G. E. Marple, U.S. Bureau of Public Roads

A continuing comprehensive transportation planning process in which the State highway departments and the local communities are cooperating is now underway or is being organized in all of the 230 urban areas over 50,000 population. It is necessary to include the qualification "or is being organized" only because 5 of the 230 passed the 50,000 population mark only recently.

Much of the recent emphasis on transportation planning stems from the Federal-Aid Highway Act of 1962. A section of this Act declared it to be "in the national interest to encourage and promote the development of transportation systems embracing various modes of transport in a manner that will serve the State and local communities efficiently and effectively." It instructed the Secretary of Commerce to cooperate with the States in the development of long-range highway plans and programs which are properly coordinated with plans for improvements in other affected forms of transportation. It also specified that the plans be formulated with due consideration to their probable effect on future development.

This directive establishes the broad scope of the information required for transportation planning. While the basic problem is to project growth of transportation, to do this it is first necessary to project growth and shifts of the population and economy. To assess the probable effect of transportation improvements on future development requires knowledge not only of how transportation serves the land but also how it can itself influence land use. And the coordination of plans for all modes requires knowledge of the factors that affect the division of travel between the various modes.

Once future travel has been forecast, the demand must be measured against the capabilities of existing facilities. The planning to overcome deficiencies must seek the best balance among the three choices of new construction, upgrading of existing facilities, and traffic engineering improvements. And, insofar as roads and streets are concerned, there must be a division into systems for purposes of administrative, operational, and financial responsibility.

The urban transportation planning process may be characterized in four general phases: inventories; analyses of existing conditions and the development of forecasting techniques; the forecasting of future conditions; and, a systems analysis which provides for the essential feedbacks between the transportation and land use elements. The inventories form the base upon which the entire process stands. The Bureau of Public Roads has suggested that inventories and analyses are required for 10 basic elements: economic factors affecting development; population; land use; transportation facilities; travel patterns; terminal and transfer facilities; traffic control features; zoning ordinances, subdivision regulations, building codes, etc.; financial resources; and social and community value factors. I shall discuss these very briefly in order to identify more specifically the informational requirements.

The first three are closely related. The economic activity and population measures are key determinants of travel demand. The land use inventory and forecast pinpoints the location of activities within the urban area.

An analysis of the existing economic structure is needed as well as estimates not only of the total level of probable future economic activity but also of its probable character. The specific products of economic studies that are inputs to the transportation planning process are forecasts of employment, labor force by industry category, income distribution, and car ownership. You will recognize there are wide variations not only in the scope of the studies but in the techniques employed including the judgment decisions that must be made.

Answers must be obtained to such questions as, "How many people live in how many households in the study area now? How many will there be in the future? What is the breakdown of the population with respect to age and sex?" The inputs to population studies are, of course, data on births, deaths, and migration. The outputs-future population and households--establish the total potential trip makers at some future time.

Land use studies as we define them are concerned with the spatial distribution within the study area of both current and future population and economic activity. We need to know the type of activity and the intensity or density by small geographical areas. While the current techniques utilize land use categories at the onedigit level of generalization, we strongly urge that all field inventories provide for the listing of specific activities and on a parcel by parcel basis. There is a growing need for the collection of land use information in a form that will allow comparability between localities and regions, and that will also permit the study of trends over time. To assist in this the Housing and Home Finance Agency (now the Department of Housing and Urban Development) and the Bureau of Public Roads jointly issued in January of 1965 a manual for identifying and coding land use activities at the two-, three-, and four-digit levels.

It is probably realistic to state that the land use forecasting process is the least advanced simulation tool in the transportation planning process. Data descriptive of the changing locational patterns of urban activities are extremely difficult to come by and exhibit a substantial degree of qualitative and quantitative variation nationwide. Seemingly in contradiction to this is the fact that land use forecasting is becoming more and more important in the overall planning process. Since the introduction of mathematical models into the forecasting procedures, planners and policy makers have the opportunity to examine the effects of alternative planning and policy decisions on the likely activity structure, and to evaluate and choose between alternative structural arrangements.

Four of the basic elements are directly concerned with transportation facilities and travel patterns.

Information is needed on the physical features of each link of the major street system such as right-of-way width, roadway width, roadway type and condition; parking regulations, and traffic control regulations and devices. And, in order to evaluate the existing system, it is necessary to have information on the operational characteristics--the capacities of the roadway and the major street intersections; the volumes of traffic on each segment of the system; the speed of traffic movements at different volumes; and, the frequency and location of accidents.

Consideration of public transit requires information on route location, passenger counts, passenger fare distribution, and such operational data as: revenue vehicle-miles; average seating capacity by type of service; routemiles and terminal-to-terminal running time; headways; and regularity of service.

Since the effectiveness and efficiency of the urban transportation system is dependent to a large measure upon the availability of adequate terminal and transfer facilities, the present supply of parking spaces in critical areas must be inventoried, and the parking, loading, and unloading requirements for terminals must be determined.

And, of course, urban transportation planning requires specific knowledge of the current travel patterns. Information is needed on the location and amount of travel by the various modes, and on such trip characteristics as purpose, length, time of day, and land use activity at the termini. The task of travel forecasting is usually handled in two steps. Utilizing the land use and travel inventory data, trip generation and trip attraction rates are established for various types of activities and trip ends are computed for each analysis zone. In the second step, the trips originating in each zone are distributed to other zones in the study area.

Two of the elements that we have classified as essential to the transportation planning process relate directly to plan implementation. Zoning ordinances, set-back requirements, subdivision controls, building codes, and the official map together with licensing powers are basic techniques used to control community development. Existing laws and ordinances should be analyzed in the light of the objectives for future development. Deficiencies should be carefully documented, and recommendations for needed revisions or additional regulations should be prepared.

Financial resources are, of course, one of the more critical factors influencing the selection of an urban transportation system and the programs devised to implement the system. In addition to determining the estimated costs of proposed facilities, the transportation planning process should also survey and analyze the abilities of the various governmental units to finance the needed improvements.

The last element, social and community-value factors, is perhaps the most important, but it is also extremely elusive when we attempt to establish quantitative measures. Some community values are measured in dollars, such as the amount of funds that a community will raise through self taxation for public services. Many others are measured in distinct terms by the number of votes cast for candidates for public office. Some, however, involve the full range of attitudes, opinions and even the emotions of the citizenry, and are not subject to precise measurement. Undoubtedly we need to expand our knowledge of environmental effects. But this additional knowledge will not eliminate the conflicts in the choices to be made. Hopefully it will assist in the development of bases upon which the necessary trade-offs can be evaluated more objectively and consistently.

Basic to the development of any plan is the establishment of goals and objectives by both planners and policy makers. To assist in the difficult job of determining what people value, some of the transportation planning studies have utilized attitude surveys. The Minneapolis-St. Paul study, for example, asked 4,600 area residents their attitudes about housing, employment, transportation, government, recreation, and other aspects of their environment. The results were used in judging alternative growth patterns. In this brief discussion I hope that I have made clear that we believe transportation planning requires lots of information. It should be of interest to you that the work programs of the State highway departments for the 1966 fiscal year included over 35 million dollars for urban transportation planning.

I should like to close with the reminder that there has to be a big pay-off if those of us who are concerned with the collection and analysis of data can find ways of utilizing the regular administrative records of governmental units more effectively. We need also to make greater efforts to tailor our inventories and surveys so that the data will serve multiple users. We are anticipating substantial benefits from the current studies being made by the Bureau of the Census which hopefully will result in their making available many items of information from the 1970 census by small geographical areas.