; and, of course, of the complete right-of-way drawings. All problems, questions on right-of-way, drainage, Bureau questions and justifications must be worked out completely before programming and appraisal work on partial takes. At this stage, grading and drainage and slope lines must be ready for staking in the field.

About once a month, Design, Right-of-Way and Programming go over schedules for the year ahead to determine how the established schedule is being met. In the past several months, from the results of these meetings, it appears that procedures must change somewhat. There is too much redesign. These changes increase beyond reason design costs and necessitate design overtime.

The changes make for too late and too costly justification of details to the Bureau of Public Roads—all of which results in reduction of right-of-way procurement time, and some delays in contract awards.

How to overcome these delays is the present problem. From a schedule standpoint, approvals of urban projects form a major delay in the procedure schedule. The goal is to award contracts, including urban construction contracts, on the date scheduled and at a reasonable design preparation cost.

In Michigan, by legislative act, it is necessary to obtain route approval of the governing body of any incorporated municipality, before proceeding with construction of the urban project. This should not be considered as restrictive legislation. This requirement forces a good job by making it necessary to consider all the problems which will be brought about by construction of the highway. It is necessary to consider tax base loss to the community, access to areas, division of the municipality, problems to residential and business areas and many other problems, with the final determination that what the municipality is requested to approve is the best plan and route that can be provided. These are all problems which should be and must be worked out even if it were not necessary to obtain the approval of the local governing body.

One weakness which must be remedied is not always being in a position to answer all questions pertaining to a route or routes when presenting the plan for local approval. It has not always been possible to define complete limits of take, how much of a factory parking area will be taken, how much of the resident's back yard will be included in the take. If several routes are presented, with a recommended preferred route, definite cost estimates and statements of the amounts of tax base affected by each route must be prepared and have local concurrence prior to general discussion with the local approving authority.

There have been good results in the largest urban area where the approval was handled as a separate project, with

a designated person handling the project approval. Here, too, the operation must be revised so approval of a package can be requested. A "package" means going to the City Council only once for approval of route, road closures and all agreements, including the cost participation agreement.

Early route agreements in many municipalities have often been pushed at the expense of design and right-of-way operating time. Submission of the job to the Design Division with an order to proceed with surveys and design with no further need to consult with local governing bodies will bring about lower design and contract preparation costs and reduce the time required to get the job under construction. This means it will be necessary to work with major industrial organizations to show them how they will be affected, work with the city engineer and city planning organizations, discuss the problem with major property owner organizations affected, have worked out the detail and presented to the Bureau the advantages and costs of the proposed interchanges—so that neither the municipality nor the Bureau will ask for revisions or further detail once the design stage is reached.

It is important and a substantial time-saver if cost agreements and road closure agreements can be packaged in this one approval to eliminate future revisions required by changes in Council personnel and bargaining practices. Early railroad agreements at the time of Council approvals will also step up ultimate construction schedules.

To further improve coordinating efforts, the Department, through the Office of Planning, has been cooperating with the Michigan Department of Administration, the present Section "701," Housing Act of 1961 program agency, for Michigan. Applicants for planning assistance under the Federal program have been formally offered the complete cooperation of the State highway department in the preparation of their transportation plans. Upon receipt of notice from the State Department of Administration that a municipality has applied for an urban planning assist-

ance grant, the Office of Planning informs the applicant of its readiness to supply relevant information on traffic and transportation studies on request. Research is coordinated with the proposed planning studies, where practical.

A formal contact has also been established with cities that are applying for urban renewal loans and grants to insure close coordination of their projects, where applicable, with proposed highway projects. The opportunity exists, in certain instances, for the city to use the planned highway project as part of its local financial participation required for urban renewal. A case in point is the City of Pontiac where the Perimeter Road expenditure by the department is, in part, serving as a credit toward the city's local share of an urban renewal project.

Although the department has strengthened the internal position of the planning function, coordination with other planning agencies is sometimes made more difficult because the same integration does not exist in all local jurisdictions. This subject is of concern to professional planners and local administrators. By the very nature of municipal government organization, the decision-making process at the local level cannot be as completely integrated as it can be in a single department.

The difficulties encountered in getting decisions at the local level do, however, mean that highway departments must allow more lead time for this phase of planning. It also implies that perhaps even more technical assistance can be provided within the realm of the department's competency in this area.

Cooperation with such organizations as the Michigan Municipal League—with its interest in highway matters—has also been effective in the effort to promote the understanding which is antecedent to cooperative effort.

As Michigan does not have a State planning agency, some of the planning that would be performed by such an agency, must be done by the highway department if its responsibility for a well-planned highway network is to be discharged.

In an effort to obtain adequate staff, a training program was developed with Michigan State University which enables students to study and work at the same time. However, this solution is not completely satisfactory. It means that trained personnel must devote a considerable part of their time to training; and, when personnel are trained, many are hired away at salaries higher than present salary scale. The training expended is not a complete loss, if the personnel remain in the State and in the highway or municipal transportation field.

As more work is scheduled for construction in urban areas, the planning task becomes more complex. Problems of corridor selection and route location are magnified many times in contrast with these same problems in rural areas.

In densely built-up areas, application of planning principles must be more precise and many more variables must also be considered. The challenge of planning in these areas calls for an upgrading of present planning skills and the addition of related skills to the planning process.

Translated into budgetary terms this implies that the increased construction costs in these urban areas must be accompanied by an increase in planning costs if the skill of the engineers is to be matched with the important planning knowledge they need to be able to do their work well.

Planning is necessary to preserve and maintain an existing highway system, a major responsibility of State highway departments. But it is even more indispensable if this system is to be expanded and integrated with the changing development pattern of the State, especially in view of the rapid rate of change that is occurring in urban areas. It becomes necessary to anticipate future community patterns and forecast the resulting transportation requirements.

For the State highway department to be able to carry out its assignments effectively, its efforts must be coordinated with the efforts the communities of the State. It is the task of the local planner to define community goals and

objectives which will be accepted and implemented by community action. It is the assignment of the highway planner to translate local development patterns in terms of traffic and traffic facilities. Highway planning, thus can be seen to require cooperative effort, and coordination makes the process work.

The State highway departments across the country are in a unique position to assist in plan implementation. Highway plans, unlike so many other plans, do not remain on the shelves to gather dust. They are a guide for action, and the action follows soon thereafter. Sometimes too quickly for the administrator who must marshal men, materials, and money to get the project built.

It is in the interest of the State highway department to see that current and realistic urban arterial street and highway plans are developed by the urban areas of Michigan in cooperation with the department.

State highway departments have a special responsibility to see that these plans are technically adequate, *i.e.*, they are able to meet the future traffic demands which will be placed upon them and they are properly integrated with the highway and land use development.

State highway departments, responsible as they are for a statewide highway system, must ascertain that area, regional, and State transportation needs are integrated with local highway system planning.

State highway departments must display an even greater sensitivity to the problems of the urban areas; and to do so, they must participate more and more

in local planning problems. What is local today may very well have a wider import tomorrow.

Approaching the time when 8 out of 10 citizens will live in urban areas, it becomes even more true than in the past that the economic and social well-being of these urban citizens will determine the prosperity of the United States.

Historians have noted that great civilizations of the past have reached their peak development in urban environments; and it has also been pointed out that in these same urban areas the deterioration which preceded national collapse was first in evidence.

Planners alone have not yet found the answer to the problem of decay at the core of urban areas; nor have they solved the problem of urban sprawl on the periphery.

Highway administrators know that soundly planned and soundly built highway transportation promotes the growth and development of communities, the State and the nation.

Application of present knowledge together with a better appreciation and understanding of the dimensions of the problems that confront urban areas, may make it possible to make an even more positive contribution to the future of the cities.

The plight of the cities is a matter of great public concern. Highway administrators, community planners, State and local legislative bodies must respond to this genuine interest by developing new solutions for the problems presented. New concepts must be formulated to serve as the basis for testing new proposals. A new dimension to cooperative efforts may well provide the best answer.

DISCUSSION

Steele.—I have visited a number of the States over the past few years in connection with their long-range fiscal plan. One of the problems that comes up is: On what basis are we going to allot aids to the cities, the counties, etc.? There are two elements in the picture. One is outstanding debt. How should

that enter into the picture of allocating a share of the income from motor vehicle user taxes to the cities? The other is should allocations be on the basis of the program that is proposed or on some other basis?

It is rather obvious that you have two problems here that are not easy to

solve. At least one State is thinking of this possibility, even though they know that there is a certain amount of penalizing of some cities involved. They will help the counties and the cities to bail themselves out, and then they will pay additional aids on the basis of either a proposed program period or the proposed financing period, or possibly even on what might be called the cost period, that is, the period over which the facilities will be used and will be productive.

These are some of the practical problems that are facing not only the highway administrators, but also the governors and the State legislatures.

Granum.—Mr. Hill, you said your office of planning consists of three basic functions, and the problems you deal with dealt almost entirely with the programing area.

Are we to assume that basically your problems relate to the over-all office of planning, or are confined, then, largely, to the programing functions?

Hill.—I was speaking principally of the office of planning, and the problem of obtaining the major thoroughfare plan. Preparing the trunk line plan to fit that major thoroughfare plan is a function and responsibility of the planning division, located in the office of planning.

We have no problems in the scheduling division. Those are problems which are not within our own organization.

In the route location division, our problems are not quite as pronounced as in the planning division, because a major part of the responsibilities of the route location division are also problems which we can handle.

The major problem is the planning division's problem of getting the approval of the route, which is prepared by the route location division. We have much joint effort between the route location division and the planning division.

Granum.—This problem of getting municipal approval is basically the function of the planning group within the office.

Babcock.—Mr. Hill, you say you do not have too much trouble in scheduling your planning. This is something I

would like some guidance on. I find this is the most difficult end of it from our standpoint because you can put engineering into a schedule, but I have never found that you can put planning into a schedule. Do you try to set a specific schedule for the planning?

Hill.—We set a definite date for the approval of the route by the municipality, and work towards that date. In some areas, we do not think we are going to have such tremendous problems. I might mention just a few.

In Lansing, they want much more than we can give them, because their priorities are not adequate to give them the routes that they want. We do not have the money to give them all the routes that they have the money to fit into their plan.

We go into a community such as Bay City, and we must be the driving force. We set the date, which is probably three or four years in advance, because we are going to have to start hammering on them to get their master plan prepared, and then to fit the trunk line plan into their master plan. We may be a year late with it, but we set a date.

The reason we program and plan is that we are programing all our funds into that 5-yr period. We expect to have no funds other than for emergency work during the period. If that job does not make it we will have some additional money not tied down. But so far, in our first 5-yr plan, every job which we have had out of a \$1.25 billion schedule has been made.

Babcock.—I was just wondering, because we find it is difficult to do that first stage in the planning. We estimated an up-grading of a 2-lane highway to a 4-lane divided one. This is rural, and we thought this would be a simple planning operation which would take about 60 days. We have been on it a year and a half. Therefore, we try to give a little more flexibility. The only thing we are afraid of is that if we try to set too specific a deadline, we are going to get an answer that might not be the best answer.

Wiley.—I believe I understood you to say that you do have trouble, particularly in municipalities, and even sometimes

in rural areas, in hitting the date you thought you could get the job ready. If this is true, then I believe this is a difficulty in scheduling, rather than in operation, perhaps.

Hill.—No. That is why we have our round-table discussions so often. We have programed every step, from getting agreements with the communities through route reports, surveys, preliminary design, final design, preliminary right-of-way drawings, final right-of-way drawings, etc.

Wiley.—In other words, you anticipate where you think you are going to have trouble with local communities, and you allow adequate lead time?

Hill.—Yes. In fact, for the first time, in the past five years, we have some jobs on the shelf, which we will pull down in April, May, or June of this year, and get them out to award.

Wiley.—I would say that is really remarkable, if anybody can set up a schedule for that many years and hit it fairly consistently.

Hill.—Another advantage that we think we have gained in this scheduling and programing: We used to get delegations in constantly, with their specific job that they had to have. We announce our program. It is announced in the papers, and every local community knows what the program is. In fact, most of the property owners along the routes we are taking know it. And when the delegations come in, we can tell them, "We can't put on your program. We have programed every dime we have coming in. We have no more money. If we put on your program, we will have to take a higher priority program off. So we will consider yours in the next 5-yr period."

And the drop-off in these delegations has been tremendous. It has permitted us to go to work, instead of just meeting with these organizations.

Carley.—I do not think Mr. Babcock missed what I heard, that the State of Michigan is interested in comprehensive planning, and there is not any comprehensive State planning agency. Therefore, they have even appealed officially to the Federal Government that they go ahead on a statewide program.

I forgot to buttress my argument, that the State of California in that freeway study two years ago did exactly what I was talking about, and now Michigan is saying they want to do it. So it is possible for highway commissions to go into that large and comprehensive a program.

Hill.—I do not know how we will handle it, because one of the items you mentioned earlier is that we have earmarked funds in Michigan, and we fight tooth and nail to see that those funds are not used for anything else except highway purposes.

There may be some connotation in the 701 funds, which means that we will have to get some funds from some other unit of government, or somewhere else, in order to do the planning, which is not strictly highway planning. But I think we can find the way to do it.

As I mentioned, we do not have a planning organization in Michigan, and I for one would certainly like to see one, but I can see some problems if we had an organization such as yours. I do not know where our planning and your planning would have their dividing line.

Holmes.—I was interested in that 701 program. I know you had requested the highway department to be the qualified applicants for 701 funds in Michigan. That does require that any planning that is done with those funds be comprehensive planning, under the definition of the Housing Act, which certainly goes far beyond the normal requirements for highway planning. And I would presume, also, you would tap some other State funds besides highway user funds for that purpose. I do not know how successful you would be, but I imagine you would try.

The thing that intrigued me was your comment, if I got it right, and that is what I would like to get clear—the fact that the community must participate under your law in the planning of a highway program, or participate in a highway program, and that does include the planning of it. Then they are contributing, or that contribution can be then used as a part of the one-third matching of the community for 701 grant.

Hill.—By legislative act, any community of over 30,000 must participate in the cost of the highway construction—it starts with 25 percent and goes up to 37½ percent—all funds, after taking out Federal participation. So in Interstate money, it means 2½ percent; and 7½ percent State; and then, of course, the 10 percent Federal.

The legislature also has required that any incorporated community regardless of size must approve a route within that community before we can construct. That does not mean cost participation because if they are under 35,000 they do not have to participate in cost. But we must go to their council or their legislative body and get the approval of the route before we can go into the community and construct the route.

That in itself makes us do considerable planning with that organization. In many areas we meet first with the manufacturing organizations or industrial organizations. You also have to meet with the landowner organizations and the engineering organizations, then with the planning organizations, that is, the city planning groups.

If we get enough weight from the manufacturing or industrial organizations, the local people, and the business organizations, and the city's own engineering organization, we can get the council approval which is what we need.

Holmes.—I thought you had said that the fiscal contribution that the community makes toward the highway program could be used as the one-third matching requirement in connection with the 701 grant, which would extend that planning to comprehensive planning.

Hill.—It was with redevelopment planning, urban redevelopment planning. For instance, we have a project in Pontiac, the periphery route. We are trying to see whether we can save the core of Pontiac, which is one of Michigan's major automotive cities and is fairly well dying at the core, with a periphery route. The funds which we are expending on this periphery route will be Pontiac's share, or their urban renewal development project.

Babcock.—The reason I took the posi-

tion I have taken is that in the matter of comprehensive planning, perhaps we in North Carolina are ahead of some of the States in the approach.

The State highway department pays 60 percent of the cost of the development of a comprehensive plan for a city out of SP funds.

My second point is that in North Carolina we have a law requiring a comprehensive plan mutually adopted by both the city and the State highway commission before any projects are built.

We have no city in the State with a population in its corporate limits or beyond in excess of 20,000 which does not have a mutually adopted, comprehensive land development plan. We are in the process of working in area redevelopment in detail. We have been very fortunate. Practically every city of 20,000 has a competent planning staff, probably because the university has developed so much of this planning.

Perhaps I am a little biased in my approach. The reason I am biased is that where you have the comprehensive land development plan and where you have the transportation plan and these things mutually adopted together and worked out in detail, the local government which had a hand in it is very knowledgeable of the entire plan. At the same time the local government is picking up right-of-way that would otherwise block development of future streets and things of that sort.

That is the reason I feel fundamentally they need to be in it: they are working very close with us in picking up this right-of-way as we go along and in letting us know about situations. They can do that much better at the local level than we can.

