Transportation planning and Management

Mid Term paper

Irfan ullah

ID# 15245

MS(TE)

Submitted to:Engineer Muhammad Majid Naeem saib

Ans#1 What is planning

Planning studies

Assumption and limitation

1-planning & Transportation planning:

Planning may be defined as the activity or process that examine the potential of future actions to guide a situation or system toward a desired direction.

Transportation planning is a cooperative, performance-driven process by which long and short-range transportation improvement priorities are determined.

2-Planning studies and methods:

Background:

The background section outlined the progress in the development of a formalized transportation planning process to produce transportation plan ,revised and selected to be implemented.

It also described the group of participants and that factors relevant to the best suitable execution of the planning function.

The participant groups were among elected official bodies, agencies having leading and supportive roles, advisory commissions and committees ,citizen officially appointed ,operators of public and private transportation networks, voluntary citizen ,professional associations and individuals.

Transportation engineers and planners participate various aspects of this complex process. One aspect of involvement that merits further treatment here is the conduct of supportive planning studies that attempt to model and estimate some of the many travel, economic, social, and environmental factors that have been deemed important to transportation planning.

Antecedents to Planning Studies:

The current transportation planning methodology has developed in a three step program

The first step toward the development of the contemporary transportation planning methodology may be traced to the conduct of land surveys that included

- the layouts of cities and towns
- and the locations of turnpikes, canals, and, later railroads.

The second step was the need to conduct facility inventories, such as the first national inventory of .1807.

The third step started when the Office of Road Inquiry, toward the end of the nineteenth. century, extended data collection efforts to include information relating to facility use, that is,

- traffic levels,
- trip lengths, and user costs.

The expanded usage studies that followed the prescription of the Federal-Aid Highway Act of 1921 to plan a connected national network and the transition' to studies emphasizing highway planning to meet future needs made possible by the Hayden-Cartwright Act of 1934 established the fundamental elements of transportation planning.

Planning for Future Needs:

Planning for future needs was developed during 1930 and 1940 recognized that the planning highway network extension should not be based on the criteria of connectivity, and desired to fulfill future travel demand.

In the starting it was established to project current traffic measurements in to the future using traffic growth factors based on relationship between population and economic growth.

For example, based on annual rates of growth in the gross national product (GNP), traffic growth factors in the range of 3 to 4% were considered to be reasonable. The projected traffic levels could then be checked against the capacity of existing highways to anticipate future capacity deficiencies and, within financial constraints, to plan and schedule capacity improvements accordingly.

Large-Scale Urban Travel Surveys:

Due the significant difference in the patterns of urban travels, there was a need of more refined techniques .An important difference was (and still is) the fact that in urban areas, street capacities between various parts of the city involved multiple rather than single

routes. If needed, capacity enhancements should consider this combined supply of road-. ways.

A desire line diagram, which shows the region divided into smaller sectors, or traffic (analysis) zones, and the flows between these zones irrespective of individual roadway links are preferable.

In order to obtain such information a new travel survey and data reduction methods were developed during 1940 including the origin and destination (O-D) surveys consisting of

- home interviews,
- truck interviews,
- taxi interviews,
- and parking surveys.

The required data was obtained from interviewing a sample consist of 4 to 5 % of the total households in the region and 20 % of the truck and taxi companied and then were expand to the overall population by application of computer based statistical techniques

and the actual traffic counts crossing selected screen lines were used to check the accuracy of the statistical expansion of the sample data. The first large-scale travel survey of this type was conducted in Detroit. At the present time travel surveys have become an indispensable tool for planning.

In 1996 the Travel Survey Manual authored by Cambridge Systematics, Inc. was released. The manual is a product of the Travel Model Improvement Program (TMIP) and was sponsored by the FHWA and the EPA.

TRAFFIC VOLUME COUNTS

- Number of vehicles passing a point.
- May be comprehensive counts covering the entire main road system in an area.
- Counts on all roads intersecting a cordon line which encircles a particular area.
- Counts on screen line(s) which divide a city into two or more parts.

Counts at specific points.

