URBAN TRANSPORTATION PLANNING

(18CV745)

QUESTION BANK

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MODULE 1

1. What are the impacts of transportation on environment?

Some of the major environmental impact of transport development are:

1. *Energy consumption in transport and environment pollution:*

- Transportation requires energy mainly for vehicle operation and to some extent for manufacturing of vehicles. The energy consumption in transport is main cause of pollution.
- There is a significant difference in fuel efficiencies between various modes of transport Eg: Consumption of energy in car is more among urban transport modes. Though there is significant improvement in the fuel efficiency of automobiles, the energy consumption will continue to increase in spite of fuel efficiency measures.

2. *Air Pollution*

Pollution of the atmosphere by fumes and smoke emitted by the motor vehicles makes the urban street extremely unpleasant. With further growth of vehicle population, the problem is bound to assume serious proportions.

The major source of the pollutants in the exhaust gas emitted by the internal combustion engine. The following are the major components of the exhaust gas:

- Corbon di-oxide (CO_2): It is the most important contributor to climatic change.
- Corbon monoxide (CO): This is the poisonous gas caused as a result of incomplete combustion. Small doses of CO present in air due to rad traffic may not be a medical danger, but can cause major effects.
- Oxides of nitrogen and lead compounds: The concentration of nitrogen oxides due to road traffic being small, there presence does not appear danger to health but the effect of long-term exposure might cause anxiety. Increase in concentration of lead compounds also affects the well-being of the society.
- Carbon particles (Smoke): Smoke contains minute particles of carbon and though by itself is not a health hazard, it may prove dangerous in combination with other compounds.

3. *Noise Pollution:*

Another impact of transport system is the noise pollution. The sources of noise from road vehicles are many and varied including,

a) Noise generated from various parts of the vehicles like engine, exhaust, breaks, horns, chassis, loads in the vehicle, door slamming etc.

- Motor vehicles and scooters are generally nosier than passenger cars
- Commercial trucks are a main source of noise as they carry heavy loads
- Old and improper maintenance of vehicles generates more noise

b) Noise contributed by the interaction between vehicle and road surface:

- Smooth surface generally produces less noise than rough surface
- Grooved cement concrete has been practically found to be a source of annoying noise

c) Noise dependent on the speed, flow, density of traffic:

- AS the traffic volume increases, the noise level inevitably raises
- Higher speed also known to cause higher noise level
- Noise level increases during acceleration

4. *Visual intrusion and degrading the aesthetics:*

- In urban areas, the motor vehicles have been competing for space for movement and it appears that buildings seem to raise from the plinth of cars.
- The tranquillity and openness of parks and squares has been occupied and spoiled.
- To attract the attention of the motorist numerous signs, signals and bill board have sprung up all along streets, spoiling the beauty of the surrounding land, historical landmarks and architectural master pieces.
- Service stations, garages and petrol filling stations have spread up along the road and added their mite to the degradation of the general scene.

5. *Severance and land consumption:*

Severance is the general term denoting the psychological, cultural and physical disturbance caused by a traffic facility on the neighbourhood, land, society and life cycle.

- Highway and streets consume an enormous amount of land and requires compulsory acquisition of land which can cause disruption to way of life among community.

- The amount of land acquired by streets and highways is so large that it has created problems of rehabilitation and relocation.
- Precious land uses such as forestry, agriculture, housing and nature reserves may be displaced.

2. Explain the difficulties in urban transportation condition.

- The most serious effect of increasing urbanization and accelerated traffic cause the severe congestion on the streets. The condition results in concentrated demand both in time and space.
- The very advantage claimed for motor vehicle viz. its ability to provide a door to door service seems to be difficult to obtain. It is not possible to stop the vehicle and get down at one's own will.
- Parking at a safe place is almost an impossibility in some areas of the city
- Loading and unloading of goods by commercial vehicles is hampered by too many restrictions.
- Congestion results in delays and time losses.
- Driver stresses are caused by frustration and delays.
- An inevitable result of growth of traffic results in increased road traffic, which take a great toll of human life every year.
- The deterioration due to traffic has been causing serious concern.

  a) The noise in the streets and adjoining areas has been growing up to intolerable levels

  b) The exhaust from the vehicles pollutes the atmosphere with fumes and smell

  c) Vibration of buildings and adjacent structures and visual intrusion are some of the other ill-effects.