Holmes.—Our position is that you cannot plan transportation without recognizing the interaction between land use and transportation. If no land use plan exists, the highway department has no alternative but to participate in the preparation of one to the extent that it is needed for transportation planning.

However, we do not feel that we have the authority to participate in a broad comprehensive land use plan which goes

well beyond the needs of transportation. Frequently, that is what local planning people would like to have us do.

Carley.—You say 60 percent of all of the local planning in your cities is paid for by the State highway commission out of $1\frac{1}{2}$ percent funds?

Babcock.—I better explain why we get to this 60 percent. There is the Federal planning in a small city, which is $66\frac{2}{3}$ - $33\frac{1}{3}$, which taking out administrative cost, brings it to about 60-40. We work on this same general basis of 60-40. We are working with sufficient basic land use planning to do the transportation plan. If they want to come in and do other planning and get planning to specifically detail their zoning, subdivision, and all of these other requirements, this is beyond the pale.

As far as getting the basic framework of growth, location, probable location, industry, business, shopping centers, yes; but if you want to go into the specific planning that others are doing into zoning regulation and subdivision control and that type of thing, no. You would have to use other Federal money.

Campbell.—This goes back to another subject. Out of your 5-yr plan, is that a "moving" 5-yr plan that you have? By "moving" is meant that a year is added as a year is completed.

Hill.—No, we had a 5-yr plan beginning July 1, 1957, terminating June 30, 1962. The second 5-yr plan picks up after the termination of the first.

Campbell.—How does that affect your lead time? When you start a new program, have you entirely new projects to be considered?

Hill.—We do not put any new projects into the 5-yr plan. In our second 5-yr plan, we have about \$80 million worth of planning and right-of-way procurement for construction jobs which will be awarded in the third 5-yr plan. So we do have the planning lead time, and the preparation, surveys preparation, of preliminary plans, and the procurement of right-of-way. We have other jobs which will go through the planning stage, and we expect a route approval by June 30, 1967, which would not have any money for right-of-way involved. That right-of-way procurement would

probably come in 1968 and 1969, and construction later.

Carley.—I think this fits within the context of programming for years ahead. I would like to ask a question that I would only like to see hands on and not necessarily for the record. In programming for the future, how many of these State highway people have put political pressures on them from a legislature or some other place that make difficulty for program scheduling?

Froehlich.—You get all kinds of pressures. You can get pressures to do it, and get pressures not to do it. You get pressures by the same person to do it and then not to do it.

Carley.—I am aware, of course, that you get pressures. But I mean in terms of undue pressure to the point where it really fouls up the whole planning process.

Hager.—We had in 1959 an appropriation of \$484 million, to cover our needs, which amounted to \$527 million. So there was \$43 million worth of roads that had to be left out.

By 1961, certain people who supported the \$484 million bill were disappointed people, as we had to drop some of the jobs. So recognizing that they gave us \$43 million less to do with than we needed, they decided they would come out with a \$150 million program and include those \$43 million in other jobs which were necessary throughout the State.

And for the first time in the history of Connecticut, the Highway Commissioner has been directed to complete that 4-yr program which was the \$484 million program, which was designated by projects, and the \$150 million. They listed the projects, 24 of them, and put an amount on each project which we cannot exceed.

Now, if you don't think that hurts planning. . . . We cannot tell until the day a project is designed whether we are going to have enough money to do it or not. But the estimates that we gave the legislature on these roads go back to 1959—and they set up the same price for them; the cost index has not been considered; nothing has been considered. So we are in trouble.

Telford.—Everyone has had similar problems at one time or another. However it might be interesting to point out the success we have had in California with a long-range program. We have had set up by the legislature a basic framework. It is a master plan of freeways for the State, together with a program of financing over a period of about 20 years. For example, there is on my desk a map showing our 8-yr program. It is very helpful when these men who have been elected by popular vote come in and want to talk. I can

point out, "Well, now, gentlemen, here is what the money adds up to. Which one of these do you want to take out to put yours in?"

We cannot say this before a legislative committee, but when we get them in our own territory, we can very often talk to them about the problem and point out that we do have a plan, and that a lot of consideration has been given to this plan. This technique is very helpful in overcoming these pressures if we have a specific plan well thought out, which can be easily presented.

Session Three

Tuesday, March 27, 1962, at 9:00 A. M.

UTILIZATION OF PLANNING INFORMATION

F. R. OLIVER, Presiding

The Planning Organization—Its Dual Role

H. S. WILEY, *New Mexico State Highway Department*

• THE LAST FIFTY YEARS have brought greater technological advancement than all the ages before them. Never before has so much scientific knowledge been commanded, and never has there been an era in which the concentrated effort toward even greater knowledge has been so intense and widespread. Despite the potential peril in this search, this is a wonderful and challenging age in which to live, and it is each man's task to contribute what he can to progress.

In the highway field of endeavor—relatively small, perhaps, but nevertheless vital—the amazing development of an intricate network of highways to serve the needs of a rapidly changing world has occurred. This highway system can be viewed merely as a great technical achievement, spanning the plains, the mountains, and valleys of the nation with efficient fabrications of steel, asphalt, and concrete. But it should also be noted what this system does to link the diverse sections of the country, unify the people, and nourish an economy unmatched throughout the world. However, much of the job still lies ahead and there are many and varied problems to be faced in trying to get the job done.

The tremendous increase in the number and use of motor vehicles has overloaded much of the American transportation system. The frequent changes in design of the vehicles themselves have contributed to the outmoding of high-

ways only a few years ago considered adequate. The phenomenal growth of urban areas has brought an urgent need for more expeditious movement of goods and people.

It is true that the growth of motor-vehicle use has brought with it an increase in road-user revenue for highways. Increased Federal taxes have been imposed to support greatly augmented Federal-aid appropriations. And public and political interest in the highway program is at an all-time high.

Paradoxically, some of the problems arise from the fact that there is now more money available for highway improvement than ever before, while others stem from the parallel fact that highway improvement needs still exceed the public funds that can be expected for this purpose. With the money available much highway building can be done but because of the gap between revenue and need, that building must be accomplished with wisdom and thrift.

This circumstance makes it vitally important that highway administrators be fully informed of all relevant factors before they make decisions. Sound management of the highway program rests heavily on thoughtful planning for the present and the future.

BACKGROUND OF PLANNING IN HIGHWAY DEPARTMENTS

Since passage of the Hayden-Cartwright Act of 1934, 1½ percent of Fed-

eral-aid funds for highways has been reserved for engineering and economic surveys and investigations, for the planning of future highway programs and financing, and for necessary research in connection with the planning, design, construction, and maintenance of highways and highway systems, and the regulation and taxation of their use. As a result of this provision of the Hayden-Cartwright Act, planning surveys were initiated in nearly every State. Although various titles are used, every State now has in its highway organization a unit engaged in such studies, with much of its work formalized and directed along standard lines of research through the efforts of the Bureau of Public Roads.

The following excerpts from Articles II and III of the formal project agreement between the States and the Bureau of Public Roads for the use of 1½ percent Federal funds state the objectives of the planning organizations:

The Highway Department, under the advice and direction of the Bureau of Public Roads, shall conduct statewide investigations, and shall make surveys, prepare plans and assemble engineering, economic and other data deemed necessary for the general planning of a complete highway system and program of highway improvement in the state . . . and . . . shall assemble and analyze the results of the investigations and studies . . . in such manner as to permit their use for the purpose of classifying highways according to their importance, preparing programs for future road construction and reconstruction, formulating a highway budget and determining the equitable sources of revenues for highway purposes.

The basic philosophy of highway planning is stated in the American Association of State Highway Officials Policy Statement on the subject of highways in a national transportation policy:

Throughout the period of growth and maturity of highway transportation, it has been the objective of highway engineers and administrators to build, maintain, and operate highways in accordance with the indicated desires of the American people. . . . The golden rule in all the planning work is to find out what people want and to make plans to satisfy those wants.

In other words, it is the job of planning units to determine the physical

condition of existing highways and who uses them, to what extent, and for what purpose, and how they are supported, in order to determine present and future highway needs. With this information at hand, planning can advise management how to provide efficiently for these needs, build economically, and spread the costs equitably.

ORGANIZATION OF PLANNING UNITS

The planning segment is essentially a service unit, operating for the benefit of State highway department management, the Bureau of Public Roads and other governmental agencies, private institutions and individuals. Its precise place within the highway department organization varies according to the responsibilities with which it is charged. For example, mapping, programing, or traffic engineering and operation may or may not be planning functions, depending on how the individual highway administration regards them. A glance at the State highway department organization charts reveals the diversity in the relation of planning to the chief highway engineer, as well as the various names given to the planning unit—Planning and Programing, Research and Planning, Planning and Traffic, Planning and Economics, Statistics and Analyses.

The structure of the New Mexico State Highway Department Planning Division is relatively simple and over the past 15 years has proved workable.

Certain phases of planning work are, by the very nature of the material and its use, best handled by continuing operations. These are, in brief:

1. A complete and current inventory of the entire highway transportation system of the State, recorded in the form of maps, charts, tables, logs, etc.
2. Information on the number, types, sizes, and weights of motor vehicles, and the use of the highways by each class of vehicle.
3. Historical and current records of income and expenditure for highways and streets at all jurisdictional levels, and accurate records of unit costs for construction and maintenance.

These three phases of the work are therefore assigned to three separate sections within the Planning Division: Road Inventory and Mapping Section; Traffic Section; and Fiscal Section.

The task of gathering information from each of these sections for application to specific problems and for presentation of the material in acceptable form for a selected audience is assigned to a fourth unit within the Division: the Special Studies Section. This section also conducts a number of studies on its own and maintains some degree of control over the research done by other sections of the highway department and by consultants and universities for the department.

These units gather the facts, analyze the data, apply the results, and submit the findings. The first three operations comprise the research function of the Planning Division and the fourth is a part of the advisory function. Actually, the two functions are so closely interrelated that they cannot be so neatly set apart, but for the moment, the actual content of the Planning Division's research work as it has developed in New Mexico will be discussed in more detail.

Abraham Lincoln, in 1858, said in his "house divided" speech that "if we could first know where we are and whether we are tending, we could better judge what to do and how to do it." It seemed in New Mexico that if the answers to a series of specific questions could be found then the "where" and "whither tending" would be known.

The questions asked were these:

1. What highways exist and what is their condition?
2. Who uses them, how much, and for what purpose?
3. Who is paying for them?
4. What will be the future demand?
5. What facilities will be needed to meet the demand?
6. What will they cost?
7. Who should pay?
8. How much money will be available?
9. How large a highway system can the State afford?

10. When, and in what order, will construction be undertaken?

Tackling the basic problem posed by the first question, information was obtained by conducting a continual inventory of the State's roads. Field crews travel every traversable road, county-by-county, endeavoring to repeat the inventory of each county every 5 to 7 years. More frequent inventories are made of those areas in which extraordinary change may be occurring. Data obtained in the field are recorded on maps and in descriptive logs and tabulations showing road types, widths, administrative jurisdiction, and other details. Because of new development and changes in corporate limits, Planning Division city maps are frequently reviewed and revised.

To acquire the intimate knowledge of highway revenues and expenditures required for analyzing trends, predicting future financial status, and conducting economic studies, the Fiscal Section maintains contact with the Bureau of Revenue and other State offices concerned with the collection of motor-fuel and mileage taxes and motor-vehicle registration fees. Numerous monthly and annual reports reflect the trends in receipts from these sources of revenue. On the basis of material acquired through correspondence and field trips, an annual accounting is made to the Bureau of Public Roads on the road and street receipts and expenditures of each county and municipality.

The traffic section of the Planning Division maintains a continuing survey of highway and street usage, and endeavors to be in a position to develop on short notice a reasonable estimate of the annual average daily traffic on any section of road or street in the State. Data are collected by means of permanent and portable automatic traffic counters, and by manual counts made for the purpose of classifying vehicle types and recording turning movements at important intersections. Annual truck size and weight studies are conducted in order to follow trends in truck usage and loadings on principal highways. Speed studies are made at selected locations every two years.

The volume of traffic using a street or highway may include an appreciable number of vehicles which are there only because the route is the best available link between their origin and destination, although it may be considerably out of direction. Surveys are made by the traffic section to determine whether there is enough such traffic to justify rerouting of streets and highways or the provision of new routes.

Because highways involve so heavy an investment of funds, they must be designed structurally and functionally to achieve a maximum useful life. It is therefore essential to anticipate future traffic volumes, so that highway design will not become obsolete and thus accelerate depreciation. Traffic projection requires a study of population trends and of anticipated population curves as developed by the Bureau of the Census, university research groups, and other organizations. Relating population to motor-vehicle registration and to trends in motor-vehicle use makes it possible to formulate a rational estimate of future travel on a statewide basis. For specific road sections, it is necessary to define the areas which influence movement on the section and to evolve a factor of relationship between such areas and the statewide growth factor. Origin-destination surveys provide information from which areas of influence may be defined. They also furnish a means of determining diversion of traffic to a new or improved route. In addition to diverted and normal growth traffic, the future volume on a specific route will probably include an increment of entirely new or generated movements which come into being as a direct result of the improvement of the facility.

The special studies section of the Planning Division conducts investigations of such a nature as to require fact-gathering beyond the scope of the regular research sections. One such project was a survey of statewide motor-vehicle use to establish a thorough knowledge of annual patterns of travel. Other special studies include an investigation of methods for classifying roads according to their economic value to the State; a

study of the economic costs of motor-vehicle accidents; and a fuel-consumption study in which employees of the Department and the Bureau of Public Roads were the respondents.

Also under the direction of the Planning Division, by reason of the Federal funds involved, but conducted by other units of the Highway Department or outside agencies, are the following:

1. Statewide survey of soils, geology, and geologic associations, and an inventory of sources of aggregate materials—materials section of the Department's Materials and Testing Laboratory.
2. An analysis of New Mexico law relating to highways—legal section.
3. A before-and-after study of the value of severed parcels—right-of-way section.
4. A survey of archeological and historical sites that might be disturbed by future highway improvements—Museum of New Mexico.
5. Soils vibration research—New Mexico State University.
6. Study of the economic impact of highway relocation—New Mexico State University.
7. A study of roadside planting for prevention of erosion along highways—New Mexico State University.
8. Flood-frequency study of the Rio Grande Basin—U.S. Geological Survey.

APPLICATION OF PLANNING DATA

Each section of the Planning Division makes various analyses and presentations of the basic information for which it is responsible. These are generally designed for specific purposes. Although each report or tabulation has a particular value for highway administration, a greater value is usually realized by combination and correlation of the material.

For example, through the use of road inventory, traffic, and fiscal data, it is possible to prepare an estimate of revenue that can be expected to accrue from the use of a given section of road. With the further addition of data relating to the cost of operating motor vehicles under varying road and traffic conditions, comparative estimates of the cost

of operation on suggested alternate alignments may be developed. The annual costs of motor-vehicle operation can be compared with computed annual costs of building and maintaining suggested routings to determine whether the proposals are feasible and which one of several alternates may be expected to show the highest ratio of savings to road-users per dollar of highway cost.

One of the most difficult tasks confronting the administrators of a highway system is that of determining the priority of improvement projects. Nearly all States now use one method or another to minimize the uncertainties of rule-of-thumb selection of projects. The most common of these is some variation of the so-called sufficiency rating, which places a numerical value on the relative sufficiency of such items as structural condition, geometrics, and safety. The items are rated against a par value, totaling 100 for all items, with an adjustment against the rated total based on the traffic volume of the section as compared to average traffic for the system. New Mexico has evolved a method of its own which is somewhat more selective than the standard procedure. Ratings are made annually on rural Federal-aid primary and secondary routes and are the basis upon which a 4-yr construction program is drawn up.

The above examples are more or less routine applications of planning data. Studies of greater scope and complexity may encompass such matters as the calculation of improvement needs of all roads and streets, in comparison with anticipated revenue for a future period, and the extensive urban studies conducted in cooperation with local authorities. All such reports of a general nature, together with annual traffic surveys, city traffic studies, road condition ratings, and various special studies suitable for lay consumption, are prepared for distribution to the public.

In summary then, the research function of the Planning Division is to obtain and analyze factual information bearing on highway economics and administration for the purpose of provid-

ing solutions to problems that confront State highway management. Through contacts with the Highway Research Board and its Correlation Service, the American Association of State Highway Officials, the Bureau of Public Roads, and other national and regional organizations, planning divisions are kept abreast of the newest developments in highway research. Clearly the combined efforts of all concerned can produce a wealth of information that may be utilized to determine whether a given course of action is wise and equitable.