ORIGIN AND DESTINATION SURVEYS

An origin and destination survey may range from a relatively simple study to determine the amount of traffic that would by-pass a town to a comprehensive transportation survey for planning and design of the transportation system in a large metropolitan area

Travel-Demand Forecast:

The projection of trip generation was initially done by applying simple growth factors to the base-year desire travel volume in a manner similar to rural highway practice.

The first computer-based quantitative land use and socioeconomic projection models were developed by transportation planners in this connection and were later adopted eagerly by other urban planners.

Mathematical trip-generation models relating the trip-producing capability of residential areas and the trip-attracting potential of various types of nonresidential land-use classes were postulated, calibrated, and validated.

Of relevance to urban highway design was a prior knowledge of the degree to which arterial street traffic would be attracted to new freeways. Having this knowledge before designing a new facility was important in determining the capacity (e.g., the number of lanes) that it should provide.

Thus trip-generation, trip-distribution, mode choice, and traffic assignment models evolved, each intended to describe and forecast a different component of travel behavior.

Limitation and Assumption:

The added capacity and parking facilities in urban area was not uniform throughout the region and was dependent on special types and intensities such as residential, commercial, industrial density, workers per acre and shopping floor etc

The expected and economic system was unevenly distributed among the zones.

Ans#2: There are activities in a transportation planning are listed below

1. To collect travel information.
2. To identify existing system performance level
3. Estimating future travel demand
4. Forecast future system performance levels
5. Identifying different alternative solutions.

The activities exercised in a four steps conventional transportation will be discussed below.

1. **Trip Generation**
2. **Trip Distribution**
3. **Mode choice**
4. **Trip Assignment**

1-TRIP GENERATION;

The first step to forecast the travel is trip generation. the purpose of this model is to collect the information about the person trips that begin and end in each analysis zone for a typical day including

- Calculate number of trips generated /produced in each zone
- # of trips attracted to each zone
- Number of trips begin from and end in each zone for a typical dau

before its application, a trip generation model must be estimated and standardized by observation taken during the base year by means of travel survey.

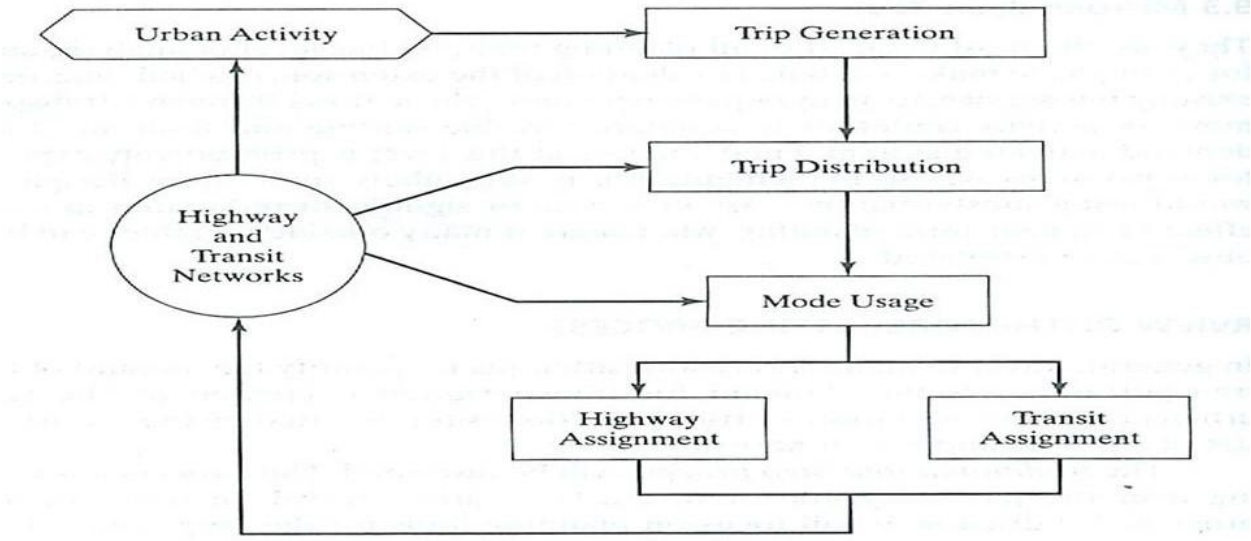


Figure 11-4 Four Basic Models Used in Transportation Planning (FHWA/UMTA, 1977).

