



IQRA National University, Peshawar

Subject : Transportation Planning & Management (Mid Term Paper)

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Q . N O . (01) ANSWER (BELOW)

- + Definitions**
- + Planning studies**
- + Strategies**
- + Assumption and limitations**
- + Conclusion/Result**

➤ **Planning :**

- ❖ An activity that examines the potential of future actions to guide a situation/system towards a desired direction.

➤ **Transportation Planning :**

- ❖ A methodical process of planning for transport needs. It is a combination of science & arts.

➤ **STUDIES TO BE CARRIED OUT IN SCOPE OF TRANSPORTATION PLANNING.**

- Traffic volume studies
- Origin & Destination studies
- Speed studies
- Travel time & delay studies
- Parking studies.

Explanation:

(1) Traffic volume studies:

- To collect a data on the number of vehicles/pedestrian that pass a point during a specified period.
- To know whether the existing road can accommodate the vehicles that using a road.
- May be comprehensive count covering entire road system in an area.
Counts on all roads intersecting a corden line which encircles a particular area.
Counts on screen line & specific points.
 - The information sought will be traffic volume & direction , volume of turning traffic, hourly ,daily & seasonal variation of traffic & proportion of cars/trucks.

(2) Origin & Destination studies:

- The survey is primarily for transportation planning, particularly the location, design, and programming of new or improved highways, public transport, and parking facilities.
- 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.
- **Methods include**
 - Recording registration numbers
 - Handing postcards to drivers
 - Roadside interviews
 - Tag-on-vehicle surveys

- Home interview surveys

(3) Speed studies:

- In this study, a radar meter, which gives a direct reading of speed.
- Taking photographs of a section of road at a predetermined time interval and measuring the distance
- Results may be presented in tables, graphs and diagrams.
- These may include
 - Speed distribution and cumulative frequency distribution curves.
 - The mean speed (TMS & SMS)
 - The 85th percentile Speed

(4) Travel & time delay studies:

- **Travel time** measures the average journey time and journey speed on sections
- Used in traffic assignment, Quality of the traffic route , Before and after effect of traffic engineering techniques
- **Delay study**
- By analyzing the delays, the location and cause of the congestion can be identified and remedied.

(5) Parking studies:

It is usually done to;

- Assist in cordon counts
- the number and location of existing parking spaces, both kerbside and off-street;
- existing parking practices, including usage of available spaces, parking duration, illegal parking;
- the need to impose or vary parking time limits or to install parking meters;
- the adequacy of existing enforcement measures.
- For larger cities, a comprehensive parking demand study is required.
- It includes the determination of parking usage, parking habits as well as the origin, destination and purpose of trip of drivers parking in the area.

Other Traffic Studies include:

- Turning movement count, Vehicle delay studies, Saturation flow rate, Queue lengths, Gap study, Vehicle occupancy study, Commercial vehicle survey , Trip generation study.

➤ **STRATEGIES IN TRANSPORTATION PLANNING/MODELING:**

- Information sharing & awareness for the need to adapt are important to improve the capacity of citizens in terms of transportation.
- To take in to account the future climate change impact , there is need to gather data as discussed & study vulnerabilities.
- Planning with resilient design standard technologies materials for infrastructure construction/Roads.
- Urban Transport planning with focus on high risk areas.
- Improved Drainage systems.
- Robust decision making is required.

➤ **STRATEGIC TRANSPORTATION PLANNING**

- Capital intensive improvement
 - Major S&M synonymous to small strategic plan
 - Recycling of S&M during long time possible
- New facilities, Major changes in existing facilities, Long range policy actions, Future land development policies, adding highway link, bus transit system.
- Travel demand forecasting play an important role.

➤ **SHORT &MEDIUM TERM TRANSPORTATION PLANNING (S&M)**

- Making existing system efficient.
- Short range transportation needs.
- To increase efficiency:
 - Efficient use of existing road space.
 - Reduce vehicle use in congested area.
 - Improve transit service.
 - Improve internal management service.
- Planning with short range objectives based upon studies with limited scope and local orientation.
- Evaluation Criteria can be accidents, travel time etc.

ASSUMPTIONS

➤ **Fundamental Assumptions:**

Travel patterns are tangible, stable and predictable. Movements demands are directly related to the distribution, and intensity of land use, which is capable of being accurately determined for some future date.