PLACE OF PLANNING ORGANIZATIONS IN HIGHWAY DEPARTMENTS

With all the riches of fact and figure at its command and the experience and skill in interpreting the data, the planning organization cannot fulfill its advisory role unless the climate is favorable. Management must recognize the need for planning activities and be disposed to consider carefully the conclusions to be drawn from planning material. If such a climate does not prevail, planning reports will simply gather dust on library shelves and serve only a small fraction of the purpose for which they were prepared. Historical record is good and necessary, but builders of highways are deeply committed to today and tomorrow.

During a quarter-century in highway planning work, the author has witnessed the metamorphosis of small and struggling planning units, tolerated only because of Federal requirement, into influential and effective staff consultants whose opinions carry weight with top management. Consequently, firm ideas on the proper means of achieving this development have been developed.

It is of paramount importance that the planning director or engineer, or whatever other name he is known by, should hold a staff position immediately under the chief highway engineer. He has too much vital information of specific importance in its purest form to risk having it watered down, or in any other way rendered less effective, by its passage through an intermediate office. Furthermore, the planning di-

rector, who has been charged with the conduct of research and the development of its findings, is the person best qualified to make a strong and convincing presentation of the case.

A favorable climate for profitable development and use of planning data must also prevail within the planning organization itself. This means that planning units must be highly receptive to change. They must welcome new procedures and new techniques, while retaining the best of old methods. They must be alert and sensitive to the needs of management, and whenever possible, they must anticipate these needs. There are a number of ways in which these attitudes may be developed.

If it is to be effective, the planning organization cannot operate as an isolated cell within the highway department. It must itself have a sound knowledge of what constitutes proper highway administration and the problems involved. Highway planners should also be familiar with all department operations and have more than a casual acquaintance with department personnel at all levels. Only in this way can the planning organization fully know what research needs to be done and to what ends it should be directed. Suggestions for extremely valuable projects can emerge from such an exchange of ideas.

It is vital to the health of a planning organization to maintain contact with its opposite numbers in other highway departments, through national and regional associations as well as direct contact. The long-established cooperation with the Bureau of Public Roads, which has grown into a full partnership, has been of inestimable value to the Bureau and highway departments alike in making available to all a vast pool of experience, and in standardizing procedures and forms, so that a truly national picture can be assembled from the separate activities of highway departments across the country.

A legitimate extension of the planning organization's advisory function is the dissemination of planning data in a variety of forms. A fully-documented technical report may be suitable for the

engineer or fiscal expert but not very helpful to the busy administrator who needs the substance of the findings in brief and readily accessible form. And the abbreviated document prepared for a highway commission well versed in highway language and problems may be wholly unintelligible to the audience at a public hearing. Capturing the essence of a planning study in appropriate words and graphics, designed for a particular audience, is an unremitting responsibility. A single chart merits the same kind of concentrated effort to get the message across as does a sizeable booklet or a documentary film.

A comparable area in which planning can serve in an advisory capacity is that of public speaking—at public hearings, and at meetings of civic, church, business, and educational groups. The planning director and his top assistants are normally well informed on so many facets of highway department operation and transportation system requirements of the State, as well as current developments at the national level, that they can make excellent ambassadors to the public. A forthright, factual, and courteous presentation of what the highway department aims to do, and why, can go a long way toward enlisting public acceptance of the highway program. The public welcomes reliable information, and the task of the highway administrator is made much easier when enlightened support replaces uninformed opposition.

Yet another opportunity is offered the planning organization to serve administration well. Oddly enough, this relates to an aspect of planning work which most take so much for granted that its potential force is not realized—the integrity of research and the interpretations of findings. It would be naive to deny that political and financial pressures are, on occasion, exerted on highway department activities. If the planning unit slants or falsifies the information it furnishes to the highway administration, the unit's efficacy and its value are seriously impaired, if not forever lost. It is far more important

for administration to trust the planning organization than to find its recommendations uniformly palatable.

Given the power to reason and make choices, man is obligated to act accordingly in whatever field of endeavor he engages. Highway planners have exceptional opportunities in this respect. For the most part, they can acquire the needed knowledge, interpret it, and

select a just and sensible course of action. This part of the dual role has been widely acknowledged. But the successful fulfillment of the advisory role rests heavily on the manner in which findings are presented. This must be done with such imagination and honesty that planning will be universally recognized and accepted as an indispensable element of highway management.

Role of Top Management in Developing and Using Planning Information

WILLIAM R. B. FROEHLICH, *Pennsylvania Department of Highways*

• IN A HIGHWAY DEPARTMENT, as in any large organization, the administrator (as top management) simultaneously is the head of the organization to whom all others look and the bottom of the funnel where the knotty problems gravitate. In every respect, he is responsible for the overall work of the Highway Department.

In attempting to keep the organization moving toward its predetermined goals, the administrator has six generally recognized functions: (a) organizing, (b) planning, (c) directing, (d) staffing, (e) controlling and (f) non-delegated activities. Since the Highway Department is an arm of government, the highway administrator must spend much of his time in "non-delegated activities," that area of his work relating to external contacts such as appearing before legislative committees, meeting with various delegations and speaking to a seemingly infinite number of publicly oriented organizations. The necessarily large amount of time spent on non-delegated activities not only adds to the highway administrator's work hours, but also means that he must be more efficient in performing the other five basic functions relating to the general work of his Department.

IMPORTANCE OF PLANNING

Attention in this discussion will be directed largely to the second mentioned basic function of the administrator, that of planning. In the purely administrative sense, planning has been defined as "the function of selecting, from among alternatives, an effective economic basis of action for the achievement of specified objectives." (1)

In a comprehensive paper (2) W. L. Haas summed up the Planning function very effectively by this statement:

Planning is one of the least understood and least effective aspects of highway manage-

ment, yet it is an indispensable part of administration. It is the key operation from which all other activities flow. It serves to activate the enterprise and gives direction and guidance in accordance with the principles and philosophy of the administrator.

Planning of this nature, as the key operation from which all other activities flow, is the all-encompassing type of planning which is being discussed at this conference.

A highway administrator is not only concerned about planning in the narrow sense of highway planning surveys or specific route or system planning or financial management planning—but with all of these, and a few more. The administrator must develop planning as a concept in all phases of the work of the highway organization: long-range planning of goals, planning of objectives, planning in determining policies, planning in financial management, planning of the highway program, both long range and short range, and planning for personnel management.

Without effective planning in the highway organizations, those in top management become fire chiefs, spending most of their time putting out conflagrations, both large and small, which would not have developed at all if the organization had planned properly.

Any organization without a strong planning function is like a ship without a rudder, drifting aimlessly across the seas with little chance of docking at any port of consequence.

DEVELOPING AND UTILIZING PLANNING

With planning as one of his important functions, the administrator must develop planning, as a concept, within the organization. This he does first by practicing planning himself, and giving it status within the organization. In his contacts throughout the organization, both orally and through written direc-

tives, he must make it known that he is concerned not only about the everyday operational and administrative problems, but also is concerned about looking ahead and properly charting the course. He must develop the planning function by giving it organizational status and by insisting that it permeate every functional part of the organization. Planning is a requirement, not only for the planners, but also for every administrative and operational part of the highway department's organization.

Once plans have been developed, again it is the responsibility of the administrator to see that these plans are utilized. Too many good plans have been developed by staff units, only to be put on the shelf and largely forgotten by the line personnel in the organization who would most benefit by their knowledge and application of these plans.

It is true that the manner in which plans are presented, "the package in which they are wrapped," often has a great deal to do with how well they are accepted and used. Therefore, the administrator must insist that the plans of the organization be as clear and as simple as feasible so that they will gain acceptance further down the line. In addition, he must institute controls which will guarantee that the plans he has sanctioned will be used effectively.

STATUS IN THE ORGANIZATION

Much of the effectiveness of the planning function is determined by its importance in the organization. If planning is to be a principal function of the administrator, it must be given a status to reflect this importance.

As a function, planning should be tied directly to the administrator with the planning head reporting directly to him. An example of this may be found in the organization of the Pennsylvania Department of Highways in which there are four deputy secretaries, one of whom is the Deputy Secretary for Planning and Programing. Under him are three bureaus: (a) economic research and programing, (b) advance

planning, and (c) highway planning statistics. The function of the bureau of economic research and programing is to develop various highway economic studies such as road classification and highway needs, to conduct economic research and to handle programing activities involving long- and short-term projects of the highway construction program. The function of the bureau of advance planning is to develop long-range generalized plans on a state-wide, regional and specific urban area basis. It is their charge to coordinate these long-range plans with other State regional and local urban bodies which would be concerned. The function of the bureau of highway planning statistics is to collect, develop and interpret the basic planning information which will be needed for the planning process, not only under the planning deputy but also in other areas of the department.

AN EXAMPLE OF PLANNING DEVELOPMENT AND UTILIZATION

One area of planning activity which was mentioned previously is that of personnel management. This is an example of one type of planning that would not be the responsibility of the planning unit itself. Rather, it is typical of administrative planning which would be the responsibility of the particular administrative head.

Looking into the future through planning of personnel development and personnel management often has been neglected. However, it should rank in importance with all of the other planning activities in a highway department if the department is to perform its functions effectively.

In Pennsylvania, through a study conducted by the Automotive Safety Foundation, it was determined that the department should hire approximately 500 additional engineers in order to keep pace with the expanding highway program. These engineers were to be recruited as college graduates in civil engineering and from the ranks of civil engineers with 5 to 10 years of experience. Through 1958, 1959 and into 1960, the effort to recruit college grad-

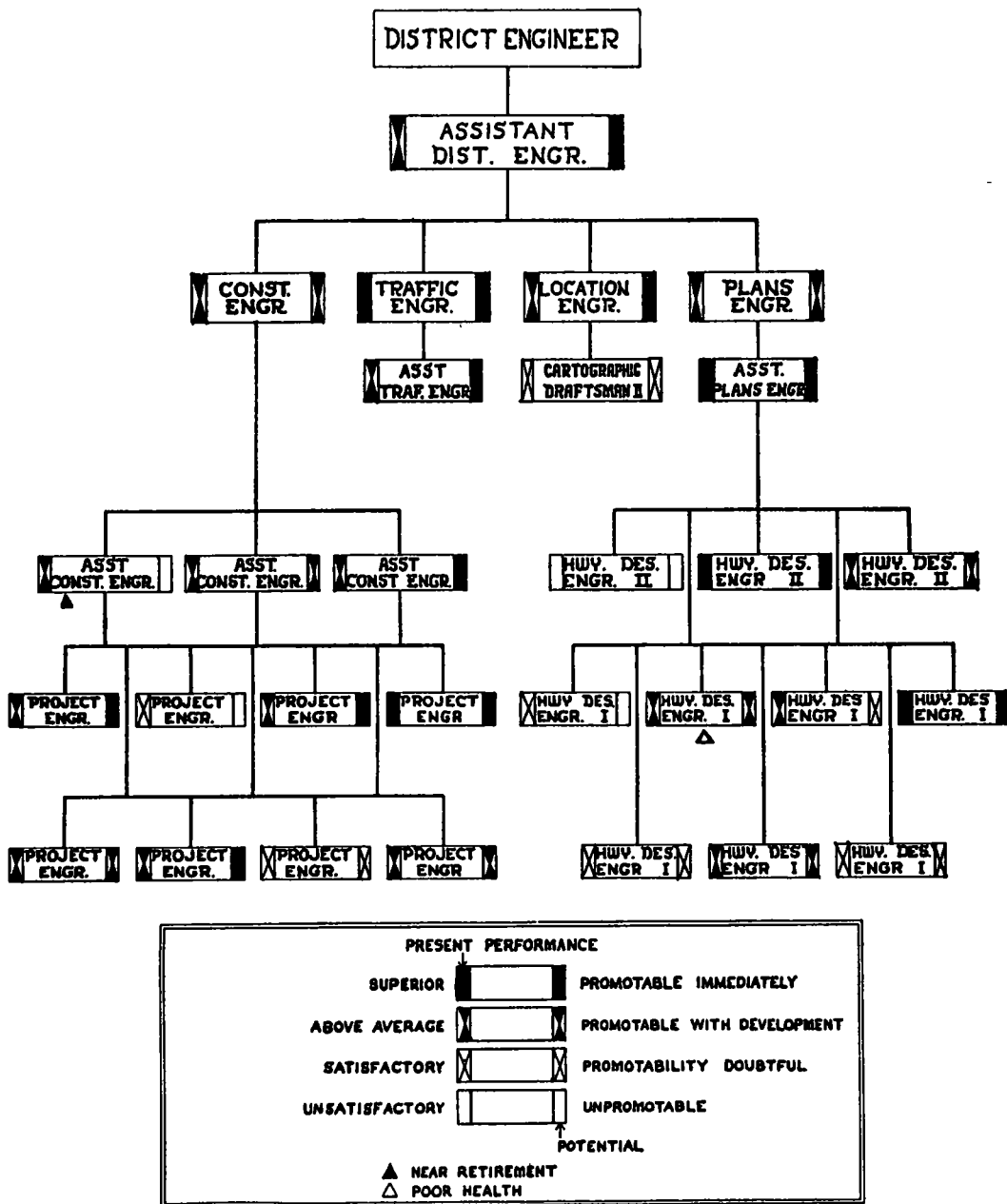


Figure 1. District organization.

uates was very successful, but the recruitment of engineers with several years of experience was not particularly successful. Therefore, a comprehensive management development program was initiated beginning in 1960 with the goal of determining those engineers in the department with good potential

and developing them for early assumption of greater responsibility. This was accomplished in several ways: (a) a series of management seminars was held to bring the problem into focus and to give direction to the management development program and (b) all engineers were required to complete a man-

power inventory questionnaire which determined their background, experience and job desires. Concurrently, each engineer was evaluated and appraised by at least three of his superiors. In this manner the present performance and potential of each individual was determined. This was charted graphically for each highway district and central office bureau. Figure 1 illustrates one segment of a district organization showing the present performance and appraised potential of each individual. A chart such as this compels advance planning on the part of the district engineer or bureau head, because impending requirements are indicated and personnel problem areas stand out effectively.

Again, such a planning device is effective only if it is used. Therefore, the Secretary of Highways has directed that all district engineers and bureau heads state in their recommendations for promotions that they have examined and considered the organization's status chart and the appraisals of those individuals eligible for promotion.

As another element of the manpower planning and development program, the

department is beginning to embark on additional work and study which has the goal of determining manpower requirements during the next several years, taking into consideration shortages of qualified personnel, anticipated rate of turn-over and the projected work load. Once these requirements are determined, the department then can proceed to give even more effective direction to its management development and personnel program.

This has been one example of the application of the planning principle in an area of highway department's activity where, in the past, planning has not been seriously considered. It may serve as an illustration that the planning concept should be all-embracing and applicable in every segment of the work of a highway organization.

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DISCUSSION

Hill.—It seems all comment and discussions both this morning and yesterday have been on the basis of continuing planning with all the traffic being carried by the wheeled vehicle, just as it is now. I wonder how much consideration is being given to rapid transit, and rapid transit carrying a part of the load away in advance. I am not saying within 5 or 10 years, but we are developing highway systems which may in some areas be partially obsolete by the year 2000, and we are putting terrific investments in highways.

I wonder whether any State is planning for a part of its load to be carried by other than wheeled vehicles. For instance, Mr. Telford I am sure has had to consider San Francisco's thinking. Is California taking into consideration the possibility of the mono-rail system coming into the San Francisco area? Will that lessen their high-

way needs and their highway planning in the future?

I believe our advance planning must take those things into consideration, if we are actually doing planning, rather than just going ahead and developing and continuing in a better way what we have been doing than in the last 10 or 20 years.

Froehlich.—I do not think this is being neglected, or completely neglected, in the highway departments. Two studies in Pennsylvania, the Pittsburgh transportation study and now the Penn-Jersey, have included all forms of transportation.

The charge of the Penn-Jersey study will be to evaluate metropolitan transportation, not highways alone. This has included railroads and rapid transit. The various breakdowns and models that are being prepared will reflect that.

Both Mr. Wiley and I this morning made rather strong positive statements

about where the planning function should be in the organization; that is, that it should report directly to the chief administrator. I wonder whether anyone would want to challenge or question that. I do not believe that this is true of all highway departments.

Haas.—When I wrote a paper about a year ago, I made a quick check and I know there were approximately 40 that would appear to have some direct connection with the top administrator.

Froehlich.—In other words, they may report directly to the chief administrator, but they are not given comparable status?