To apply a calibrated trip-generation model the independent variables must be provided these variables are included:

- Land user activities in travel analysis zone
- Socioeconomics characteristics
- And population

Trip productions are based on household characteristics such as the number of people in the household and the number of vehicles available.

- The variable which affect trip generation and attraction are included.
- Density of land use
- Social and socioeconomic characteristics of users
- Location

This is completed separately by trip purpose

1.1-Trip Purpose:

In transportation planning the zonal trip making is estimated separately by trip purposes, typically including

- home based work trips (work trips that begin and end at home
- Home based shopping trips
- school trips,
- non-home based trips (trips that neither begin nor end at home
- social or recreational trips.
- Trucks and taxi trips

In some special context studies, other types will be considered suitable such as, a study that observed the travel behavior of users of a special purpose for elderly and handicapped persons considered travel are

- for medical and rehabilitation purposes

The reason separate trip-generation models are usually developed for each trip purpose is that the travel behavior of trip-makers depends on the trip purpose.

For example,

- work trips are undertaken with daily regularity, mostly during the morning and afternoon period of peak traffic, and from the same origins to the same destinations.
- The same is in the case of school trips.
- Social and recreational trips are clearly having different characters and are highly variable by origin and destination, number and time of day.

1.2-Zonal-Based versus Household-Based Models:

In a transportation planning study, the travel pattern of every individual is too complex, therefor the regions are divided into smaller travel analysis zones to summarize the geographical patterns of trip making.

The models are standardized on zonal base mean zonal characteristics were considered as independent variables

These zonal attributes included variables

- such as the zonal population,
- the average zonal income,
- the average vehicle ownership,

The household- models is bases on that households with similar characteristics will tend to have ·similar travel tendencies without any relation to the geographical location within the region.

The standardization of household-based models works a sample of households rather than a sample of zones. These models are called as disaggregate models, as each zone is decomposed into smaller units.

The attributes of households are included.

- Family income
- Family members
- Vehicles .

1.3-Productions and Attraction:

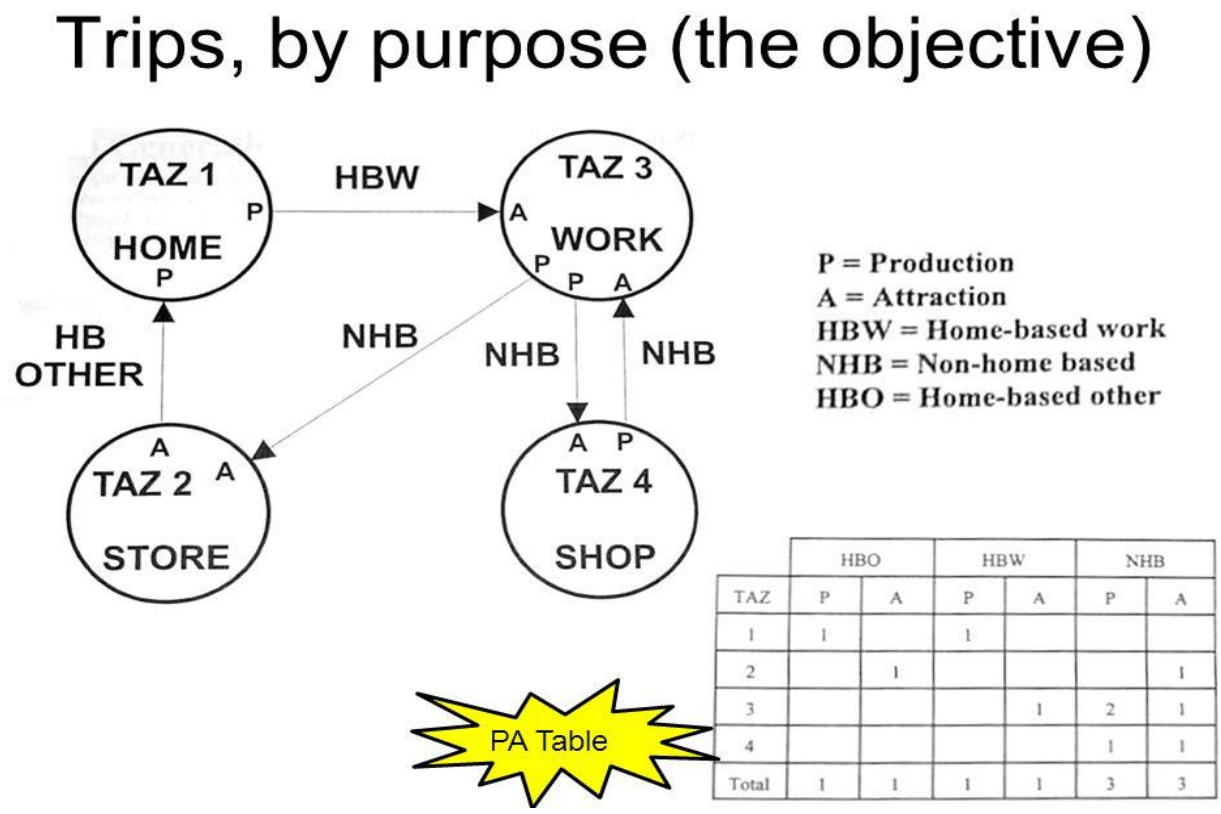
The Trips are forecasted by a trip generation model for each zone are referred as the trips ends related with that zone.