3. Write a note on

(i) Para Transit Transport

- Paratransit service is the general terms for a "demand-response" service which a passenger must reserve a ride in advance.
- It includes all public and private automobile travel and fixed route and fixed schedule bus and rail transit.
- It also includes carpools and vanpools (shared ride modes), public autos (station cars), charter buses, exclusive and shared ride taxi cabs and bus transportation operating on

flexible routes and flexible schedules in response to individual request for service. Hence termed as " Demand-Responsive" or 'Dial-a-ride" service.

(ii) Light Rail Transit (LRT)

LRT is popularly known as the tram or the street car. Trams used to operate on the roads of Delhi and Bombay where they have now been discontinued. However, continue to be run in Calcutta. Word light rail not refers to the strength of the rail, but to the lighter cars, shorter trains and method of operation.

Advantages:

1. Trams is an electrically based system. The fuel crisis has made oil-based bus transport system costly. Trams is free from the uncertainties associated with availability of oil.
2. Trams are relatively cheaper than conventional sub-urban rail systems.
3. Trams are suitable for pedestrian malls.

(iii) Private Transport

The personalised motor vehicles have grown popularity because of greatest advantage it has over other forms of transport system like flexibility in travel route and travel time, door to door service. But the problems of fuel shortages, congestion, parking, environmental pollution etc. hampered the further development in this system. Developed technologies includes:

a) Automated Highways:

It consists of a specially designed highway carriage way with control cables embedded in the pavement. The operations normally performed by a driver such a speed selection and adjustment of space between successive vehicles would be handled by a centralise computers. It is reported that capacity of 9000vehicles/hour/lane is possible with this system

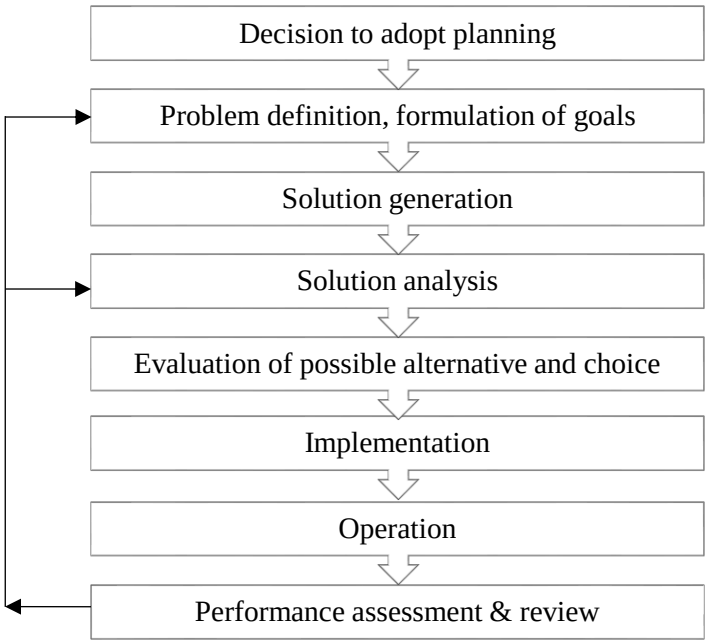
b) Dual- mode system:

Consists of a small personalised car, capable of moving on roads as well as on rail lines. They are automatically driven and controlled when it is on rail

c) Battery powered small cars offers new power source and are likely to be popular in near future.

4. Explain System Approach to transportation planning with a flow diagram.

The process involved in the system approach in transport planning is represented in figure below:



- The transport planning starts with the decision to adopt planning as a tool for achieving certain desired goals and objectives.
- After goals and objectives are defined, solutions are generated taking due consideration of problems, constraints, potential and forecasting. These solutions are evaluated after analysis.
- The best amongst is chosen for implementation.
- After implementation, the system is studied in operation and its performance assessed. Based on this assessment it may be necessary to go back to certain stages of planning and repeat the sequence.

5. Explain the interdependence of land use and transportation.

Transportation planning was done through measurement of traffic using streets, identifying those sections were present traffic has exceeded the capacity and undertaking improvement measures to relieve congestion and bottle necks in the smooth traffic flow. This simplest approach failed to deal with complex transport problems and only provided short term solutions. This approach is eventually abounded.

1. In 1954, **Mitchell and Rapkin** made a statement that '*Urban transport was a function of land use*'. It paved the way for a new line of thinking in urban transportation and land use planning. Mitchell and Rapkin observed the various kind of activities based on the land called land use – "generated'' different amount and kinds odf traffic. They concluded that measures such as provision and improvement of physical channel of movement and regulation and control of traffic were effective in dealing with urban traffic. But the most basic level of action for a long run solution of traffic problem is the planning, guidance and control of land use pattern.