Haas.—Quite often they do not have status and the effective relationship with the administrator that planning requires. We still have a long way to go. The progress is in that direction, and there is more and more dependence on the planning function to be organized along the lines that you have mentioned previously. There is more and more dependence on the administrator for his decisions on particular matters.

Froehlich.—Of course, speaking as one of these so-called chief administrative officers, I am constantly aware of the fact that whether you have planning or whether you do not, you have got to go ahead. You have to make decisions, and you have to act. If you can act on the basis of planning information and work that has been developed for you, you are acting out of a lot more knowledge than you must in many other instances.

Oliver.—That is in effect the exact subject we are discussing this morning, which is utilization of planning information, regardless of what is on the covers. Those decisions do have to be made, and they have to be made sometimes more rapidly than we would like to have to make them. If we have that planning information, we are in far better shape.

Froehlich.—We have found that a number of our people in the districts, district engineers in particular and some of their assistants, are not completely aware of the information that is being turned out in our planning activities. We have taken some steps to communicate this through the de-

partment because these people are glad to have some of this information. They did not know it existed. This gets back again to the proper utilization of whatever information you do develop.

Babcock.—In my judgment, the weakest thing we have in the highway departments normally is administrative planning. Poor communication is 90 percent of the reason everything gets fouled up. The matter of administrative planning, financial planning, personnel management planning, operational planning, scheduling, all of this, to me is one of the biggest challenges that we face today.

We have been treating the highway business as engineering. It is not; it is big business. If we can get good administrative planning in all our areas, I think we could do the job much more efficiently and at a cheaper cost. I think we could have a group working at the management level looking into all phases of the management operation.

Paterson.—If I understand, you are suggesting that the planning operation should be a staff rather than a line position. If so, then we are running into difficulty because it seems that if you are going to operate it as a staff position, you are going to have planning activities under each one of your line positions.

Wiley.—It is a service unit within its scope to serve all areas of the highway department.

Paterson.—I think there are a number of places where you have a functional unit within the highway department itself, which is set up as a nice, contained little unit. I suspect in numbers of cases it is burdened mostly with surveys. To what extent is your capital budget planning handled in a division of planning, in any highway department?

Wiley.—For long term projections we make estimates, and we formulate programs against it. But the budgeting within the immediate forthcoming year is tied so definitely to the amount of money available that it is just a matter of taking that which is going to be available for the construction out of our priority list. That is the way the construction budget is formulated.

Then maintenance has to be taken out—administration planning and other miscellaneous items. Whatever is left is used for construction, and there is very seldom anything left except what is used to match Federal aid.

The accounting section has quite a lot to do with formulating those budgets, but when it gets down to detail, these are worked up in each individual section, and then gradually brought together among the region heads. We furnish certain information, and the budget is finally brought together by the accounting section.

Paterson.—I agree the planning should be a staff organization if it is done in each one of the units.

Wiley.—Perhaps it is not clearly only staff. There might be certain things that you might call line. But generally, we think of it as being advisory, not only to the chief, but also to other divisions or sections or wherever that information is needed.

Froehlich.—Wherever the line is affected they should participate and they do in our operations.

Paterson.—The only point I am making is that if you have a separate division of research and planning, and this division is supposed to bring together all of the planning activities of the department, then it would be better to have it represented by a line position equal to and commensurate with the other line officers.

Wiley.—Of course Mr. Froehlich was talking about planning in terms that we do not think of in just the planning division itself. To that extent there is planning at the top and in all of the divisions and sections of the department.

Froehlich.—I was talking about planning as a concept in that each one of these segments should have planning as one of its functions. You asked about financial planning. In the Pennsylvania Department of Highways, you have a fiscal management unit under the deputy secretary for administration. They put together many of the figures relating to the budget, but the budget itself is determined by a budget com-

mittee. On it are represented the deputy secretary for planning, the other deputies, including administration, and the people in fiscal management who have the responsibility for actually doing the job. Also the deputy for planning gets into the act wherever we get into questions of economic research and other areas where he would be affected.

This is a committee kind of structure which brings in all the people who are concerned about the budget because this is the ultimate end of all operations, and all the people who are affected by it should be involved in the final decision.

Telford.—The staff work of planning is included in each district. The details of the organization of that section will vary, depending on the size and the burden.

Included in that planning is fiscal planning as well as the long-range group planning. I found it essential to take the engineering planning and segregate it from the fiscal planning, so that each would have an independent view.

We find that that leads to budget recommendations from each district, developed within the framework. Then it is put together in the planning section in headquarters. This is a continuing operation, with a continual exchange of information between the district and headquarters, as to funds that may be available and other matters which may affect long-range programing.

As your program moves and comes closer to you, you then have a budget. It is a continuing process of planning at both the district and the headquarters level—that applies to budgeting and to other things that are closely related in the whole concept of planning.

Hager.—As an administrator, you have to plan the maintenance operations and the capital outlay program. You need new garages as you get more roads. You need more equipment. You have personnel planning. So really your planning unit does not come up with a package for you with all your decisions. You still have much planning going on in all other parts of the organization.

Froehlich.—There is much other planning in the organization, beyond what is done in the planning unit itself.

Hager.—But the fewer the people that report to the administrator the better off the administrator is. There is no place in the organization that you can get everything in one package from the standpoint of planning. Then is it really necessary that this planner be on the staff? In Connecticut, the planning unit as such reports through the chief engineer, and the chief engineer reports to the administrative officer, and he comes up with the maintenance program—with the construction program, and the fiscal services come up with a balance of money that can be thrown into capital outlay. Then the administrator has to divide it up, among the four or five functions of the department, which he feels more important. But there is no one person you can lean on for a program or a plan for all your operations and your construction and maintenance.

Froehlich.—Planning activities go beyond just engineering. You get into areas such as economic research, the broad guiding type of decisions which must be made. Having it come through the engineer alone would distill it and dissipate it somewhat if you have reflected merely the engineering approach. This is one reason why we think it is important that the planning deputy report to the chief administrative officer.

Steele.—It might be worthwhile to think for a few moments about the relationship of planning organizations to planning concepts.

In planning—and in this sense I am including research, except for some fiscal research—we need to have a broader conceptual idea of planning than we sometimes do. We need to be doing several things. One is that we have to take care of day-to-day activities. The planning and research group is a service organization, which puts things together in a hurry for the administrator, for legislative hearings, for other hearings, etc. Then there is relatively short-range planning, which has to do with such things as sufficiency ratings. I have been a little concerned to see so

much brought into the long-range need studies as a concept.

Then we need to get into long-range planning, the development of the program over 15 or 20 years. But beyond that we need to be thinking about these conceptual approaches. After all, what are we here for? Is highway transportation going to play the same sort of a part in the future that it does at the present time? What about these so-called monorail systems?

Personally, I think these are a step backwards. We tore our elevateds down because they created Chinese walls. What would we be doing but building them up again? We ought to study them and study other means of mass movements of people and vehicles. That part of the program should not be related to any particular time schedule.

We do not have any pure research, but the nearest thing we have to it should not be related to any particular time schedule. I realize that many of the smaller highway departments do not have the staff and the funds to do very much of long-range planning.

That brings me to the next point: How much staff can we and should we have? There has been too much emphasis on the engineering phases. We have no place, really, in the hierarchy for people who are not engineers. Consequently, we cannot hire economists and sociologists because there is no place for them to go. Perhaps we should integrate our planning, to that extent at least, with some of the other State planning activities.

But if we cannot have a broad gage organization in which we have all the necessary disciplines represented at a high level, maybe what we need to do is to maintain a skeleton force to do more work on a cooperative basis or on a contract basis.

Now, by cooperative research, of course, I am thinking of the AASHO program and some joint work the States have done together, and the States and universities.

Babcock.—I am going to be a heretic, probably, but I believe one of the basic faults is the fact that there is no national planning, what I am going to

call an over-all agency. I think you are going to have to approach this on a nationwide scale in the same way you would approach solving an urban problem.

I think you first have to take a look and find out where the country is today in its land use and typical planning process. Then you have to look into the future, 20, 40, 60 years ahead, at the possible ramifications and directions that the country could possibly go by technological developments and by environmental change. At that point, if you can do some crystal ball gazing, you may be in a position (if you had the forces to do this) to start to determine how transportation ultimately will fit into this thing, and be able to see the various directions that we might go. Possibly we might get some ideas as to how it should be guided in its development.

I have never been convinced that you are ever going to be able to solve the urban problem with the automobile or an existing form of transportation. If I had my preference and was in a position of authority I would like to see this country spending in basic research \$10, \$20, \$30, or \$40 million a year on the over-all transportation problem, because we are dealing with a \$100 billion industry, and it is splintered up into a million aspects.

I question whether it can all be done through a State planning agency. I think you have to move it to a national scale. I am not for federalization, but I feel strongly that more has to be done in basic research, and I think it is going to have to be done at the national level.

This so-called national transportation policy that we have had for years is merely a set of isolated bodies regulating various agencies under a historic concept of 60 years ago, which in my judgment does not hold water today.

Winfrey.—I reached the same conclusion you have. We are not getting down at all to where we ought to be until we get into some real honest planning of a basic nature on transportation.

We are too much concerned about getting a construction program ready

for tomorrow. We want to look a long way into the future to find out why we need transportation, and where we are going to need it. That is real planning. I do not think we have reached that stage yet.

Telford.—I think one trouble is that the engineer is too inclined to narrow down his interest and concern, and too afraid to bring into partnership some of these people we have in the schools of business administration, etc. Engineering is a broad field, accomplishing things with what you have: Those in other disciplines are a part of the team, and I do not think we should be afraid to call them in and ask them for help because we need all the help we can get.

I think it is somewhat in that field that the engineer has been deficient. He has been defending himself because he has had a slide rule in his hip pocket and has been engaging in a dubious exercise in arithmetic. Bring these others in, and let them take some of the burden.

There is a terrific fear on the part of local governmental agencies that has to do with any cooperation and any work at the State level or the national level. I have found that if you are going to get from your local agencies, the cities and the counties, effective planning organization, you must give them assurance that you are not going to dictate to them the use of the information they develop. You have to guide and you have to help, but just as soon as someone talks about a requirement, you have lost your team right away.

Therefore, the problem lies in—How can we develop this national program in which, at a national level, there is a real need for research, and bring the usefulness of this down ultimately to the local application, without scaring away the support?

We have, I think, made a mistake in trying to consider them all at once. But it is a broad field, and it does stem all the way from the beginning at the national level right down to the local application. You are dealing with human beings, and all their idiosyncracies and whims all the way down the line.

Quinnell.—I think one of the things

we are doing is going out too far on a limb with basic planning by the highway departments. I have to agree with Mr. Telford that this thing is a far greater and larger problem than we realize.

Now, our research and planning work for the Montana Highway Department takes into consideration the accounting, of course, engineering, and a few basic principles, small or large—but not in the scope that they should be. Eventually some big program is going to have to go all out, to give us the information we need, so that we can go into our little planning organizations within our State highway departments and do a good job. I do not think any of us, even in the larger States, are large enough to have a planning section, or a research section, with the capabilities that are necessary to solve the problems that we have now.

Paterson.—I should like to agree that the schools of business administration in the country are very much interested in assisting with projects with State highway commissions.

In the first instance, usually, there is a difficulty. The terminology that is used tends to scare off some academic people. This is unfortunate. It can be overcome very quickly, as I think Mr. Steele will attest.

Hill.—What I have in mind is to develop how far highway departments should go in advance planning. Our planning division is to me an immediate planning division. It is going to the communities, each of the municipalities, and determining from their master plan—and that master plan is prepared for a projection of 20 or 25 years from now—and we are developing our plans to fit their plan.

Those are individual communities, so we are fitting our highway needs studies into the existing thinking. And we are developing a plan to serve these communities. But we can definitely see that from Detroit to Chicago, for example, there is one community developing, so that in the next 40 years there will be just one continuous urban area.

In our development, we are taking this community and this one and this

one, but nowhere actually are we planning the continuous community.

The planning we are doing is immediate planning, probably 20 years ahead. It is based on need studies, which are not actually need studies with new thinking in them, but are the present studies becoming obsolete and brought up from year to year without a fresh viewpoint. They are made by the same people who have been making them for the last 10 years.

Maybe we are doing our job in just doing a job to develop the highway needs, but the future projected transportation, which is not going to roll on wheels, will affect our highway needs.

What I do not want to see in future years is all these highways going into Detroit, and some other means of transportation taking the load of transportation, and the highways not being necessary, with the expenditure of that money partially wasted.

I heard the comment here yesterday where a legislature had built a road where the needs were not present. In Michigan no matter where you build a road, it is going to be crowded. The traffic is there. We can build it anywhere in the State, and it will be full in no time.

To me, the future of transportation needs is just too big. We are spending in our advance planning program about \$150,000 a year and I do not know how many years we can carry it. It is not a productive unit. It is a unit set aside in a separate building and it does practically pure research in transportation.

Our planning unit is an operating unit—it is working on the immediate needs and it is a production unit.

Campbell.—For the purpose of the record, I would like to ask Mr. Shaneman about the Mississippi Valley origin-destination survey as it may relate to studies in resource development and also transportation development; its concepts, its values; its techniques, and whether the concept would be worth trying to spread nationwide.

Shaneman.—Three years ago at the Mississippi conference of State Highway Officials, Illinois proposed a regional O-D survey to be conducted by

the 14 States comprising the Mississippi Valley Conference.

This survey was to be conducted simultaneously in the member States. It was to be keyed in to latitude and longitude coordinates throughout the States—the idea being that by doing this at the same time, and by using the same grid through the area, we would be able to get a picture of the traffic pattern throughout the region. The majority of the States participated in the study. The results are still being tabulated and being finalized.

However, we have had occasion to use the information in our own work several times, and I know the surrounding States have. This would be a worthwhile project on a national basis. I think it ties in to the point that was made that we should have some sort of national transportation concept.

I do not know that we would want to limit this study to a motor vehicle traffic origin and destination study like the Mississippi Valley study. I think certainly someone would have to take into account mass transit—public transit by rail, water, and air.

A study like that done on either a national or perhaps a regional basis, with the regions then being interrelated, would certainly give us much toward what we have all been feeling for and no one has put their finger on: What will the transportation picture be in the year 2000?

Campbell.—Is it the intent to tie it into resource development at the present time?

Shaneman.—Not at the present time. We have been slow in analyzing the study, and because of that it may be losing some of its effectiveness. This was a gigantic undertaking and there is a tremendous amount of information to be analyzed.

Campbell.—Is that being used in the projection of in-use facilities comparable to the Interstate Highway System?

Shaneman.—We are hopeful that within the next year or so we can, at least in Illinois, convince the legislature that we need several thousand more miles of freeways, and we certainly ex-

pect to use the results of this study in that.

We do not think that we can build a freeway system in Illinois that is not related to or connected with freeways in the surrounding States. And while our neighbors to the north and west have already laid out freeway systems, we think this streamlined Mississippi Valley study will certainly tie into those and substantiate what we are proposing.

Telford.—Are you relating that in any way to this population prosperity, which generates transportation demand, endeavoring to project forward on the basis of development in the area as to the needs for the future?

Shaneman.—We are not that far along with it yet. I think the point you are making is that perhaps on all of these studies there should be a land use study made in the entire State, or the entire region. We have done that, of course, in the Chicago area transportation study. Our projection there has been based on land uses. I think so far as a study of that kind is concerned, whatever you get from streamlined O-D's merely substantiates what has already been found out from land use and projected land use.

Whitcomb.—In the Boston area we have planned three highway loops. One will be a complete circle, just going around the core of the metropolitan area. About 10 miles from that, there is Route 128 which has already been built and is now being widened.

Then, 15 miles farther out, or 25 miles from the city, is an outer belt, which circles around. From the core of the city, there are nine radials crossing all of the belts.

After we laid out this network, we hired a social economist and asked him what the land use would be in this area on the completion of this highway system. We have an answer, and from that we have to forecast the traffic.

The location of the highways and the location of the interchanges really dictate the development of the area—the various towns, the industries, the number of employees, the number of services to be constructed for these em-

ployees, and where these employees will live.

I think in this case the employee will live within a certain time zone, or within a certain distance of his place of employment. From that information, it was possible for the social economist to develop the zoning, the business areas, the manufacturing areas, and the residential areas.

From these developments, and the number of people traveling back and forth per car, the number of trips to work, the number of trips to the store, church, etc., it was possible then to develop a traffic pattern.

Now, we have a problem here because we must take into consideration the different means of transportation that we should develop inasmuch as the automobile cannot service all the people who want to travel. The minute you go outside of the field over which you have no control you are apt to get into trouble.

