APPENDIX IV

Guidelines Supplementing the Definitions
and Interpretations in IM 50-2-63
September, 1963

A. *Transportation planning process.*—Ten basic elements for which inventories and analyses are required are listed in IM 50-2-63. A more detailed discussion of the scope of the ten elements follows:

1. *Economic factors affecting development.*—An economic study of a community should provide the data needed to estimate the total change in the level of economic activity in the study area from the present to the forecast year. This forecast of future economic activity together with the population forecast will provide the basic input totals for the land use and travel forecasts.

An economic study should collect, analyze, and forecast such factors as the following:

a. All employment data, by industrial category, relating to the study area and its subunits.

b. Per capita income, in constant dollars. Increases in per capita income are closely associated with increases in employment and productivity. These may be translated into increases in consumption of goods and services.

c. Income-consumption patterns for the study area. A change in these patterns will indicate a change in the demand for services relative to basic necessities.

d. Car ownership per capita or per household. Relative changes in population and per capita income will be reflected in the car ownership ratio and will reinforce the anticipated change in demand for services (i.e., for transportation facilities) noted above.

e. An inventory of all pertinent forecasts made by others for the larger region, the study area, or for any of its subunits.

It is important that, if at all possible, economic data be obtained in units of detail, both by category and by geographic subunit, that are compatible with the design of the land use study and the trip generation study.

In making the forecasts of future economic activity, the study area's economic advantage in holding and attracting industries and

workers should be analyzed and evaluated. Industry location decisions are influenced by such factors as costs of production, access to resources, characteristics of the labor force (i.e., its occupational skills, productivity, educational level, age, sex, etc.), the quality of the area's non-human resources including the geography of the region (i.e., the future supply of these resources, climate, terrain, water, transportation, recreational facilities, etc.), and the fiscal and financial policies guiding the area's governing unit (i.e., its tax structure, borrowing powers, etc.). Moreover, analyses of data and forecasts should take account of the effect on the local economy of variations (recent or otherwise) in the national economy; the effect of economic fluctuations on different industries, and the probable effect of technological developments on local industries over time.

Forecasts which are merely extrapolations of recent trends may give misleading estimates of the future. An analysis of relationships between factors found within recent trends, however, form an important part of any forecast and provide a basis for forecasts that diverge from these trends.

Regardless of the method used to make future estimates, the results obtained should be tested for reasonableness and consistency. For example, an important check is to prepare a population forecast based on the employment forecast and compare this with the independent population forecast based on demographic techniques.

2. *Population studies.*—A population forecast is required to provide an estimate of the total potential trip makers at some future time. The population and economic forecasts together form the basis for estimating future land use and travel demands, since the number of people and jobs are the major determinants of trip making.

The first step in a population study should be a survey of all available historical data on total population, its distribution by small areas, and its characteristics. Using these data, analyses can be made of changes in rates of growth and in composition of the population. Such analyses will aid in determining the appropriate forecasting techniques to be used.

All available pertinent population studies previously conducted by others should *be fully utilized to the extent they are applicable and acceptable.* These may include estimates of current population as well as forecasts, and may relate to the study area, parts of the area, or to larger regions containing the study area. If an acceptable estimate of current population is not available, an estimate should be prepared before the forecast is made.

Several forecasting methods are in common use today. The simplest of these produce population forecasts by extending past growth trends forward, using graphical or mathematical methods. Ratio or stepdown methods utilize historic and projected relationships of the local area to some larger area (often the State or United States) for which a reliable forecast is available. Component methods are more complex and analyze the separate components of population change, such as births, deaths, and migration.

The technique used to forecast population will depend upon the input requirements of other phases of the study, the detail of the available data, and the special characteristics of the study area (size, composition of population, and growth rate). The most important information that should be provided by the forecast is an estimate of future total population and average household size (or number of households). Additional detail such as age and sex breakdowns must also be provided as required by other parts of the study.

All assumptions and the reasons for making them should be documented. Where possible, the population forecast should be checked for consistency with other forecasts independently prepared, especially those relating to employment.

3. *Land use.*—A forecast of land uses within an area—their type, intensity, and geographic distribution—is based on the long range goals and objectives of the individual communities, the broad planning concepts for the entire urban region, and the market forces inherent in private and public capital expenditures. The land use forecast is essential for determining future travel movements and transportation needs.