➤ **Additional Assumptions:**

- Decisive relationship exists between all modes of transport and that the future role of a particular mode cannot be determined without giving consideration to all other modes.
- The transportation system influences the development of an area, as well as serving that area. Area of continuous urbanization require a region-wide consideration of transport situation.
- The transportation study is an integral part of the overall planning process, and cannot adequately be considered in isolation. The planning process is continuous, and require continuous updating, validating and amendment

➤ **LIMITATIONS.**

- No feedback with transportation plans.
- Current development is fixed – considers only vacant land.
- Mixed-use benefits not considered.
- Only considers factors and alternatives explicitly included in the equations.
- If models are not sensitive to certain factors, they will not show any effect of them.
- This could lead to a conclusion that the factors are ineffective. E.g., bicycle or pedestrian
- It is therefore critical to consider the assumptions before decisions are made

➤ **CONCLUSION/RESULT**

- **A clear understanding of the transportation modeling process and assumptions is essential to understanding transportation plans.**
- **Studies must be carried out carefully for effective transportation planning & to avoid negative consequences in future.**

Q . N O . (02) ANSWER (BELOW)

- ✚ **Activitteis exercised in four step conventional tranportation Modeling.**
- ✚ **Four step conventional model/Activities Involved.**
- ✚ **Reference to different Zonal production & Attraction.**
- ✚ **Conclusion/Remarks.**

➤ **ACTIVITIES EXERCISED IN TRANSPORTATION MODELING/PLANNING**

- Collect travel information
- Identify existing system performance levels
- Estimate future travel demand
- Forecast future system performance levels
- Identify different alternative solutions

➤ **EXPALANATION:**

- **Activities “Population forecasts”**

Future population forecasts are based on assumptions about birth rates, death rates and the rate of migration into or out of the study area. Current information about the ages of the population is used to forecast ahead by the calculation of the number of births, deaths and migrants added or leaving the region in each year of the future. These rates are assumed to remain constant or to change in a specified way. These rates have changed substantially over the past 30 years so often several forecasts are made under different growth rate assumptions. Population forecasts can be made by the planning agency itself or they can use forecasts done by others such as a state agency.

- **Activities will people engage like “Economic forecasts”**

Forecasts need to be made of future employment levels as these are the basis for forecasts of travel to work, school, shopping, etc. Economic forecasts are done in conjunction with the population forecasts since the two are highly interrelated. Employment grows because the population is growing, but migration rates into and out of the community depend upon the growth of the economy. Assumptions have to be made of the ability of a region to generate new basic employment and to hold onto its existing basic employment. Basic employment is that which exports good and service outside of the region. It is different from the non-basic or local sector of the economy which circulates the money brought into a region by the basic sector. Total employment is found by applying an economic multiplier to basic employment.

- **Activities occur “Land use”**

Population and economic growth has to be distributed to different locations in order to do travel forecasts. It is necessary to know where people will live, work, shop and go to school in the future to estimate of future trip making. Future allocation of land use may be based on past trends, assumptions about changes in trends or through a negotiation process among local officials. Land use plans are be developed to change existing trends if is felt that current trends will not continue or are undesirable.

The first step in a land use planning process is to establish specific land use goals and associated land use rates. Goals need to be set concerning preservation of open space, wetlands and environmental corridors as well as land use mixes and densities. Quantities of land required for various uses are established to meet projections of population and employment. Alternative plans can be developed to reflect different goals, land use policies and assumptions. For example, land use plans could be developed to continue current trends, to reduce low density urban development, or to concentrate development along major corridors or in satellite communities.

➤ **STUDY AREA**

- Divide study area into study zones, TAZs (Travel Analysis Zones)
- Homogenous urban activities (generate same types of trips)
- Residential, Commercial ,Industrial

➤ **Travel Analysis Zones-TAZs**

- May be as small as one city block or as large as 10 sq. miles
- Natural boundaries --- major roads, rivers, airport boundaries
- Sized so only 10-15% of trips are intrazonal

- Links: sections of roadway (or railway)
- Nodes: intersection
- Centroids: center of TAZs
- Centroid connectors: centroid to roadway network where trips load onto the network

FOUR STEP CONVENTIONAL TRANSPORTATION MODEL ACTIVITIES INVOLVED/EXERCISED.

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

(1) Trip Generation

- Trip generation is the first step in the conventional four-step transportation planning process, widely used for forecasting travel demands. It predicts the number of trips originating in or destined for a particular traffic analysis zone.
- Trip generation uses trip rates that are averages for large segment of the study area. Trip productions are based on household characteristics such as the number of people in the household and the number of vehicles available.
- TAZs land use activities
- Socioeconomic characteristics of TAZ
- 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

➤ **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.

(2) Trip Distribution

- Trip distribution is the second component in the traditional 4-step transportation planning model. This step matches trip makers' origins and destinations to develop a "trip table" a matrix that displays the number of trips going from each origin to each destination.
 - Determines trips between pairs of zones
 - T_{ij} : trips from TAZ i going to TAZ j .
- 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

- Mode choice analysis is the third step in the conventional four-step transportation planning model. Trip distribution's zonal interchange analysis yields a set of origin destination tables which tells where the trips will be made; mode choice analysis allows the modeler to determine what mode of transport will be used.