Mr. Hager and I are in trouble in that respect, because the New Haven Railroad is just about on its last legs, and probably before long will not be carrying passengers. It means the people who were using this railroad have to revert to some other means of transportation.

We have found in the Boston area that this means the transportation is the automobile, and that the roads that we had planned, and we think properly planned, 10 years ago, are overloaded because of the lack of train service. The railroad went out of business. Now these people are traveling by automobile, and the highway that was designed to carry 60,000 cars a day is carrying 90,000 ten years after it was built.

We should take into consideration other means of transportation, but you cannot control them and you cannot rely on them.

Wiley.—Did the railroad go out of business because people started to travel by automobiles or are they traveling in automobiles because the railroad went out of business?

Whitcomb.—I do not know. This railroad serviced New England and parts of New York, and I think that the point was brought up this morning

that, "Nobody is going to tell me where to live. I am going to live where I want." And the same thing applies to, "Nobody is going to tell me how I am going to travel. I am going to travel the way I want." And the people apparently have wanted to travel by automobile. They have done that, and the railroad is going out of business.

Telford.—We have been working as closely as possible with the rail transit and rapid transit people in Los Angeles, and neither they nor we have been able to come up with any satisfactory basis on which to stimulate the percentage of trips in a given corridor that you might tempt onto a railway system.

Whitcomb.—In the development of this traffic and the network, which was given, we have far more trip desires than we have capacity on the highway. As a result, it was necessary to determine a design that we would want to build. What we determined was an 8-lane facility with shoulders and with service roads on each side. That was for the inner belt and for the radials for some distance of the inner belt. It was necessary, then, to determine a carrying capacity of this system. And all other traffic then had to be pushed out.

There is enough desire for traffic for the highway system, plus mass transportation, because the traffic that we had, on some links over this highway system, was something over 3,000 cars per day. We cannot carry that on any one of the links. Even with the congested highway system there are still enough passengers for any mass transportation, if they want to use it.

Holmes.—It seems to me that is the key—if they want to use it. People will put up with what the transit people like to call intolerable congestion on the highway rather than use transit. If they would, they are going to do it. The transportation system is there. The New Haven is there.

Quinnell.—Is it not true that the buses in those rapid transportation systems are more or less getting in bad in a lot of cities because people will not accept them? Is it progression to the automobile?

In Montana there are no large towns, probably 45,000 being the biggest. Transportation bus companies have to be subsidized one way or the other to stay in business, because people will not accept them.

Paterson.—There are probably a host of considerations that are sociological in nature about all of this, but I would maintain that there has been a diminishing market for commuter service in

the last 15 years. It is peculiar that we do not know why this diminishing utility function has come about. This brings into proper focus this whole question of research because we will spend a billion dollars on metallurgical research, to find something that will withstand heats of 3,000 degrees, but we will not spend money to uncover the basic question of how people live and what they want in transportation.

Session Four

Tuesday, March 27, 1962, at 1:30 P. M.

THE FUTURE OF HIGHWAY PLANNING

G. P. ST. CLAIR, Presiding

A Look to the Future

E. H. HOLMES, *U. S. Bureau of Public Roads*

• ALTHOUGH EVERY FACET of planning in administration must surely have been well covered by previous papers and discussion, a few thoughts are presented with the hope that duplication or repetition may serve to add emphasis, and that some ground may not have been so thoroughly turned over but that it may be plowed again to advantage.

It is understandable that the problems facing the highway administrator in meeting today's crises are so complex and demanding as to give him little opportunity to think about the future. And even taking the time to look ahead it is difficult, if not impossible, to visualize what the future holds. If the concept of 1960 as visualized in 1940 or 1930, or 1920, could be reconstructed, how would those visions correspond to today's realities. What is hard to accept is that choices in transportation, as in other aspects of life, 20 or 30 years hence will be made on the basis of physical, economic, and social conditions at least as different from today's as today's are from those of 20 to 30 years ago. In trying to visualize transportation and travel in the future, it is necessary to consider not only the quantities involved (which perhaps can be estimated) but the different social and economic conditions within which those quantities must be accommodated. In large measure it will be through the facilities being designed and built today that they will be accommodated. To-

day's highways involve far greater capital cost and enjoy or suffer through a far longer life than those of a generation ago. They represent a far greater investment of public funds and have a far greater impact on the communities they serve than their earlier counterparts. Work done today and in the years ahead will be judged by another generation in the light of a standard of living and degree of affluence that does not exist today. It has to be then, that in building today for another generation, it is necessary to plan for that generation's use of what is built. There is no alternative if the highway planning responsibility is to be met.

In trying to estimate what the future will demand of facilities there are logical, successive steps leading toward an answer that might not be too difficult to follow were it not for the distractions and the confounding effect of many side issues. A logical start is to estimate the total transportation need for the area of concern for the year of interest. This estimate would probably require first some projection or forecast of population and from this the production and consumption of goods and services, or the probable uses of the land included in the area. By relating land use and economic and social factors to transportation requirements for the past and present, there is the possibility of projecting, or perhaps better, forecasting, the total future transport requirements. This is an obvious first step, but logical

as it is, too few forecasts start in this way. Therefore item 1 in "A Look to the Future" might be: Estimate total transportation needs.

The next step is item 2: Estimate what portion of the total transportation needs will or must be met by highways. Both people and goods must be considered, and the problem logically divides between rural and intercity, and urban. Here the nature of the goods to be produced and consumed in the area becomes important, as do the other probably available forms of transportation. The movement of people within and through the area as influenced by the distribution of its population, the location of its employment centers, its attractions to outsiders, and the extent to which this movement will be served by highways must be estimated. In the urban areas the daily and peak-hour movement of people are presumably the most critical factors. What portion of this movement will be served by transit? How will urban renewal and redevelopment change the character of the city and consequently its transport needs? Current values for most of the factors in this item can be reasonably estimated from measurements that can be made now or have recently been made in many areas, so defining or describing the present situation should not be too difficult. In some cases past measurements will permit the establishment of trends. But what of the future? Can trends, where they are available, properly be projected into the future, and what if there are no past trends? But item 2 should not be too difficult.

Next comes item 3, or perhaps it is 2a, for now the confounding elements begin to appear—one in the form of technology. Others will enter in also as 2b or 2c to the point where orderly listing of successive steps becomes more difficult. The many interactions that will be possible will open up a variety of combinations of assumptions. Decision must be made whether to follow through a particular combination or to abandon it. The forecaster is thus faced early in his process with the necessity of deciding whether he can afford to discount a possible eventuality, or to

take the time and effort to pursue it to a probable or possible dead end. These early decisions can have such crucial bearing on the ultimate answer that it takes real courage to discard a possibility. There is reason behind the suggestion of several years ago, that the planning function might be labeled "The Department of First Assumption." The first one may be the decisive one.

But to return to the next item, 2a, what of the effect of technological developments and other factors that may influence the choice between highway transportation and other modes? The growth of the "piggy-back" operation must be taken into account, especially in its intercity aspect. Will it become a significant factor generally, or only in special cases? The recent inroads in auto carrying by highway with the introduction of three-deck railway auto-carriers has had significant effect already on some highways. What will its future impact be elsewhere? To what extent did revised freight rates make auto carrying by rail feasible, and what other rate or regulatory decisions will influence demand for highway transport? Will movement of goods by air become a serious consideration?

In urban areas the division between public and private transportation is of critical importance for many reasons. This ratio in the future will be influenced by the size and character of the metropolitan areas, but also it may be as strongly influenced by technological advances. Subways, monorails, "super-rails," and more acceptable commuter rail service promise to redress the impact of the automobile on urban transportation, at least in the views of their proponents. But will they? Their effect cannot be ignored in planning.

Technology in highway transportation itself does not stand still. What will be the size and weight of the future highway vehicle? Can a highway structure be built to meet the requirements for today's loads and be forever restricted to loads of today's limits? What will be the speed, acceleration, grade ability and braking characteristics of motor trucks or truck trains 40 years hence? Will they be as different

from today's vehicles as those of today are from the trucks of 1920? What will be the characteristics of passenger cars of the future? Will there be town cars and highway cars, or cars with speed and acceleration characteristics significantly different from today?

What about the highway itself? To what extent can its capacity be increased by electronic warning and guidance systems, or even by full automation? In urban areas what should be expected in the way of more efficient traffic signal control systems, computer operated? Here without doubt is the widest area available for improvement in urban transportation. To what degree will it be explored and exploited?

With such a variety of possibilities to explore or ignore, any logic in numbering successive steps seems to have disappeared. But by now an over-all estimate of highway transportation demand should be attained, either restrained or boosted by considerations such as those just mentioned. The next step is the determination of the facility required to meet that demand. Demand will range from that of the vacationing tourist to the urban commuter, from the farmer's pickup truck to the line-haul trucker, from the school bus to the TV serviceman, from the RFD carrier to his now-motorized city counterpart. These differing needs will be accommodated by different systems, each comprising routes on which similar characteristics of demand predominate. Grouping of roads and streets into systems is of key significance not only with respect to providing service, but also for organizing their financing.

With roads thus classified into systems of like characteristics, the next logical step is to decide what is required in the way of structural and geometric design standards to meet the needs on each system. This step requires consideration of the numbers of vehicles and their distribution by routes, estimated from earlier steps, to be expected in the future, and of their performance expectancies from other earlier steps. The product of this operation is a determination of highway requirements, by systems, to meet the demand. The next

step is simple enough—compare the future needs with the present facilities, determine the life expectancy and salvage value of the present roads, and calculate the cost of overcoming the current and future deficiencies. Of course a few confounding elements appear here, too, such as future price levels, improved construction equipment, and scarcity of materials, but they should be possible of handling with relative ease.

This procedure has been followed through so often that it has become a stylized or almost classical process. It is one of the two halves of the customary needs study. The other half is the financial study in which the financial resources to meet the estimated needs are inventoried, and projected or forecast as clearly as possible.

At this point will appear another series of confounding elements. First, the total resources will probably fall far short of the total needs. And beyond that there is every likelihood that the current distribution among the different systems, rural and urban, is far out of tune with the relative needs of those systems. Now, then, is the time to take a hard look at the demand for transportation, and the highway needs to supply it. Economists outside the highway field often take issue with estimates of demand for highway transportation, especially in urban areas, on the grounds that what is measured is usage, not demand. In their view the existence of a facility invites use and satisfies not necessarily demand, but desire. But in any event if the gap between what is defined as need and resources is too great, then another look at demand may be required to be sure it is not overstated.

It also may be necessary to re-examine need. Are the standards selected actually needed, are they the minimum, or are they desirable standards? Perhaps overgenerous allowances have been made for speed and freedom of movement in the future. If it is evident that the estimated needs mathematically arrived at are clearly beyond foreseeable resources, cutbacks must be made or slowdowns accepted. The question

will become one of degree, in which the effect on the budget, on the users, and on the public of any reduction of standard or stretchout of program should be measured and appraised.

Of course there is also the other side of the equation—resources. Perhaps the first inclination in trying to close any gap between needs and resources would have been to look at resources. The highway itself represents but one-tenth of the cost of highway transportation, so perhaps it would not be illogical to increase the highway share. Even a major increase in the highway cost would involve but a small percentage increase in the total.

The financial aspects of highway planning are far more complex than the physical aspects. Not only is the total amount of financing important. The relative financial support derived from non-users and users, and the distribution of the users' share among the various classes of users and vehicles, are also matters of real import. The voluminous Highway Cost Allocation Study, presented to Congress a year ago after 4 years of study, is testimony to this point.

Over the years support for highways, once drawn entirely from general funds, is now derived primarily from highway users, and for the Federal-aid program, entirely from user sources. Highways produce many benefits to other than highway users, to individuals and to the community as well. Has the pendulum swung too far? Is there justification for recovering some of these benefits to help close the gap between needs and resources, and if so, is there a feasible way to do it?

What are the benefits accruing to the various classes of highway users from the highway program, and is there a reasonable balance between the benefits they receive and their support of the program? What is the cost of providing highways for the various classes and numbers of vehicles using them and is there a reasonable balance between these costs and the user taxes they pay?

Are the taxes paid by residents of cities, for example, applied to the different road systems in proportion to the

use of these systems by city residents? This relationship is a key not only to the distribution of funds to the different systems, but also to the reasonable extent of the systems if their cost is to be kept in reasonable balance with their usage and within the ability of the jurisdictions involved to support them.

Other and less tangible items also enter into the problem of resources and equity of financing. The items thus far mentioned are tangible and measurable, and to some extent predictable. There are less tangible benefits to the public, however, that should not be overlooked, and which might well justify support not solely from direct beneficiaries, but from general government funds. One intangible is the effect of economy of scale. Highways are a peculiarly good illustration of the effect that public works have on the over-all economy. They are not an additive, but a multiplying factor, and their benefits to the whole economy increase with time in a geometric ratio. Should there then be a deliberate investment of general government funds for this reason?

Another intangible, perhaps also justifying investment of general funds, is the increased quality of living that highway transportation obviously produces, a type of benefit perhaps not measurable, but shared by all, users and non-users alike.

Then finally, for this discussion at least, on the resource side of the equation, are funds supplied by higher levels of government. What will be the trend in State support of county roads or city streets, through actual construction, through financial aid, or through return of State-collected revenues to local jurisdictions? From the State viewpoint, what is the future of Federal aid? More and more States are finding their entire highway revenues required for maintenance, operation and administration of their systems and for matching Federal aid. Nothing is left for wholly State-financed construction, even off the Federal-aid systems. What will happen if needs continue to rise after 1972 and the 90-10 program is discontinued? Will States be able to finance the heavier maintenance costs of future higher-

standard highways with larger traffic volumes and heavier loads? Will the continued extension of the Federal-aid secondary systems, with inflexible apportionments for those systems, some day produce an intolerable maintenance and replacement responsibility? There are not now answers to all these questions, but planning cannot ignore them.

Now, if through consideration of these foregoing items and others involved—some balance is achieved between needs and resources, and amounts of money are determined to be annually available to meet the accepted needs, the administrator faces his next step—developing the annual program. This is perhaps the weakest link in the whole process of highway administration, and it is probably the one for which the least analytical support can be mustered. Beyond that, it is a politically important step because it exposes to the public view the results of all the administrator's cerebration up to now. Presentation of an annual program is indeed a moment of truth for the administrator.

To what extent should future needs be provided for in today's construction? Should roads adequate for twenty or more years hence be built now at the expense of meeting other current needs? Should stage construction be employed to greater degree, taking into account the probability of higher costs and disturbance to traffic in the construction of later stages? To what extent can the program be concentrated on certain areas or routes of importance, at the expense of needed work elsewhere? Or can the program be concentrated on one system at the expense of others? How can an economically sound, defensible, long-range program be developed, with some assurance that projects scheduled for 4 or 5 years hence can actually be started when scheduled?

How can the priority of a city street improvement in one city be established in comparison with the importance of concentration on an expressway in another? To what extent should improvement in operating efficiency through better traffic signal control take precedence over physical improve-

ments in the same city, or in another city? How can the relative priorities of rural and urban needs be defined, and how can the priority of correcting a structural deficiency on one route be differentiated from a geometric inadequacy on another?

These are simply more confounding elements, but once we have a way worked through them, a program emerges. That is the administrator's goal, or at least one of many. From then on it becomes engineering's responsibility.

There is little new in all these items. Good administrators take them into consideration in one way or another, and have been doing so over the years. There is one new factor emerging, however, as urban highway programs become more critical—the comprehensive plan.

There seems to be increasing clamor that the highway plan be articulated with the general or over-all plan, that the highway plan and program in urban areas be made the responsibility of the city planners, or that the highway program be stopped or retarded until transit has been given opportunity to show its value. Highway officials are placed in defensive positions, with implications that they have gone ahead with complete disregard of general plans or community values.

The facts are, of course, that highway officials do give proper attention to plans where they exist and where they have official approval and public acceptance. The facts also show, however, that there are virtually no comprehensive, accepted development plans for the metropolitan areas from which much of the clamor arises.

In these circumstances what does the administrator do? He can go brusquely ahead without regard to over-all planning considerations, or he can do his best to encourage and assist in the development of general plans, at least to the point of assurance that the highway program will be consonant with good planning principles and community desires. There is overwhelming evidence that he chooses the latter, constructive alternative.

Without doubt a principal planning function in future highway administration will be found in this area of coordination with comprehensive plans. A great deal has been done already by State highway agencies working with officials and planners of local jurisdictions to ascertain facts and make projections or forecasts of future transportation needs. Basic problems arise, however, as to the extent to which transportation facilities will merely serve or will help to shape the future community. Even more fundamentally, what will the citizens of the future community want in the way of living and working conditions, and how will the economic, cultural, and social environment develop around their desires or potentials?