The land use data needed as a base for developing the forecast may be obtained from field surveys, secondary sources, or a combination of both. All existing land use data, such as those available in local planning departments, should be fully utilized, provided they are adequate for the needs of the transportation study. Where a new field survey is necessary it should, to the extent possible, be jointly undertaken by local and regional planning agencies working together with the transportation study group.

The land use data should be collected in a form that will allow their use for a variety of planning purposes, as well as for future use in studying the area's land use growth trends and characteristics. To accomplish these objectives, the land use data (the location, identification, and areal measurement) should be collected and preserved in the greatest detail possible. It is desirable that land uses be identified

and measured on a parcel-by-parcel basis, rather than by larger areal units. Parcel-by-parcel identification may not be necessary in the case of homogenous areas of single-family residences where the data usually can be more economically collected by larger areal units, such as groups of parcels or entire blocks.

Similarly it is also desirable to list land use by specific activity (e.g., men's clothing store, drug store, radio and television repair shop, etc.) rather than to classify the land use activity into major categories. The detailed land use information can then later be classified in a variety of ways and to whatever level of detail is desired to accommodate the needs of different planning groups.

It is important that in planning for the land use survey, adequate provision be made for updating the land use inventory in an efficient and systematic manner, and also for preserving the data collected in a way that will allow their ready use in the future.

In addition to information on the location, identification, and areal measurement of land uses, the inventory should collect information on the characteristics of vacant land which may influence its potential for urban development.

The land use forecasting procedure results in the distribution of the total study area population and employment into smaller analysis areas (zones). These estimates should be consistent with current and anticipated trends, giving full consideration to plans or programs reflecting officially approved community goals and objectives.

There are several methods for forecasting the distribution of future land uses. The selection of a particular method will depend upon the economic characteristics and the size of the area studied and upon the basic data that are available to, or can be developed by, the transportation study. Long range estimates of the future spatial distribution of land use categories should be developed in approximately 5-year incremental periods to permit the periodic comparison of forecasts to actual development.

4. *Transportation facilities including those for mass transportation.*—The inventory of the existing transportation system should provide complete information on the physical features and operational characteristics of each link of the major street system (expressways, arterials, and collectors). A functional classification should be made of the street system, and procedures for accomplishing this are given in the National Committee on Urban Transportation Procedure Manual 1A.

Among the physical features of roads and streets that should be

inventoried are right-of-way width, roadway width, roadway type and condition, parking regulations, and traffic control regulations and devices. Other items that may be included are listed in the National Committee on Urban Transportation Procedure Manual 5A. The items to be included should fit the specific needs of each urban area study.

In order to evaluate the existing highway system, information is needed on the following operational characteristics by time of day: (1) the capacities of the roadways and the major street intersections; (2) the volume of traffic on each segment of the system; (3) the speed of traffic movement at different volumes; and (4) the frequency and location of accidents.

The street capacity study should utilize the techniques described in the Highway Capacity Manual. Data from the physical street inventory will be required for the capacity study.

Procedures for measuring traffic volumes on the street system are described in the National Committee on Urban Transportation Procedure Manual 3A. Additional information is available from the Bureau of Public Roads "Guide for Traffic Volume Counting Manual." Traffic volumes should be measured at a sufficient number of points to describe the traffic being carried by the major street system. Both the average daily traffic (ADT) and the morning and evening peak-hour volumes are needed. The total traffic counting program should also include manual and machine counts at selected cordons and screenlines, turning movement counts at important intersections, and vehicle classification counts at points representative of conditions on different types of roads and streets.

Procedures for making traveltime studies are described in the National Committee on Urban Transportation Procedure Manual 3B.

The inventory of the transportation system should also provide information on public transportation. Transit studies should provide data which will be useful in estimating the choice of mode of travel in the forecast year. The following data should be collected for each transit line by period of the day for an average weekday for the survey year:

a. Transit route map by type of service and transit vehicle.
b. Passenger counts at the CBD cordon or maximum load points.
c. Passenger fare distribution by single or combination fares.
d. Operating data, consisting of:
   (1) Revenue vehicle-miles.

(2) Average seating capacity by type of service and standee regulations.

(3) Route-miles and terminal-to-terminal running time.

(4) Headways.

(5) Regularity of service as measured by ability to maintain schedules.

Often additional information is needed on the character of trips within the central business district. To collect this information, "on and off" counts may be necessary.

A major purpose of the forecasting and inventory procedures is to judge the adequacy and efficiency of the future transportation system. To accomplish this objective it is necessary to assign the estimated future travel to existing and proposed new facilities. These assignments should be in sufficient detail to judge the reasonableness of the location and design of each segment of the network including one-way design hour volumes.

