DATA REQUIREMENTS FOR CONTINUING TRANSPORTATION PLANNING

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Continuing transportation planning needs some definition, or at least some bounding statements, if we expect to make any headway with regard to outlining its data requirements. There are at least 10 specific areas or functions that properly fall in the continuing transportation planning process. We do not claim that this list is complete, nor do I suggest that many of the functions included imply data requirements different from those of the original transportation planning, whose major purpose was the preparation of a long-range transportation plan. The functions or objectives of the continuing transportation planning process are as follows:

1. Update the long-range regional transportation plan;
2. Program or assist in the programming of the elements of the long-range plan;
3. Locate or assist in the geographic location of elements of the long-range plan;
4. Design or assist in the design of elements of the long-range plan;
5. Design and evaluate or assist in the design and evaluation of transportation facilities and improvements not included in the long-range plan but necessary to the efficient functioning of the plan;
6. Coordinate and integrate the transportation system with other urban systems including joint design of improvements and new facilities;
7. Monitor the performance of the transportation system;
8. Enlarge the frame of transportation planning to better deal with such special transportation problems as airports, terminals, and goods-movement systems;
9. Provide transportation information services to other operating agencies; and
10. Continue basic transportation research.

We have used the term "long-range transportation plan." In another report (1), we defined strategic transportation planning "...as the process of determining a recommended long-range level of investment in transportation, the division of investment among major modes of travel (i.e., among expressways, major streets, and transit), the location of corridors for expressways and rail rapid transit facilities (or in smaller urban areas the locations of major streets), and the general timing and sequence of investments." In considering the needs of the continuing transportation planning process, we assume that this defined process has provided the region with a long-range plan.

The preparation of this long-range plan included in most, if not all, cases a simulation of the performance of the system of transportation facilities that constitute the plan under conditions of travel demand expected at a point 20 to 30 years in the future. Although this testing of the transportation plan under expected future conditions is common to urban transportation studies, the simulation technique, associated methods, and data requirements are not. Therefore, the specific data requirements for updating the long-range transportation plan cannot be detailed for all studies. Certain characteristics, however, are common and some general statements may be made in this regard.

First, the demand for travel is typically related to the expected future arrangement of urban activities in the region. This future population and land use base should, therefore, be periodically reviewed and modified on the basis of actual development data, changes in development plans, announcement of new plans, both public and private, and analysis of trends based on the most recent data available. The integration of 1970 census data in this review process is an obvious and vital step.

Second, the simulation process includes continuation or extrapolated values of variables such as trip length, trips per person, and interactance model coefficients (e.g., travel time factors in the gravity model). These values should be reviewed and updated. However, the usual basis for calculating these values, the home interview origin and destination study, can be very expensive, especially when used to estimate interzonal travel. Because future travel among zones is usually simulated, it should only be necessary to take a sample of a size sufficient for calibrating parameters of the simulation model. However, even the selection of a small sample can be expensive and time-consuming; without an adequate sample frame, it can be biased. The existence of a complete file of households organized by block face within the Bureau of the Census provides an excellent opportunity for carefully designed small samples of households in urban areas.

This discussion suggests that the data required for updating the long-range transportation plan differ from the data required in the original surveys basically in terms of quantity, sample size and source, and use of secondary data including the 1970 Census of Population and Housing. However, this is definitely not the case for most of the remaining 9 functions listed as essential to the continuing transportation planning process.

The reason for this lies in the very nature of the functions themselves. The long-range transportation planning process was concerned with defining travel corridors some 20 to 30 years in the future. Generally, route locations are described only as falling somewhere within a 3-mile corridor. When we are concerned with problems of route location, and concerned we must be if we are to implement the plan, this generally must be left behind. Nor is route location the only place where specificity of geography distinguishes long-range transportation planning from the continuing phase.

The simulation process typically used in regional traffic assignments suffers to a significant degree from the aggregation of travel data to zone centroids. This aggregation, necessary for the symbolic representation of an entire region of a hundred square miles or more, results in a loss of detail in terms of geographic consequences of traffic. The local street system typically must be excluded. Also, loadings are distorted wherever zones are larger than the area enclosed by the network itself. Moreover, when we concern ourselves with the impact that proposed transportation improvements will have at the neighborhood level, we need smaller geographic units than zones 320 acres or more in size. The need for detailed geographic descriptions is especially acute when we attempt to consider the impact that changes in land use will have on transportation facilities.

Specification of patterns of settlement and average densities may suffice for selecting among alternative corridor plans. But, when we consider putting in a 20-story office building on a specific site or developing a site as a shopping center, we cannot, or should not, ignore the traffic consequences of that development on the adjacent street system. It appears that these traffic consequences dissipate quite quickly as we move away from the site. The scale of regional networks and regional zone systems often would conceal this impact. Such representation would probably require block or block face loadings and link definitions. Certainly, for a zone 4 square miles in area, loading trips at its centroid would be inadequate.