An example of this very basic problem can be seen in the recently released "Year 2000" plan for the Washington metropolitan area. This plan envisions radiating corridors within which will be found all cultural development, and between which will be sectors of farm land or open space left undeveloped. The plan would require that people live in high density apartments or housing along the corridor, and work primarily in the central core. Transportation would be by rapid transit, and by highways within the corridors.

This plan is advanced as a concept, and widely published in the press. But there is no way by which public approval or disapproval of such a plan can be ascertained. There are no alternatives among which the public might choose. There is no machinery by which public opinion can be reliably obtained. And if there were, would the public of 1962 be expected to visualize what the public of "Year 2000" might want or be able to afford?

Yet as noted in the beginning of this discussion, the highways being built today will be serving the public of "Year 2000" and long after. At least they will if current ideas of life expectancy of the various elements such as right-of-way and grading are at all reasonable. So the question must arise as to whether the administrator can rely on such plans to indicate the demand or desire for

highways 40 years hence, or whether he should deliberately follow this plan in an effort to bring about its intended result. If the latter course is urged upon him, how can he be sure he is acting in the public interest and fulfilling his responsibility for expenditure of public funds unless the authors of the plan can satisfy him that it has genuine, proved public acceptance? The planners can speak in conceptual or even fanciful terms, but the highway administrator has to think in quantitative terms, in geometric and structural standards and designs. Until the planners can translate their concepts to quantitative terms, they have given the highway administrator, and his many colleagues in public and private life, little to tie to. Despite this seemingly impossible gap, however, it has to be accepted that highway planning must be coordinated with general planning to the maximum extent that the limitations of either will permit. And it must also be accepted that the highway administrator has a responsibility, as custodian of public funds, not only to accept general planning to the maximum degree it can be employed in his work, but also to encourage and assist in the advancement of general planning in his own interest, and in the public interest.

This has been a long and perhaps rambling recitation of items that might have sounded like an inventory of unknown things. It is not that. It is more an inventory of things about which not enough is known, and it is not known to what degree inadequate knowledge or incorrect assumption in the case of one or another of these or other items may lead to incorrect or unsatisfactory decisions. As noted previously, highway administration does take into account, consciously or subconsciously, all or most of the items mentioned in the day-to-day decision making process. Otherwise, this country would not have the finest transportation system the world has known. As the nation moves ahead, however, transportation problems become more intense and their solutions more complex. Likewise, the stakes become heavier—almost alarmingly great.

Correct decisions pay off in handsome benefits, but incorrect ones become costly indeed. To help him in these decisions the administrator will need to fortify his judgment with quantitative values in every possible area, and find means to array the many areas of judgment in order of their importance in relation to his ultimate decision.

The reason that the whole planning process is so complex is that so many steps are not merely dependent on the preceding ones, but through interaction and feedback, themselves affect the earlier steps. In presenting this picture, it might be well to have resorted to the methods used in illustrating the "systems analysis" approach to complex problems, for indeed highway planning is ideally suited to that approach. Illustrating the system involves the familiar sketching of squares, circles, rectangles, triangles, and other geometric shapes, each outlining an item or area of importance to the solution of the problem. Each geometric shape is connected to one or more other shapes by solid, dotted, or dashed lines, singly or in multiple array, with arrows going one way or the other, or both ways. The use of many words rather than a concise chart is because it takes more words to explain the chart than to express the thoughts without it. The author's experience is that in trying to follow such a chart, he usually flies off on a tangent at some point, or finds himself hopelessly trapped in some geometric shape with all the arrows pointing in and no way out.

But there are now an increasing number of analysts trained to think in terms of such flow charts, to follow successive steps of a process and apply the interactions and feedbacks, and to test whatever alternatives appear feasible, and there are the computers to enable them to do it.

The planning process can be viewed as a systems analysis problem. Planning will not relieve the administrator of his responsibility for decision nor eliminate the need for his judgment. But it will in many areas permit him to replace estimates with firm values. In other areas it will define limits within which his estimates may be confined. And it will spell out the importance or unimportance of each of the items involved. Mathematicians of today would embrace this whole process within their discipline, in what they would call the stochastic approach.

Research in planning, it should by now be obvious, would thus involve the setting up of the stochastic equation or the systems analysis process, and undertaking to supply or find the values to be attached to each term or step found to be significant. It also should be apparent in reviewing the areas of uncertainty that the quantification of the now-qualitative terms will usually involve non-engineering disciplines. Engineering should be drawing from the fields of geography, economics, sociology, mathematics, and city planning.

This represents a more sophisticated approach to planning and decision making than heretofore followed. But there is a need for more sophistication in the future to be better able to make correct decisions and, in the face of mounting criticism and public concern, to develop and defend the highway program that is so vitally important in the future of this nation. That is what planning must do.

Resources, human and material, are at hand or fast becoming available to permit this more sophisticated approach. Highway administration in the future will not only accept it, but must insist upon it.

DISCUSSION

Winfrey.—If we are going to get anywhere with planning in the sense that I visualize planning—and that is not day-by-day operations at all, but

looking way ahead into the future and trying to set up some goals in transportation—the highway field is only just one part of the whole system to be con-

sidered. I think we have to consider all modes of transportation, including those that we do not know anything about today. They do not exist now but they will exist some day.

It looks as though we can get further by bringing minds of many different orders into the picture—the sociologist, the psychologist, the economist, the political scientist, and the highway engineer.

But the highway engineer alone cannot do the job. No one discipline or no one man alone can do the job. It takes a combination, just as we have found in many of the lines of both practical research and pure research. If men of many different minds can be brought to bear on the problem, chances of success vary as the number of different minds bearing on the problem.

If I were to criticize the highway engineering profession, I would criticize it most strongly from the viewpoint that it has stuck to highway engineering—the thing it knows most about; but in so doing, the highway engineer has failed to grasp his opportunity in building a real transportation system for this country. He has been too much at home, and his vision has been screened by his own device, which has not permitted him to penetrate beyond his immediate job of being a highway engineer.

We never can develop a highway transportation for the urban area for the country as a whole until we break down that barrier. I think we can break it down best by inviting in help.

The highway business today is just one big compendium of psychology and sociology and economics. I think therein we have to get our help, and it is high time we were getting it. If we do, I am sure that we can really do some "ultra" long-range planning.

Babcock.—We have a tendency not to get into this long-range approach that we are thinking of as highway people, because we are running around spending 90 percent of our time trying to catch up with an existing problem. I was particularly interested in Mr. Hill's ideas on building an expressway.

Wherever you build it, there is going to be traffic on it.

What we are doing today is committing the future. We are committing the future to the point where we may be in a position where no new form of transportation can develop, because of the way the future is fitted into what we do today. The engineer is dealing with a physical thing, which, once put down, is going to be there for 40 years. I wonder if we have already reached the point of no return—if we have already committed the future to exactly the present mode of transportation.

Holmes.—I think we are fairly rapidly committing that future to automotive transportation. I am not sure that is bad. We have a form of transportation now that has greater "personality" and flexibility than anything ever before. Until something more flexible and personalized than the automobile comes along, we have to look toward the highway as providing this transportation for the future. That could well shape the city.

It seems that the planners have not visualized and taken advantage of the potential of the form of transportation that we want to live with. Most of them are still insisting on traditional plans.

I think we are committing the country to many years of automotive transportation. But as Mr. St. Clair said in response to a letter that came in the other day: At least once we build it, it is already paid for. So the people who are using it, have bought it and paid for it. "We can't lose."

Schwender.—Actually, many millions of automobile owners are committed to automotive transportation in many respects.

Oliver.—I rather think they committed us more than we committed them.

Levin.—On this point of committing the future: Are we committing the future any more with this new mode of transportation, motorized transportation, than the waterways did with their physical plans or the railroads are now doing with their plans? They are tak-

ing their place in history subject to a newer technology, and it could be that in another 25 or 30 years somebody will think of a smarter way of surface transportation that will begin to submerge motor transportation.

This is the way of life. It is inherent in the economics of a free society that you do commit the future up to a point.

In Washington, for example, we are building a complex within three square blocks. This is going to commit the future of Washington for many years to come by the private investment of this vast capital. Therefore, even outside of the transportation field, it is a characteristic of our economy that we are making decisions which commit the future. How else do you build a structure?

Telford.—I agree that if we did not commit the future we would not get very far. That is not a bad thing, as long as it is committed constructively.

At a conference in Los Angeles, about three or four months ago, we got into the field of electronic controls. Out of the discussion came something that none of us had really expected, and none of us really followed through. Essentially it pointed to the possibility of specialized vehicles with a specialized way on which they would travel, with capacity to move people or goods, using electronic controls, but separated from what is termed the conventional vehicle.

There are a lot of things that may be ahead of us that we do not really know now. When we start considering them, we come up with some of these eccentric ideas. And who knows, some of them may work. I am sure that there will be further developments that we only vaguely see now, and they can grow out of what we are doing.

St. Clair.—I think that we do, to a degree, commit the future, but that the future can take care of itself and will create obsolescence in the thing that we do, as it has in the past. The world goes jogging along in spite of the fact that some things depreciate a little faster than the original builders contemplated. That is one of the ways of the world that we have to put up with. But that

does not relieve us from the obligation of doing the best we can.

Campbell.—We all realize the value of having specialists in planning departments or divisions, but what about the man that works with them? What kind of a man should he be? Should they all be specialists or should there be a core of people who are highway engineers? If so, what kind of training should they have for the job in the planning division, and is there any way to train people to enter into the planning division?

St. Clair.—Should the leader of the planning department, who is to straw-boss a group of experts, be a highway engineer himself? Should he be, as I am sure the administrative group feels, a product of business administration? Should he be perhaps the man who evolves from the expert group as the real leader?

Winfrey.—I can answer that very simply—find the best man to do the best job. It does not make any difference what his education or profession is. There are some engineers who can do it and there are other engineers who cannot. It comes down to just finding the best man, the man who really is a planner with vision.

Hill.—In Michigan, there is a city planner as the head of our planning division. The chief of the office of planning, who heads the planning division, the route location division, and the programing division is an engineer who has been in the highway department for many years. But the chief of the planning division has been a city planner.

We also have a cooperative arrangement with Michigan State University, by which we take about five or six of the planning students to work about 3 or 4 hours a day and every summer in our planning office.

Paterson.—I think there are a set of personal characteristics that enter into a determination of who you want in planning, but I think there is also a content area that has to be satisfied. Possibly the easiest way to specify is to take the recent Area Redevelopment Administration bill, which provides assistance to so-called distressed areas.

On the one hand, you have a basic economic problem which is related to these distressed communities. You also have certain social characteristics which are related to them.

If you take a sociologist and an economist and set them down, you are going to have an argument immediately. The sociologist is concerned more with providing for the immediate requirements of the families that are distressed than he is about the possible long-run implications of policies which are formulated.

The economist is concerned more on the public policy side, with maintaining

a free enterprise system. This gets into a problem. I think that we need both disciplines in resolving the question, but I think the subject matter content is extremely important for rationalizing these problems.

Campbell.—Of course, Mr. Winfrey gave the answer—to get the best man. But in application, who is the best man? Suppose he has the proper attitudes, drive, imagination and other desirable personal qualities, then what do we add to them? If we are going to train a man, what subjects should he be conversant with as he enters a job in the planning division?

Planning in Highway Administration— Important Considerations and Summary

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• THIS PAPER attempts to relate what has been said at this conference to some of the painfully difficult problems of planning and administration in the highway departments.

At the beginning of the conference, W. L. Haas described the reasons and events leading to the decision of the Highway Research Board and Bureau of Public Roads to call this meeting. Now, at the end of the conference, the author would like to reopen the question—Why was the conference organized?

- Was it because the purely technical knowledge necessary for building and maintaining roads is today but one aspect of an increasingly complex operation?
- Was it because there is difficulty in merging planning with operational activities? Construction or engineering development is outdistancing planning.
- Was it because the activities of the highway agencies are becoming so large and so complex that no individual can comprehend all the problems he must face and resolve them imaginatively?
- Was it because planning, in the technical sense, must somehow be merged with planning in the organizational or administrative sense?
- Was it because the sensitivity toward planning of top administrators in the highway agencies is becoming dulled by the need to direct more attention to other areas of activity?
- Or was it because there is increasing difficulty in designing the kind of planning activities which will yield maximum results throughout the organization?

The subject matter dealt with in the previous papers supports the view that all of these considerations were in-

involved in the decision to hold the conference. Some of the problems which were discussed may be more crucial than others but the divisive effects of all of them are apparent in the highway agencies, other government agencies, in educational institutions, and in private business and industrial establishments.

PROFESSIONAL CHARACTER OF HIGHWAY ESTABLISHMENTS

The typical State highway organization in the United States is the showcase for effective public management of an enterprise. Its commission is a policy making board with representatives from both major political parties. The commission leans heavily on the chief executive officer of the department—the highway engineer. It requires that executive personnel possess professional qualifications. But, the final test of an organization is its ability to attract and hold competent personnel. It must provide career opportunities for competent people. The effectiveness of planning in the personnel division is vital to the health and development of the whole highway department for it is there that job qualifications, performance evaluation techniques, promotion and salary adjustment programs, employee personnel histories, and training programs are developed and expanded. One must be allowed to advance on the basis of ability—and the criteria that are being used to assess ability must be specified. Missouri is one of 10 to 15 States that are considered by highway administrators to be outstanding in the establishment of career systems. This is not to say the State has been able to resolve all questions concerning the administration and operation of highway activities, but the awareness of technical competency needed for planning various activities and the need for

proper interaction of planning between functional units has been recognized.

In thinking about the reasons why highway departments seem to be more effectively operated than most other public agencies, one confronts some assessment difficulties. There are however some salient reasons for such a belief. First, an end product—roads—is clearly visible to all employees and to the public as the reason for the agency's being. This fact immediately suggests a number of ways by which the activity of the agency may be satisfactorily measured. Miles of road constructed, area of right-of-way acquired, or the amount of maintenance and resurfacing completed during the year can be counted for a variety of road classifications. By merely keeping construction and maintenance crews on the roads, some impressive figures can be racked up each year that would seemingly indicate forward progress.

Second, highway departments are professionally staffed and in most instances there are few flagrant political patronage abuses. Thus, the public and personnel of the agencies have a sense of confidence in the operation which other kinds of government operations often lack.

Third, a level of assured support exists in those States where user taxes and license fees are allocated for road purposes.

Out of these characteristics can grow an acceptable road program built around a minimum of planning. What sets the outstanding department above the rest is its use of comprehensive planning procedures which flow throughout the functional divisions of the agencies. This kind of planning is far different from that involved in establishing and scheduling materials requirements for a section of roadway, from the establishment of cost and revenue requirements for the operation as a whole, or for the technical limits that are finally derived for the expenditure of capital on equipment. Important as these facets are, they are not enough if the kinds of problems that now exist and that threaten in the future are to

be solved. Not only must a road system be maintained, but changing use patterns, changing points of road congestion, changing locations of industrial development and land use have to be recognized. More resources must be developed when comprehensive planning is undertaken if the reservoir of public good will is to be held and strengthened.

S. T. Hitchcock provided an excellent view of the technical features of planning and interestingly enough he has concluded that, "social and economic considerations must be included as well as physical." The inclusion of social and economic factors appears to be recognized as the central fact of comprehensive planning. Highway departments learned to plan well for physical requirements during the slowly expanding period when the road system was being created. Now other appropriate disciplines must be incorporated into planning operations. Now problems of change prevail in almost every sphere of human activity. The problems are not only engineering in scope.

CHANGE AND GROWTH

Professor Joseph Schumpeter, during his career as one of the great economists of all time, constantly emphasized the close relationship between change and growth in the American economic system. Perhaps no one would deny that change is the central fact of American society. Quite early in the country's history some entrepreneurs perceived the direction of national developments and became able plotters in order to take advantage of the opportunities they foresaw. Planning, which is both the response to and director of change, has slowly, over the years, become institutionalized. No longer can it be performed on an *ad hoc*, personal, or tentative basis. Now it must be built into organizations—but it is not always well developed and carried effectively into their life blood.

ORGANIC STRUCTURE OF ACTIVITY

Certain basic administrative functions must be performed by all organi-

zations, but often the proper interaction between them is not provided. These administrative components are finance, personnel, program, and planning. Others have specified more detailed lists but these have universality and clarity which provide adequate room for the development of subclasses. Table 1 gives the functions of administration, but is not intended to indicate the precise content included within each function. It is intended to suggest the flow of activities that must be harnessed.