5. *Travel patterns.*—Urban transportation planning requires specific knowledge of the current travel patterns of the area being studied. 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. Although similarities in certain trip characteristics are found in different urban areas, there is enough evidence of differences to require their determination in each area.

For urban areas of over 50,000 population it is considered essential that the current travel for all types of trips (zone to zone, zone-to-external station, and external station to external station) by automobile, transit, truck, and taxi by purpose and time of day, be established. This can be done either by inventory (O-D surveys) or by utilizing a mathematical model which has been properly calibrated and tested. The zones into which the area is subdivided for analysis purposes should be sufficiently small to permit the transportation planning to develop traffic assignments meaningful at the arterial street level. Normally there should be no more than 10,000 future trip ends (origins and destinations) in any one zone.

It is recommended that the travel information be obtained by an external cordon and home-interview survey using methods described in Procedure Manual 2B of the National Committee on Urban Transportation. Sample rates suggested in the manual are recommended. Other survey techniques are acceptable, however, provided adequate

sampling procedures are used and adequate controls are established for expansion purposes.

The use of a model for developing the current travel pattern will be acceptable if the procedure used satisfies the following tests:

a. The total number of person trips, auto driver trips, transit trips, truck trips, taxi trips, and work trips are in reasonable agreement with controls independently established.

b. Trip generation equations used for estimating travel should be in reasonable agreement with actual relationships in the area being studied, and the trip length frequency distribution (and average trip length values) of estimated and actual travel should be similar.

c. The number of work trips estimated to be destined for selected employment areas within the city should compare with actual employment data within reasonable limits.

d. The distribution of trips crossing preselected screenlines should compare within acceptable limits with actual volumes measured on facilities crossing these lines. These screenlines should be placed so as to measure different portions of the travel pattern. The check should be made for vehicle trips and for transit trips where the latter are significant. If screenlines are used for calibrating the model, the same screenlines must not be used for testing the reliability of the results.

e. Weighting factors used to calibrate the travel distribution formula must be correlated logically with characteristics of the area where applied. The use of factors merely to provide a "match" between estimated and actual travel patterns will not be considered acceptable.

f. The assignment of the synthesized vehicular travel to the current highway network should produce a reasonable comparison with actual ground counts and vehicle-miles of travel.

Estimates must be made of the future travel by all modes. Zone to zone, zone-to-external station, and external station to external station traffic should be forecast, and it is recommended that estimates be made of the peak period travel as well as of the total 24-hour travel. Estimates of the future travel that will be generated from and attracted to each zone should be based on relationships between travel, land use, and economic characteristics established from current data (this, of course, does not preclude adjustment of current trip generation rates for use in the forecast year).

In cases where the current travel is determined by an inventory method rather than through a model, a procedure for distributing the estimated future travel among the several zones must be developed. If a model is to be used, it must be properly calibrated and tested. The current inventory data should be used for this validation of the model.

6. *Terminal and transfer facilities.*—The effectiveness and efficiency of the urban transportation system is dependent to a large measure upon the availability of adequate terminal and transfer facilities at trip origins and destinations.

If information on the present supply of parking spaces in critical areas is not available, an inventory should be made as outlined in Procedure Manuals 3C and 3D of the National Committee on Urban Transportation. The inventory should cover all parking facilities, both at the curb and in offstreet garages and lots. Also information on the location and use of truck loading and unloading facilities is needed. In addition, information on parking rates and on the average time, by hour of the day, required to park and unpark vehicles in offstreet facilities will be useful in estimating choice of mode of future trips.

Special studies should be made of selected major terminal facilities serving substantial volumes of commercial traffic whether located inside or outside of critical areas. The study of these facilities will provide information useful for determining future parking, loading, and unloading requirements for similar terminals which may be required in the future.

Estimates should be made of the future requirements for both parking and commercial loading and unloading facilities in critical areas. These estimates should be developed, utilizing the travel forecasts (as discussed under "Travel Patterns") by trip purpose and time of day, and should be consistent with recommendations for transportation system improvements. The feasibility of satisfying future parking demands should be determined considering their compatibility with existing and future land uses, ordinances, codes, and other regulations, and their effect upon the operational characteristics of expressways and arterial streets.

7. *Traffic engineering features.*—Many engineering techniques for increasing the traffic capability of facilities are known. Some involve for the most part relatively minor expenditures and little or no construction.