- Mode choice is one of the most critical parts of the travel demand modeling process. It is the step where trips between a given origin and destination are split into trips using transit, trips by car pool or as automobile passengers and trips by automobile drivers. A utility function measures the degree of satisfaction that people derive from their choices and a disutility function represents the generalized cost that is associated with each choice.
- Mode choice determines # of trips between zones made by auto or other mode, usually transit.
- 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 characteristics 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 available 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) Network Assignment

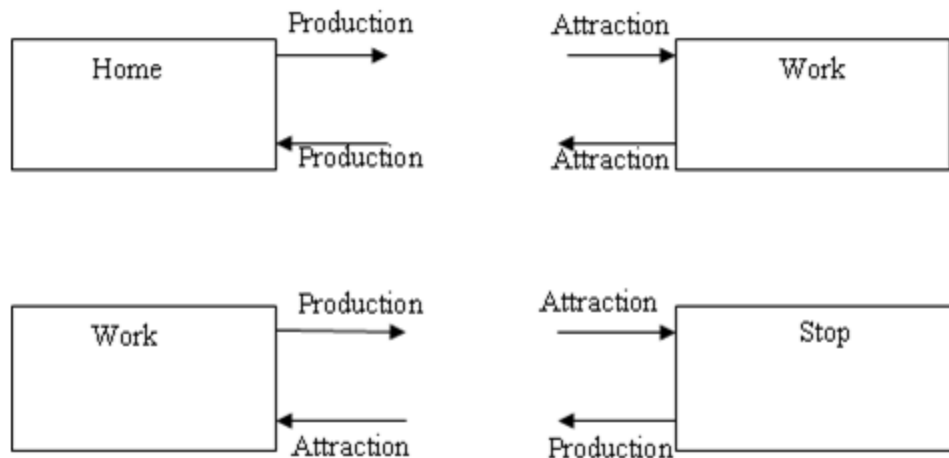
- Trip assignment, traffic assignment or route choice concerns the selection of routes (alternative called paths) between origins and destinations in transportation networks. It is the fourth step in the conventional transportation planning model. Mode choice analysis tells which travelers will use which mode. To determine facility needs and costs and benefits, we need to know the number of travelers on each route and link of the network.

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.

REFERENCE WITH ZONAL PRODUCTION & ATTRACTION ATTRIBUTES

- Forecast no of trips that produced or attracted by each TAZ for a “typical” day
- Forecast – function of other variable.
- **Productions and Attraction:**
 - The Trips are forecasted by a trip generation model (as discussed above)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.
- **Forecast # of trips that produced or attracted by each TAZ for a “typical” day**
- **Attraction**
 - It includes Number and types of retail facilities, Number of employees ,Land use
- **Production**
 - It includes Car ownership, Income ,Population (employment characteristics)



- Modeling basically relates the dependent variable i.e trips produced by a zone for aggregated model or household trip production (discussed above) rate for household based models to the corresponding Independent variables characterized by the whole zone or household characteristic respectively. Calibration is done based on the set of observations obtained corresponding to the zones for aggregate model and for disaggregate model employs a number of base year observations corresponding to an individual household in a sample of household drawn randomly from the region.