In addition to geographic specificity, there is the detail at which transportation networks themselves are to be represented. In the long-range transportation planning process, transportation networks are represented by links to which are ascribed characteristics of speed, length, and capacity. For purposes of estimating travel on major facilities in travel corridors, these network representations appear to provide adequate answers. However, when we turn to problems involving ramp design, turning movements, and volumes on local and connector streets, most assignment results require creative interpretation, to say the least. It is with such problems that we are concerned in implementation, route location, neighborhood impact, TOPICS, and so on. Thus, the data needs with respect to network facilities will be expected to become more detailed and to call for characteristics such as signal timing, intersection control, parking restrictions, number of lanes, turning movements at intersections, lane usage or sharing at intersections, presence of turn bays and median separators, speed limit or legal speed, inclusion of all facilities, reversible lanes, and peak-hour differences, if any, for any of these characteristics. The specification of such greater network detail presumes that there is the ability to employ the data in a useful way. There are, we hasten to add, at least 2 assignment programs that will accept substantially the network detail suggested.

We have described the need for greater geographic detail in the description of travel, activities, and networks. We have also described the need for more detailed information in order to represent the functioning of transportation networks at a finer level of geographic detail. There is still another dimension that we believe requires a more detailed treatment for continued transportation planning processes than that usually given to it at the regional level. That dimension is time of day. Time of day, peak hour in particular, is closely associated with problems of traffic congestion and problems of design-hour calculations. Time of day is indispensable to studies of staggering of work hours.

The definition of capacity used in many traffic assignment simulation programs represents a kind of 24-hour capacity that assumes a peak-hour proportion (not to mention a directional split, turn assumptions, and proportion of commercial vehicles). This capacity, when used with a capacity restraint algorithm, appears to give reasonable splits of traffic between expressway and major street facilities. However, these capacity definitions and restraint mechanisms intuitively are most inappropriate to use at the smaller scale required in many of the continuing transportation planning functions.

The last dimension that we wish to discuss is one that is applicable to both long- and short-range transportation planning although it has received but limited attention to date. This is the socioeconomic status of the population within the region. Most studies have incorporated some measure of automobile ownership or income in the estimation of future travel demand. However, in the calculation of the costs and benefits associated with the acquisition and use of the future transportation system, there has been little or no investigation of impact by socioeconomic class. Thus, while a particular plan may be the best plan in terms of its performance measured in goal achievement at a regional level, it may be attacked as being deficient at a subregional level or in terms of a particular socioeconomic group. Alternative plans may perform less admirably at the regional level but will avoid criticism by any particular subregional or socioeconomic group. Of course, one could argue that higher costs are a waste and represent a needless subsidy. Without discussing the relative merits of using the transportation system as a basis for income redistribution or meeting special interest groups, it seems reasonable to at least investigate the impact that the proposed plan has on particular groups and subregions.

We have attempted in this paper to distinguish between preparation of the long-range transportation plan and several other functions that are essential to transportation planning and especially to the continuing transportation planning process. In general we believe that there will be the following important differences in data requirements:

1. Greater geographic precision will be required (block or even block face data will be utilized if available);
2. Greater network detail will be required;
3. Temporal detail will be required;
4. Data on travel (trips per person, trip purpose, trip length, and so on) will be required but in quantities appropriate to calibration of model parameters rather than to estimations of zonal interchanges; and
5. System performance will need to be measured with respect to particular socioeconomic groups in subregions, and, therefore, data for this must be put into the process.

Other papers in this Special Report will deal with specific applications of census data to the continuing transportation planning process. At this time, we will suggest only the obvious connections. The 1970 census data will include data on work travel, which, in spite of its definitional differences when contrasted to work travel obtained in the home interview survey, will be of real value in the continuing transportation program. The ACG/DIME geographic framework will be of invaluable assistance in dealing with the problems of geographic detail described earlier. Moreover, this file may prove to be a very useful frame for assembling data on detailed transportation networks. This file is the key to assembling data on the socioeconomic characteristics of the population of the region in the appropriate geographic format. Finally, this file in conjunction with census enumeration of households provides a basis for the fast and efficient development of small samples of households for purposes of calibration of transportation models in the updating process.

A major forward step in the continuing transportation planning process will be achieved with the demonstration that census work-trip data coupled with a detailed traffic assignment technique supplemented by other travel data can be used to demonstrate traffic consequences of particular street-transit or building patterns or both. In any event, we believe that in the seventies we will witness significant improvements in the transportation planning process and that the 1970 census will play an important role in these improvements.

REFERENCE

1. Creighton, Hamburg, Inc. Data Requirements for Metropolitan Transportation Planning. NCHRP Rept. 119, 1971.