Trips may be categorized as either Production and attraction(P-A) or origin and distination(O-D)

Origin and destination are defined on the base of the direction of a given inter zonal trip of origin and one destination.

The associated land use with each trip end define either the trip is produced or attracted

If trip end connected with a residential land use in a zone the trip is termed as **produced,** and **trip attraction** is defined as trip end connected to a non-residential land use in a zone



	HBO		HBW		NHB	
TAZ	P	A	P	A	P	A
1	1		1			
2		1				1
3				1	2	1
4					1	1
Total	1	1	1	1	3	3

Trips can also be classified as home-based (HB) or as non-home-based (NHB). The former category consists of trips that either begin or end at a residence.

The three most common mathematical formulations of trip generation are …

- regression models,
- trip-rate analysis models,
- and cross_-classification models

2-TRIP DISTRIBUTION:

The next step in the forecasting model system is to estimate the target year trip-volumes that interchange between pair of zones

Trip-distribution procedures determine where the trips produced in each zone will go- how they will be divided among all other zones in the study area

Tij is the trip producing/going from zone TAZi and going/attracted to zone TAZj

The basis of trip distribution is as follows:

All trip-attracting zones J in the region are in competition with each other to attract trips produced by each zone I. more trips will be attracted by zones that have higher levels of "attractiveness."

If two zones having same shopping malls, resident will tend to show preference to the closest one .

There are different models for trip distribution but the most popular is gravity model

3-MODE CHOICE:

Trip maker can select between various travelling modes which includes

Driving, riding with someone else, taking the bus ,transit, bike .

A mode choice, of mode split, model is concerned with the trip-maker's behavior regarding the selection of travel mode.

The choice of mode is related with the characterisics of the Trip for example

If a person like to travel for work or school he would choose transit but for social trip he will prefer private automobile.

In addition to the attributes of the availab1e modes and the trip type, the socioeconomic ·status of the trip-maker affects the choice of travel mode.

Thus trip makers may also be classified into finer categories, such

- Income
- Age

There are some special sub group consist of people who don't have access transportation and they are exclusively dependent on private transit system, these groups include

- The poor, very young
- The elder and even the second primary individual of one car household

There are three categories of factors summarize the mode choice behavior of trip maker.

The factors that explain this behavior include:

1. The characteristics of the trip-maker

2. The characteristics of the trip

3. The attributes of the available modes of travel

4- TRIP ASSIGNMENT:

The last phase of the four-step transportation-forecasting process is concerned with the trip maker's choice of path between pairs of zones by travel mode and with the resulting vehicular flows on the multimodal transportation network.

This step may be viewed as the equilibration model between the demand for travel (Qijk) estimated earlier in the process and the supply of transportation in terms of the physical facilities and, in the case of the various possible mass transit modes, the frequency of service provided.