➤ **Zonal-Based versus Household-Based Models:**

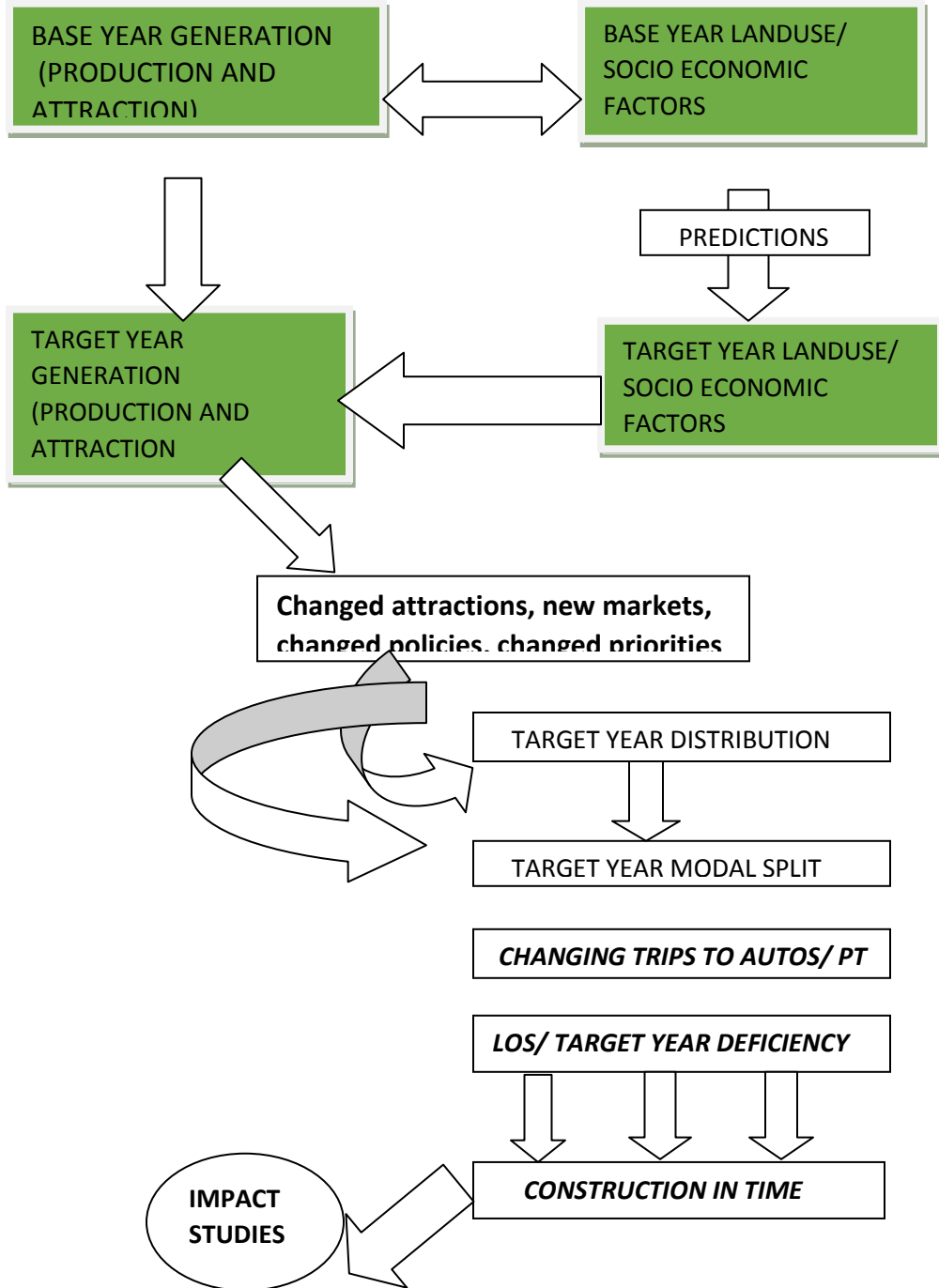
- In a transportation planning study, the travel pattern of every individual is too complex, therefore the regions are divided into smaller travel analysis zones to summarize the geographical patterns of trip making.
- The models are standardized on zonal base mean zonal characteristics were considered 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.

- (1) Family income (2) Family members (3) Vehicles



CONCLUSION/RESULT

The activities exercised in planning for a four step conventional modeling need much attention to be accurately estimated considering factors as discussed above in order to overcome issues/problems that may occur/happen in future.

Q . N O . (03) ANSWER (BELOW)

- **The trip generation/attraction have been find given In table below page.**
- **Comments:**
- **For zone 5 , the max trips will be generated**
- **Variations in different zones can manipulate from result calculated in table (given below)**

No	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 value)	Trip generated/attracted	Area(ha)	Trips per ha(average value)	Trip generated/attracted	Area(ha)	Trips per ha(average value)	Trip generated/attracted	Area(ha)	Trips per ha(average value)	Trip generated/attracted	Area(ha)	Trips per ha(average value)	Trip generated/attracted	Area(ha)	Trips per ha(average value)	Trip generated/attracted	Area(ha)	Trips per ha(average value)	Trip generated/attracted	
1	residential	7740	60	464400	24900	60	1494000	17064	60	1023840	40204	60	2412240	29317	60	1759020	576416	60	34584960	53445	60	3206700	
2	Commercial	Retail	6972	565	3939180	5688	565	3213720	26220	565	14814300	6172	565	3487180	126091	565	71241415	15270	565	8627550	1290	565	728850
3		wholesale	14940	328	4900320	10744	328	3524032	20976	328	6880128	7715	328	2530520	90065	328	29541320	7635	328	2504280	1935	328	634680
4		services	5976	78	466128	2528	78	197184	1748	78	136344	6172	78	481416	162117	78	12645126	10180	78	794040	1720	78	134160
4	Manufacturing	1290	65	83850	4980	65	323700	1264	65	82160	1748	65	113620	4629	65	300885	36026	65	2341690	12725	65	827125	
5	Transportation	1935	23	44505	8964	23	206172	5688	23	130824	5244	23	120612	4629	23	106467	90065	23	2071495	10180	23	234140	
6	public buildings	2580	115	296700	9969	115	1146435	4424	115	508760	6992	115	804080	3086	115	354890	252182	115	29000930	30540	115	3512100	
7	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/A ttracted for each zone			1021013 3			1021978 3			2365535 6			1030800 8			1164120 23			8226663 5			9850380
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