All this appears neat enough on paper. Unfortunately moving into operational programs, difficulties, problems, and human irrationality multiply whenever alternative possibilities or choices are present. Interestingly enough, beyond superficial insights, very little is known about why there is a high "we feeling" in one organization and a grudging "they feeling" in another.

To some extent beliefs about what is and what is not important in administration are colored by the complexity of administrative development of an organization at a given time and its present stage of evolutionary development.

In looking back upon the dramatic cases of success in business, it is relatively safe to generalize as follows: those firms that have become household names around the world have, at some time in their history, been able to institutionalize the process of change as a vital force in management. They are alert to change, flexible in adapting to it, and precise in evaluating its meaning for the company.

Carefully devised organizational charts can emphasize concern about certain functions. But the institutionalizing of this concern can occur only outside the charts. To give an organization meaning requires a clear concept of objectives by those who are responsible for formulating its policies and for its administration. Hopefully, executives will attempt to provide meaningful statements to high- and low-level operatives and create a two-way chain of communications throughout the organization. Coordination of activities and policy development are not appropriate functions for bottom echelons in the organization (those who have had responsibility for planning have probably questioned whether some high-level executives should be engaged in it at all).

Concerning the process of institutionalizing change it may be of interest to see how Mason Haire views shifts over time in organizational control and authority over the firm. He sees the historical development as shown in Figure 1.

The shifts from the State to the staff expert as the ultimate source of authority encompass all the problems and literature in the fields of organizational theory and management science in general. They reflect that:

1. Increasingly American concerns are becoming divorced from money markets.

TABLE 1
ADMINISTRATIVE FUNCTIONS

PLANNING	PROGRAM	PERSONNEL	FINANCE
GOALS ^{1,2}	goals	goals	goals
organizing	ORGANIZING	organizing	organizing
staffing	staffing	STAFFING	staffing
budgeting	budgeting	budgeting	BUDGETING

¹ If the specified goals and objectives as developed in planning the operation of the activity are incompatible at the other functional levels there will be a need for review in Planning

² The use of capital letters indicates the administrative unit which has organizational responsibility for a given activity. For example, employment of people is the responsibility of Personnel but Planning, Program, and Finance will set requirements for their needs, and may take part in interviewing candidates for positions, particularly when professional staffing is involved.

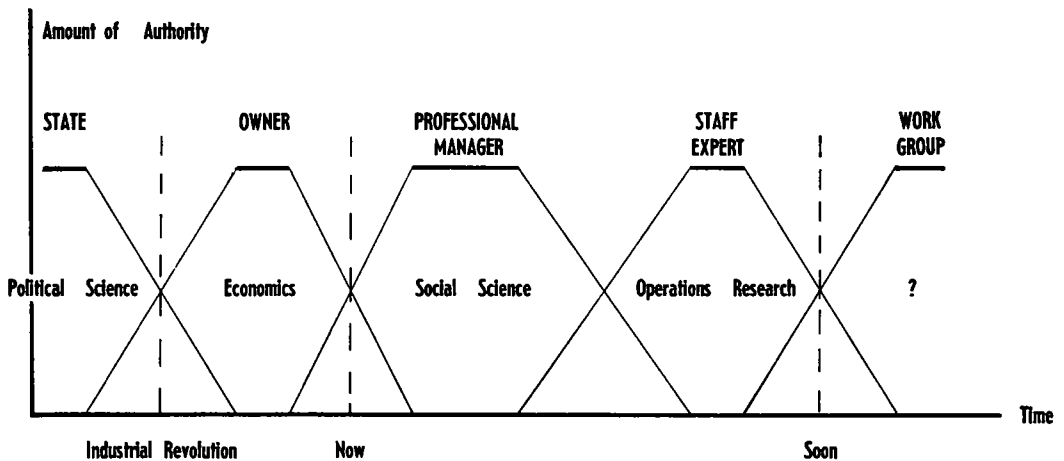


Figure 1. Shifts in organizational control.

2. An internal value system is developing within the corporation in response to public attitudes or presumed attitudes.

3. An internalization of the ultimate source of authority has been taking place.

4. Human factors have been the cause of great difficulty and concern.

Whether these things are of importance in public agencies is a source of great discussion among public officials and political scientists. Actually a strong case can be made that the latter three points apply equally well to the modern corporation and the public agency. But, although general tendencies can be sensed, lack of knowledge about the specific features of organizational behavior must be admitted.

ORGANIZATION THEORY

How to say something meaningful about the planning process in an organization, without knowing whether there are universal principles which apply to organizations and what they are, is the dilemma.

One view of organizational theory is built around the belief that there is a conflict between the needs of individual personalities and of the organization so that what actually happens in organizations can be understood in terms of dissatisfactions and frustrations of employees who react and adapt in diverse

ways, reactions of management to employee resistances and adaptations, and the continual interaction and feedback of tensions between management and employees. This is represented by the degree of "we"—"they" feelings expressed or held by both groups. Out of it comes a sense of "the organization" as a whole. But, as Professor Dwight Waldo has pointed out, if the employee is driven toward a realization of self and is thwarted by the formal organization, "to what extent is his thwarted nature innate, to what extent culturally determined? . . . To what extent do alternative and better organizational strategies exist? If they do not exist, can they be created?"

Another way of looking at the organization is through its historical development. By watching the physiological changes in the organization over time one perceives that it creates its own needs and requirements. The square-cube law of geometry specifies that as volume increases by a cubic function, the surface inclosing it increases by a square. Perhaps this does nothing more than help set a framework for speculating about what happens to an organization's efficiency when its size increases.

Efforts to explain decision making in organizations (not its technical aspects as specified by Shaneman) through a series of games have not been too productive. For as mentioned by Russell Ackoff, "In a real problem-solving situa-

tion the decision maker is not given a game to play, he must extract it out of the situation itself."

All of this poses an interesting prospect. Will a new elite rise? Computer technology is bringing a new kind of technical man into the organization to handle the apparatus. In many cases this new technical elite is responsible directly to the executive or his immediate staff. Other organization specialists are blooming under much the same condition. This sort of thing, though, is not new really, as was shown in Figure 1.

Comparative studies in administration reflect the great diversity and complexity of organizational environments. Some with vertical systems of authority work well; some with horizontal systems work well. And far from being a subject of just recent origin, one can cite historical works dealing with modern organizational problems.

Perhaps a definition of organization should be set out somewhere to satisfy those who like for things to be tidy. Some may remember POSDCORB—planning, organizing, staffing, directing, coordinating, reporting, and budgeting. It was used in the late 1930's to indicate the work concerns of the executive. Administration was conceived as a technical matter concerned with round-about production which governed efficiency. Administration was thus organization and the fellow who did this administering or organizing was an executive.

Today, however, there are more sophisticated definitions (if not any significant increase in the discovery of universal laws appropriate to organizations). Professor Bakke has produced the following: "A social organization is a continuing system of differentiated and coordinated human activities utilizing, transforming, and welding together a specific set of human, material, capital, ideational, and natural resources into a unique problem-solving whole engaged in satisfying particular human needs in interaction with other systems of human activities and resources in its environment."

If, at an earlier time, the complexity and interrelationships between POSD-

CORB items were understated, some progress is being made toward understanding the role of organizational structure, purpose, environment, and competition; and in recognizing the fact that these factors affect the society of the organization in ways and combinations of ways not fully comprehended.

Those interested in highway planning and its service to particular highway departments must be interested in things that affect the ebb and flow of information through organizations, for they are the things that determine whether work is meaningful or not. One dares say that planners in highway departments are often very frustrated that the maximum benefit from planning is not being realized in their highway departments. Developments occur within and without the organization that demand consideration in planning operations and often earnest pleas for support fall upon the ears of the deaf or near deaf.

The "categorical imperatives" to the development of planning as a sophisticated tool of the highway administrator which were specified by David Carley form, not a plea, but a warning to top management. The imperatives he stated are as follows:

- The recognition that highway planning and development is inextricably bound up with all of the other development factors of a given governmental unit and cannot be a distinctly separate operation.
- The planning of highway networks can no longer be limited in scope to a single route or community but must be based on a regional or a statewide systems concept. Also planning efforts by the many governmental units with responsibilities for highway construction must in some manner be coordinated.
- Highway planning is more than fact-gathering, origin-destination studies, and projections of traffic. It ought to be a socially-conscious and esthetic operation, tied strongly to careful consideration of other resources and their uses.

The author believes that one of the reasons why highway organizations in the United States have been able to create a united public support is that research in the past has been conducted on the basis of establishing need. Studies have pointed to current road deficiencies, and legislatures and the public can come to grips with exposed weaknesses and plans to correct them. This was fine so long as it was merely a matter of filling in lines on a road map across the nation. However, times do change and today there are economic and social forces of almost, if not actually, revolutionary force. More and more reliance must be placed on research and planning based upon future expectations or anticipations of conditions.

Then too, there is a significant issue to consider that involves a set of deeply-imbued ethical precepts. It seems reasonable to say that road programs have been predicated upon the belief that in the foreseeable future every American shall continue to have the right to drive a car. But the nation is growing, motor cars are more powerful each year, and highways are likely to become increasingly congested each year. At some future time will Congress, in the public interest, have to restrict the rights of individuals to drive at certain places at certain times, or encourage mass transit facilities? Almost all Conference participants listed traffic congestion in metropolitan centers as one of the critical problems. Are not those who are engaged in the management and planning of roads and highways going to have to set up some new hypotheses and move from research based upon established need to research based upon anticipated needs under new sets of criteria? The highway administrator and planner has been dilatory in entering the urban highway planning field and other forces have rushed to fill it.

The people of Missouri are much like people elsewhere. The level of awareness of Missourians as to what action should be taken to provide policy makers with the best knowledge possible is perhaps no keener than that of residents

in other States. The State has 8 major government departments and 60-odd agencies and no programs of information coordination. There is no program control center to assure maximum usefulness of statistical and research activities of one department with the needs of other agencies. There is no statewide economic base study to provide knowledge and guidance for either public or private concerns, although the Research Center at the University of Missouri is now engaged in such a study. It might be said that Missouri is ill-prepared for the job of comprehensive planning. And so it is, as are almost all the States.

THE PLANNING PROCESS

Rigidities in present conditions call for planning. But before planning, objectives must be established. An idea for a new road system, a new product, a new economic goal, a new approach to foreign trade must germinate and develop. From the new idea plans to build policies and programs to secure its acceptance may be made.

W. L. Haas' description of the planning function fits the requirements admirably: "Planning is one of the least understood and least effective aspects of highway management, yet it is an indispensable part of administration. It is the key operation from which all other activities flow. It serves to actuate the enterprise and gives direction and guidance in accordance with the principles and philosophy of the administrator."

The theme of planning rests on the degree to which dependence is placed on art. Planning to be sure involves art, and much more. More and more dependence is on science in the highly formal process used today in assessing the validity of proposed objectives. For example, a good deal has been learned about uncovering the operational variables between alternative courses of action. The numerology of depreciation schedules is easily obtainable. What were once largely subjective problems have slowly been reduced to problems of an objective nature. But, excluding engineering content that bears on road

systems, the planner is still very much in the realm of art.

Given an objective—the establishment of a 41,000-mile Interstate Highway System by 1975—the administrator turns to planning. A host of planning problems arise: (a) there is the problem of obtaining a staff of well-qualified personnel to work at multiple tasks and to coordinate diverse activities; (b) the objective must be scrutinized to reduce it to well-defined components; (c) it is necessary to accent the fact that the planning staff is bound by the need to predict what the future will be like; (d) action or plans statements must be prepared; and (e) careful attention must be given to the effect of change upon the highway organization brought about by the plan (the feedback problem).

C. A. Steele gave a penetrating overview of the source materials for measuring change. Of particular importance was his emphasis on the fact that because of the kinds of shifts that have been occurring—in population, location of industry (including farming), and place of residence—planners must become fairly conversant with the qualities of social and economic research. The urban transport problem and the question of mass transit prospects were again raised.

The author wondered what would be the relative financial outlays to provide an urban mass transit system for the metropolitan St. Louis area vs the urban highway - freeway - throughway system which, in the short-run at least, enables nearly everyone who wants to drive to do so. A host of procedural problems would be involved in establishing preliminary hypotheses—but what a research project it would be! The question is significant if highway users are not bearing the full costs of highways.

The technical side of planning involves not only physical but social and economic (and political) qualities. There is apparently a lack of satisfaction on the part of Conference members with planning operations in the social and economic fields. Highway programs until very recently put major stress upon the physical or engineering side of plan-

ning. Even today, how many highway departments engage the services of an economist, sociologist, or city planning professional?

Given this condition can the planning effort really be maximized—even if there is a situation where the chief engineer and top management are devoted in word and deed to planning? No matter how effective communications are, no matter how fluid are the lines between divisions, no matter how perfect the organizational arrangements, no real headway will be made until the appropriate content or subject matter disciplines are brought into planning operations. As Hope Wiley indicated, “(planning units) must welcome new procedures and new techniques . . .” Top management must have a broad appreciation of what these people are doing if their work is to be accepted as important to the organization as a whole. Otherwise these planning people will be shunted off into a cubicle or cell and are reduced to mere 9-to-5 routinized employees. “If it is to be effective, the planning organization cannot operate as an isolated cell within the highway department.”

This matter really may be refined to a question of status. William Froehlich said, “Much of the effectiveness of the planning function is determined by its importance in the organization. If planning is to be a principal function of the administrator, it must be given a status to reflect this importance.”

In short, if highway administrators are really serious about planning, the content and quality of their efforts will reflect that concern. The quality of management will also be reflected.

Planning concerns the future. The highway problems of the future involve such things as the following:

- Estimates of total transportation needs.
- Estimates of needs to be met by highways.
- Effects of technological developments influencing the choice between highway transportation and other modes.
- What shall be the division between public and private transportation and types of facilities.

- What design standards will be appropriate for each road system next year, in five years, ten years.
- Establishment of future needs in comparison with present facilities and cost estimates.
- Establishment of total resources and needs.
- Allocation of resources among different systems; including estimates of road usage and demand.
- Establishment of revenue estimates; including analyses of user and non-user support.
- Problems associated with the philosophy of fund dedication.
- Need for constant review of the benefits-received and services-rendered principles.
- Distribution of tax receipts among various road systems in proportion to use.
- Effects of economies of scale, the multiplier, and government economic policy.
- Effects of highways upon the quality of life of people.
- Establishment of trends of State support for all road systems.
- To what extent should future needs be built into today's construction.
- To what extent do better roads affect the economies of small towns and cities (distressed area problem).
- How can rural-urban needs be rationalized.
- To what extent and how rapidly should the comprehensive planning field be developed.
- How hard should the highway administrator push to obtain greater coordination between planning and research groups in State government, education, business, and foundation fields.
- How much obsolescence is there in plant and equipment which offsets the extent of commitment to the future.
- What will the economic, cultural, and social environment be in 1965, 1970, 1980, 2000, and what are the implications for national transportation system and for State systems.

In conclusion, this conference has obviously been a success. Far more questions have been raised than answers. But the stimulation will result in some approaches being made by highway departments to the study of future problems that would not otherwise have occurred. There could be no more appropriate result.

DISCUSSION

Steele.—I would like to present two points that have not been completely settled up to this point. The first one is training.

It seems to me that the young man who enters college very often chooses a field that looks attractive to him then; but as he goes along, he finds his interests change as he gets more experience, and the first thing he knows, regardless of whether he started out in highway engineering or city planning or business administration, is that he is actively engaged in highway planning.

I also want to reiterate that first we should select the man who shows the greatest potential and the greatest combination of ability and interest, and then we should proceed to train him.

The second point is this: We have referred, in a number of instances, to a change in government responsibility for

the highway function that is likely to come, not only insofar as the rural roads are concerned, but also the city streets. I feel that if we in planning fail to recognize that, we are making a big mistake.

In a cost allocation study a part of the cost of highway services should be assigned to other than highway users.

They are beneficiaries too, but if we shift responsibility for all rural roads to the State the chances are that these are going to have to be financed from the incomes of the State. So perhaps some rethinking is needed there, and we should be prepared to offer advice and help when these things materialize through the thinking of the local officials, the legislatures, and other individuals and bodies that have the right to say what shall be done.

It may be that what we are going to

end up with is not what we would prefer to have. In other words, we may end up with a much more centralized highway administration than we believe desirable. However, if that is the trend of the times, we had better know it ahead of time and be prepared to meet it.