Incidentally, this conceptual framework of economic theory is applicable to earlier steps of the process as well and has been so treated by many authors. Examples 8.6 through 8.12 illustrate how people respond to changes in the availability and price of transportation services. If the price of one mode increases relative to another, its market share will decrease. Returning to the topic of network assignment, the question of interest is, given Qijk ,that is, the estimate of inter zonal demand by mode, determine the trip-maker's likely choice of paths between all zones I and J along the network of each mode K and predict the resulting flows q on the individual links that make up the network of that mode (Fig. 8.5.1). The estimates of link utilization can be used to assess the likely level of service and to anticipate potential capacity problems

A network assignment procedure requires:

. 1. A way of coding the modal network for computer processing

2. An understanding of the factors affecting the trip-maker's path preferences.

3. A computer algorithm that is capable of producing the trip-maker's preferred paths

4.1- Person-Trips and Vehicle-Trips

The forecasts of the person-trip and vehicle-trip flows that are expected to use the transportation system are both relevant to the assessment of its performance. The estimate of person-trips that desire to use a highway, for example, provides an indication of the passenger throughput that will be accommodated

4.2- Trip Direction:

In the discussion of trip generation, a distinction was drawn between productions and attractions on one hand and origins and destinations on the other.

It was also explained why most trip-generation models estimate productions rather than origins. However, it is desirable that the assignment of trips(especially by the time of day) retains the ·direction of these trips.

The predominant direction of travel during the morning peak period is toward major activity centers (i.e., CBDs or schools), and the reverse is true during the evening peak period. The experience and knowledge accumulated through studies of the travel patterns within the region aid in the accomplishment of this task. Directionality factors by time of day and trip purpose are typically used to convert production-attraction tables to origin- · destination (0-D) tables

Ans#3:

Trip generation/attraction have been calculated .

Zone 5 has max no of trips.

land use category		zone:1(peshawar)			zone:2(charsada)			zone:3(Mardan)			zone:4(Nowshera,)			zone:5(Swabi)			zone:6(Abbottabad			zone:7(.Kohat)		
		Area(ha)	Trips per ha(average values from table 2	Trip generated/attracted	Area(ha)	Trips per ha(average values from table 2	Trip generated/attracted	Area(ha)	Trips per ha(average values from table 2	Trip generated/attracted	Area(ha)	Trips per ha(average values from table 2	Trip generated/attracted	Area(ha)	Trips per ha(average values from table 2	Trip generated/attracted	Area(ha)	Trips per ha(average values from table 2	Trip generated/attracted	Area(ha)	Trips per ha(average values from table 2	Trip generated/attracted
residential		7740	60	464400	24900	60	1494000	17064	60	1023840	40204	60	2412240	29317	60	1759020	576416	60	34584960	53445	60	3206700
Commercial	Retail	6972	565	3939180	5688	565	3213720	26220	565	14814300	6172	565	3487180	126091	565	71241415	15270	565	8627550	1290	565	728850
	wholesale	14940	328	4900320	10744	328	3524032	20976	328	6880128	7715	328	2530520	90065	328	29541320	7635	328	2504280	1935	328	634680
	services	5976	78	466128	2528	78	197184	1748	78	136344	6172	78	481416	162117	78	12645126	10180	78	794040	1720	78	134160
Manufacturing		1290	65	83850	4980	65	323700	1264	65	82160	1748	65	113620	4629	65	300885	36026	65	2341690	12725	65	827125
Transportation		1935	23	44505	8964	23	206172	5688	23	130824	5244	23	120612	4629	23	106467	90065	23	2071495	10180	23	234140
public buildings		2580	115	296700	9969	115	1146435	4424	115	508760	6992	115	804080	3086	115	354890	252182	115	29000930	30540	115	3512100
public open space		3010	5	15050	22908	5	114540	15800	5	79000	71668	5	358340	92580	5	462900	468338	5	2341690	114525	5	572625

Total trips generated/Attracted for each zone			**10210133**			**10219783**			**23655356**			**10308008**			**116412023**			**82266635**			**9850380**