The transportation planning process should include a fuller utilization of the inherent capacity of existing expressways and arterials. Some traffic engineering techniques include improved signal operations, turning movement controls, parking restrictions, unbalanced lane operations, one-way street operations, through street systems, signs and markings, simple channelization, street lighting, and pedestrian controls, coupled with enforcement of regulations.

These techniques are more fully defined in the report "Increasing the Traffic-Carrying Capability of Urban Arterial Streets" by the Bureau of Public Roads and available from the U.S. Government Printing Office.

The planning of new facilities should include full consideration of those traffic engineering measures required to assure operation as planned.

8. *Zoning ordinances, subdivision regulations, building codes, etc.*—Zoning ordinances, setback requirements, subdivision controls, building codes, and the official map together with licensing powers are basic techniques used to control community development. The forecasting of future land uses is subject to considerable error at best, but lacking adequate controls, "planned" development will in most instances have little chance of becoming reality. Further, land use controls are important to protect the traffic-carrying capability of and public investment in transportation facilities.

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.

9. *Financial resources.*—One of the more critical factors influencing the selection of an urban transportation system and the programs devised to implement this system is the availability of adequate financial resources. In addition to determining the transportation system needs for a study area and the estimated costs to fulfill these needs, the transportation planning process should also survey and analyze the ability of the affected governmental units in the study area to finance the needed improvements.

A financial resources study should begin with an inventory of the sources and amounts of revenue available for the construction, maintenance, and operation of transportation facilities in the study area over the past 5 to 10 years. In addition a historical record of the disbursements actually made for transportation purposes over the same period of time should be obtained.

It is also well to determine the overall financial condition of the local governmental units involved by analyzing the trend of their funded debt. This trend, along with any laws specifying debt limitations or taxing restrictions may help indicate to what extent the governmental units within the study area will be able to contribute to the financing of the area's transportation system.

The next step in the analysis is to prepare estimates of the revenues expected to be available for transportation improvements within the study area. For many urban areas estimates are usually available for short-time periods.

10. *Social and community—value factors.*—In the development of transportation plans it is important that full consideration be given to the possibility of utilizing these facilities to raise the standards of the urban area. Open space, parks, and recreational facilities are important environmental factors. It is becoming more and more important in our transportation planning that additional attention be given not only to the preservation and enhancement of existing open space, but also to the providing of additional open space in anticipation of future development. Similarly, conscientious attention should be given to the preservation of historical sites and buildings.

Care should be exercised in selecting locations for new transportation facilities so that neighborhoods are not disrupted. To the maximum extent possible, cutting through school districts, ethnic groups, fire station districts, etc., should be avoided.

New transportation facilities should be made to blend into the natural landscape, taking advantage of scenic vistas, topography, etc. The location and design of new facilities should be such as to insure a pleasing appearance for the motorist, the pedestrian, and the nearby resident.

B. *Cooperatively.*—Cooperation is construed to mean that each jurisdiction having authority and responsibility for actions of regionwide significance should have appropriate voice in the transportation planning process, either through direct participation or through adequate representation. State highway departments should solicit the cooperation of all political subdivisions having such authority and responsibility. This solicitation can be made directly to the governing bodies of each individual political subdivision or through an appropriate local agency.

Ideally, all political subdivisions should participate in the transportation planning process. This would insure full consideration of all pertinent factors and contribute to the resolution of any differences of opinion during the process of developing proposals for improvements.

However, individual participation by all jurisdictions will generally not be practical of attainment in the large urban areas, and in such cases it may be necessary for the smaller jurisdictions to be represented by the larger or more inclusive ones. Many small incorporated places included in large urbanized areas do not have authority to exercise land use controls or to construct transportation improvements, and their participation need not necessarily be solicited. Such places could be adequately represented by their respective counties.

Each urbanized area has State and local legislation pertaining to authorities and responsibilities of local political subdivisions which make it impractical to establish uniform criteria for determining the specific political subdivisions with which a memorandum of understanding is required. It will be the responsibility of the regional engineer to make this determination for each urbanized area within his region.

In cases where the urbanized area is located in more than one State, the initial agreement should be between the State highway departments involved. The responsibility of effecting State and local cooperation rests with the particular State highway department concerned.

The memorandum of understanding need not follow any prescribed format but should clearly indicate that a continuing comprehensive transportation planning process is to be carried on cooperatively by the States and the local political subdivisions. The administrative procedure as to how this cooperation is to be effected, including an assignment of duties and responsibilities, should be covered in the memorandum or by reference to a prospectus.