Oliver.—I can definitely confirm that it is a trend in Arkansas. In fact, it is already in legislative study.

Campbell.—There is a facet that perhaps I have missed. We want to know where the source of our money is, where our resources are for highway use. Have we gone so far in our thinking about allocation as to how we should divide it between construction, and maintenance and operation? There is a breaking point between each one of those, a point of diminished returns, or an optimum point. Have we really explored those areas: the allocations of our resources to those three? Is this something for the planning division to explore?

Wiley.—I think it is. Somebody came into the office a few weeks ago and wondered why in the world we were spending so much money for maintenance, instead of getting out and building more highways with that money.

And I asked him the question: If he had a five or six room house and the roof was leaking all over and ruining his furniture and everything else inside, would he build that extra room he needed, or would he patch up the roof?

Now, how much it is going to take to patch up the roof or to add the other room is something that has to be determined. I think we have a primary obligation to maintain those roads that we already have.

I don't think that there is anybody in this room or in the country that can look out to the year 2000 now and tell us what is going to happen at that time. But unlike the man that refused to start out on a trip at night because his headlights would only reach a couple of thousand feet down the road when he had to drive 200 miles, we cannot just stand and wait. We have to start out and, as we go, we will find that other people are on the road as well, and that each one is casting the light in the right

direction. I think that this is a thing that we have to keep working on, but the answers will develop as we go along.

Granum.—I think that this problem of economic balance between construction, maintenance, and operations as to use of funds is certainly important. If we knew the extent to which we can afford to invest in permanent facilities, for example, to reduce the cost of maintenance,—the extent to which we can afford to withhold capital investment with the certain knowledge that maintenance in its broadest sense is going to increase, it would be extremely helpful.

And in this light and in terms of specific decisions that have to be made, one example came to my attention recently. In an important urban area, the principal decision maker in that area put at the top of his list: "First, maintenance betterments; and second, operational improvements of a relatively minor nature."

And this decision making aspect had continued over a period of enough years so that the top administration at the State level actually and literally put a ceiling on the amounts they would permit that district to spend for these purposes in the interest of developing a broader program that would have more long-range lasting value.

Levin.—We have been talking for several days now about the economic and sociological elements. I think nobody would dispute the desirability of including them. But I wonder, however, about the difficulties of quantifying these two special elements. How do you add up items which at least at this stage may be very difficult or impossible to quantify?

How does the highway engineer who traditionally by training and experience has been used to quantification in very definite terms deal with the items that continue to be definite and certain and quantifiable, and the items in the realm of sociology and economics, many of which cannot be quantified? How do you balance in the urban areas deciding on location and things of this kind against design? How do you balance esthetics against cost and open space? How do you balance comfort

and convenience? How do you balance the relationship of church and school to a community?

Paterson.—If you have a metropolitan area highway department, whether it be the city metropolitan planning commission, highway commission, or the State highway commission that has an alternate choice for a road system, the relative costs can be plotted fairly easily, as to which system would be less costly to build the road to the same standard requirements. But it may have different implications insofar as what kinds of housing are likely to go up abutting the road system. There might be an older area as opposed to open space. It may be that in view of the economic and sociological trends in the older area, it would be much better to build the throughway through the older section, depending on what the trends are within that particular metropolitan area. I think you would have to analyze these before you could specify whether it would be better or not.

Levin.—And then it becomes a judgment decision, and the quantification decision as such need not be dealt with in this case?

Paterson.—I would say we should make every effort to do so, but there are limitations to it. I would be the last to argue there are no limitations to this.

Levin.—How do you get away from arbitrary decisions, then? How do you get away from tyranny in a broad sense, the tyranny of trees, for example; that some of the courts in the esthetic cases have talked about?

Paterson.—I guess it comes back to training. You want to be certain that the person who is doing this has had a wealth of training in his particular discipline. And of course it is going to get into the judgment category. Are not some engineering decisions in the judgment area?

Levin.—Yes, but they have an underlying flavor of fact and physical characteristics. It is the same as science. The decision to send an astronaut into orbit is obviously a judgment decision, but it is based on a vast body of fact which you could put in machines and get some

kind of an answer. Can you do the same with sociology and economics?

Paterson.—Why is it that you can take a given cost figure? Why not another cost figure? Somebody has to make a decision that we are building for traffic 5 years hence, rather than 3 or 7 years. Some place a decision is made.

We can get some traffic counts and some traffic projections made, but somebody is making a decision that we are building for a given volume of traffic. Therefore, you determine your requirements, your road width, depth, and all the rest of it, on the basis of a number of cars per hour, day, or whatever it is. I do not think this is made on the basis of any quantifiable data. Someone makes a decision in regard to this. You can get some data, but you are making a decision based upon somebody's subjective view of what they are building for.

Oliver.—I think one example of what you are speaking of is the Interstate System.

We have made an estimate for the Interstate System hurriedly, and we did not include complete control of access in it. When we got through with the complete controlled-access estimate, it was very much higher than the original estimate made before the passage of the Act.

Wiley.—Somebody has to decide for what projected traffic a highway is to be provided. This could be mutually agreed upon by a number of qualified people that at least think they know what we can afford to do. At that point, then, it is possible to put a fairly accurate monetary value on the thing. You could make comparisons of alternate routes and say this one is better than the other because it shows a greater benefit-cost ratio.

But how do you put any kind of a valuation on the thing you are talking about? How many dollars can you say this is equal to, or worth?

Paterson.—How would you know, until you had built a number of roads, what your costs were going to be? We have known this for a long time. You have just had experience, that is all. We have not had any experience, but I

will wager that given some limitations with regard to city size, once we know what the impact of a road system is for a city of a given size, with a certain basic population and industry component, it will be possible at some time in the near future, with a little experience on the effects of the Interstate system going through a certain area, to predict fairly closely what the impact will be upon land valuation and on the drawing power that a given stretch of road will have for industry. We know a little about this in certain areas.

We will also be able to predict to some extent what residential patterns would satisfy the esthetic qualities that people are striving for.

We don't have any experience or any research, really. We have spent a lot of money for various things, but not for really important things.

Levin.—I have been at the receiving end of the thing I have been trying to ask for here, and I ask it not in any malicious sense.

Yes, we know a great deal about the sectors you indicate, but if you are talking about city X, that is one thing, but there might be a pull of these same elements. In other words, it erupts at city X and goes down to city Y. We are not favoring one over the other. We want to know what the net is.

You are talking about a national, State, and regional valuation, rather than a local valuation. You are talking about cities or routes, rather than a sector of highway, and so on.

Paterson.—No, I would take it on an even broader framework than this. I would maintain that the highway projections being made by a number of States are nothing more than projections because they ignore certain basic national tendencies.

As Mr. Steele indicated yesterday, we know something about the regional characteristics of growth. If this is the Eastern Shore of the United States, and this is the Western, since the census of 1930, you will see on the Eastern Seaboard there is a rolling up, and on the Western Seaboard there is a rolling up. In other words, there is a piling up of population across here on the East and on the West.

I do not believe you can design a highway system over here without taking into consideration the relative factors in this rolling up that are going on, nor can you do this in California on the basis of a State projection of population for California.

If this is true, then we have to know something about the regional characteristics, and the national characteristics of growth patterns.

That population is rolling out. It is also carrying with it industry. One of the interesting things about all this is, what happens to a city like St. Louis or Kansas City, assuming this rate of increase continues? I do not think you can really analyze these things unless you go toward the national studies.

Holmes.—I will try to answer it in a different way. I think it is not so much in all cases the inability to quantify as to the different approach taken by the social scientists and engineers and political scientists, but that we tend to quantify everything right off the bat.

And I think we would quantify things in our work that cannot be quantified. But we go ahead and convince ourselves, and apparently a great many others, that we are doing a great thing for them on the benefit-cost ratios we produce, including some time values that I do not think we can quantify. Yet we do not hesitate.

The social scientists have never approached it on that basis: they consider it on the basis of esthetics. Of course, they are good. But how much more should you pay to landscape a cut or such things as that? I think there are ways by which some of those things could be quantified, if we were to spend a little research money and if we got the people who are used to wanting to quantify things to look for the reason for doing it.

The States spend some money for certain of these things that have no benefit, perhaps, except for esthetics. The fact that they do spend that money, and their public accepts it, indicates that to that public and that State that amount of work was worth that much. At least, you can find a point.

Maybe some greater amount of work would have brought criticism. Maybe

some lesser amount of work also would bring criticism. Of course, in time, you will arrive at something which the public seems to have accepted, and to which you could assign some cost values.

I do not know how you assign a value to reduction of air pollution. That goes into an area that city planners refer to as the hidden cost of motor vehicle operation. Of course there are many of these other hidden costs. So I think maybe in some of these social fields, if we were to look deliberately for means of quantification, we could not gain a great deal.

I think, on the other hand, we will always have to recognize that there are some judgment values that are going to be there just because people want them. We cannot prove why they want them any more than you can prove why you are willing to pay \$10 more for a particular suit just because you happen to like it better. That is all. You can afford it. And what will be liked in one State may not be liked as well in another. However, I think it can be approached, and that I do not think we have tried to do.

Levin.—This is all heavily involved in the process of planning, is it not?

Holmes.—It is heavily involved in the process I have described. I am sure of that. I would hate to say that we need to quantify in all this great number of conflicting and confusing areas and then come up and say, "But we can't do it."

Telford.—I was interested in this attempt to quantify everything, and I am inclined to think we sometimes go too far.

Campbell.—Do you think it would be necessary to quantify in terms of money values? There are other means of quantifying.

Wiley.—The thing that we run up against constantly is that there are certain things you can quantify, and you come out with a certain number of dollars in favor of a particular location, for example. But somebody, for esthetic reasons or otherwise, thinks that it would be better to do this other thing, and there may be some logical argument.

But how strong is this argument? In other words, this argument has to be balanced against this many dollars. You

may not be able to quantify this, but you have got to be able to arrive at a certain number of dollars before you can say, "Well, we are entitled to or should properly do this other thing."

Suppose on the Interstate System with future benefits in the billions of dollars we did find out or draw the conclusion, before we bypassed a small community, that it was going to hurt this community to a certain number of dollars. What would you do? Are you going to throw away your portion of the system, forget control of access, etc., just so you can go right through that community. Even if you do find that it is going to hurt that community, which I think is unlikely in most cases, what would you do?

I do not think we are going to change the over-all objectives of a system that has already been shown to be so great a benefit just because in a few cases it is going to be detrimental to a few individuals.

Holmes.—It is not a question of trying it inextricably to some kind of an equation and blindly taking the answer, but the more we can know about various factors, the better our judgment will be as to what the effect will be, and where the administrator can be helped by this. It is a judgment decision on almost every project, when you come right down to it.

St. Clair.—In the water resources field, where there is a multiple purpose project of power, flood control, recreation, wildlife protection, etc., in one way or another they have worked toward a quantification (see Lilley and the developments that have led to what is called the "Green Book") of some of these so-called secondary benefits that might serve as a model if we get to the point of extending the benefit-cost or rate of return type of calculation to the point of bringing in these broader benefits.

I do not think this is impossible, but it would always contain some arbitrary elements and would be never fully satisfactory.

Campbell.—What are the effects of a highway on the quality of living?

Paterson.—I have no solutions. Again,

you need some research projects related to this, but where these roads go, you build up certain suburban residential communities, and this does have some impact on the way people live, where they work, and how they play.

There is access to services, for instance. You may have to forego a given level of school systems for one not quite so good. The tax base itself is likely to change for individuals who are going into new communities. This is likely to mean a large difference in services rendered by the community itself.

Campbell.—Is that shifting to an economic slant? How about the social slant, and quality of living? Does it have any effects on that? To what extent can something like that, some exterior force, have an effect on the quality of a man's life?

Paterson.—I can think of several examples. For one, in the metropolitan community of 1920, there were residential communities with certain sociological characteristics. These are gradually breaking down, perhaps not all the way through society, but in the newer suburban areas—is it true that the individuals of \$6,000 income reside

quite closely to individuals with \$35,000 and \$50,000 income? This means there may be a change in the breaking up of barriers. This is one possibility.

The whole effect of the road system in making the United States as a whole accessible to communities a State or two States away is nationalizing the country, and in much activity in research, planning, and building we underestimate the effects of this nationalization.

St. Clair.—I think Professor Paterson is quite right about that. I think the controversy revolved around whether this is good or bad. I am inclined to think it is good, myself; but some of the sociologists seem to think if you break up little social structures that have existed since the 1850's or something like that, you are doing something bad.

I think that is just what we need to do; that a community in which there is an exchange between people, people of all nations, for example, is a living and growing and functioning community; but the one that is stabilized is dead.

CLOSING REMARKS

M. EARL CAMPBELL

On behalf of the Highway Research Board, I want to thank each one of you for your part. I think one reason we called for this conference was that we knew that truth builds on truth.

Another reason we are having this conference is to try to assemble what we know now as a springboard for the future.

The points that were brought out with respect to the needs for research by a number of the people were very appropriate to this conference because we are shooting at a moving target, and when the target quits moving we have just about come to the end of any dynamism in our society.

W. L. HAAS

General Chairman

I want to express again our thanks and appreciation to each of you for giving your time and attention to this most important endeavor, and particularly for your active participation in the discussions. Much credit is due the arrangements committee for organizing the conference, and the presiding chairmen of the sessions who did so much in keeping the sessions moving. Also, I want to express our appreciation to the Bureau of Public Roads and the Highway Research Board for their sponsorship, support, and active participation in this planning conference.

Many ideas and viewpoints have been presented and discussed, and I feel that each of you has acquired some fresh knowledge and information which will be helpful in advancing your individual planning efforts. In the long run, I would like to look upon this conference as an important step and useful tool for evaluating the strong points and deficiencies of existing planning. Thus it should aid in bolstering and bringing up to date our concepts and thinking, and facilitate the necessary adjustments in our planning operations to better satisfy the complex requirements as outlined by the conference presentations and discussions.

Planning is basically thinking about the needs and problems brought on by our dynamic society and economy. If we accomplish nothing more immediate than more intensive thinking and more imaginative treatment, and the acceptance of a more positive role of leadership and cooperation, the conference will have been amply justified. Personally, I feel that the thinking and suggestions coming out of this meeting will give new impetus to the highway planning activity and help us get sufficiently ahead in our planning to eliminate some of the improvising, delays, and confusion which now are in evidence.

When we are able to straighten out our thinking and get on a basis of offensive planning instead of the prevailing defensive attitude, we will be demonstrating our planning capabilities, and that we can be entrusted with the responsibility. Every public agency has the obligation of letting the public know what lies ahead for them, and in such a way and in ample time to let the people know and understand so that they have the opportunity to pass judgment thereon. In that way only can we get the much-needed public participation and support for the needed expansion and improvements. Also, when we

straighten out our planning many of the present technical and administrative problems facing the departments will tend to dissipate.

It is axiomatic that in order for the highway administrator to know what he should be doing today, he needs to know what his department should be doing five or ten years from now. This makes a long look ahead almost a neces-

sity. Only effective planning can make this possible.

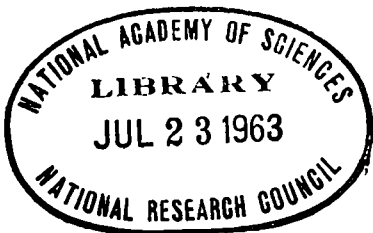
In conclusion, I would like to look upon this first effort as the beginning of greater things, and that this conference will be a conspicuous landmark of progress. It has been an honor to have served as chairman, and I hope that my small contribution has been useful. Thank you very much.

THE NATIONAL ACADEMY OF SCIENCES—NATIONAL RESEARCH COUNCIL is a private, nonprofit organization of scientists, dedicated to the furtherance of science and to its use for the general welfare. The ACADEMY itself was established in 1863 under a congressional charter signed by President Lincoln. Empowered to provide for all activities appropriate to academies of science, it was also required by its charter to act as an adviser to the federal government in scientific matters. This provision accounts for the close ties that have always existed between the ACADEMY and the government, although the ACADEMY is not a governmental agency.

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The HIGHWAY RESEARCH BOARD was organized November 11, 1920, as an agency of the Division of Engineering and Industrial Research, one of the eight functional divisions of the NATIONAL RESEARCH COUNCIL. The BOARD is a cooperative organization of the highway technologists of America operating under the auspices of the ACADEMY-COUNCIL and with the support of the several highway departments, the Bureau of Public Roads, and many other organizations interested in the development of highway transportation. The purposes of the BOARD are to encourage research and to provide a national clearinghouse and correlation service for research activities and information on highway administration and technology.



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