2. **Buchannan** has also emphasised the inter-relationship between traffic and buildings in town. He states that 'In towns, traffic takes place because of buildings in fact all movements in town have an origin and destination in building'. The pattern traced by traffic is thus closely related to the manner in which buildings are arranged.

6. Explain the 4-Stage transport planning model?

The process of travel demand forecasting consists of four stage model

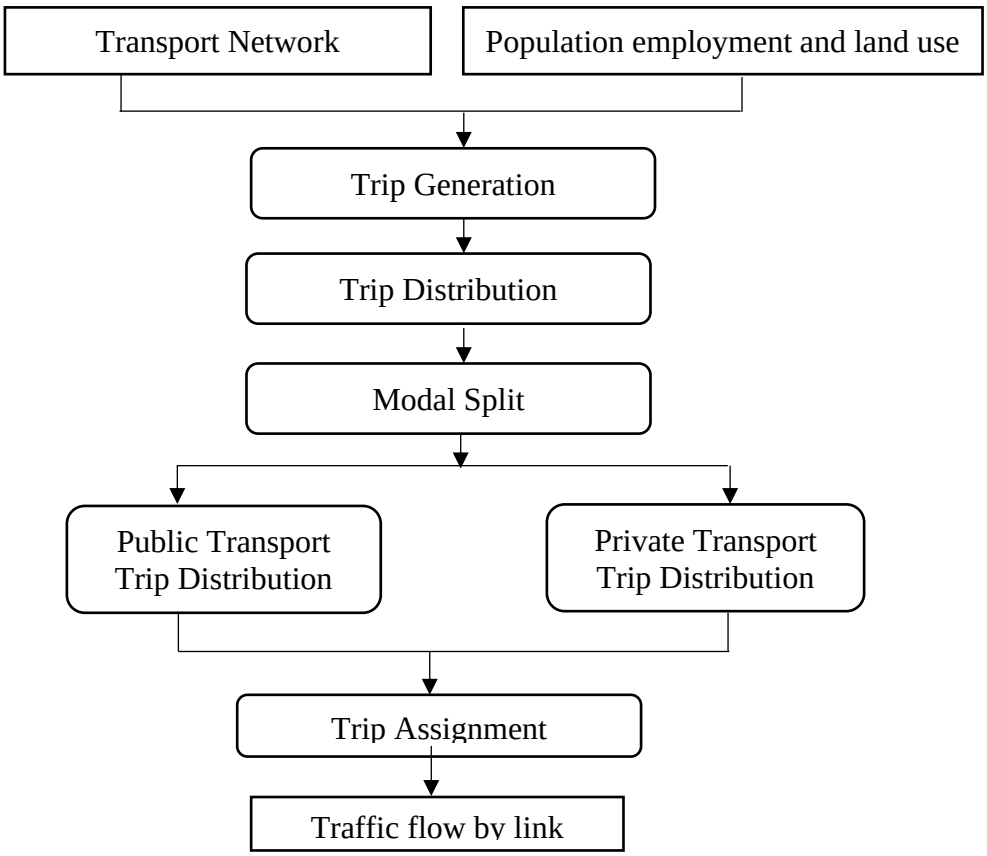


Fig: Stages in Transport Modelling

1. Trip Generation:

Trip generation is the first stage of transportation demand models. It is a general term used in the transportation planning process to cover the number of trip ends in the given area. Trip generation is classified into production and attraction.

Production (Origin): Number of trip end originated in zone i

Attraction(Destination): Number of trip end attracted to zone j

There are basically two tools for trip generation analysis:

a) Multiple linear regression analysis

b) Category analysis

2. Trip Distribution:

The decision to travel for a given purpose called trip generation. The decision to choose destination from origin is directional distribution and forms the second stage of travel demand modelling.

Trip distribution is determined by the number of trip ends originated in zone-i to number of trips attracted to zone-j, which can be understand by matrix between zones. The matrix is called origin-destination (O&D) matrix.

The trip generation models include:

a) Growth factor models
   - Uniform growth factor
   - Average growth factor
   - Fratar method
   - Furness method

b) Synthetic modes
   - Gravity model
   - Opportunity model

3. Modal Split:

The third stage in travel demand modelling is modal split. Modal split is determined by number of trips of people process by the different mode of travel. In other words, modal split is used to C two or more mode categories like public transport riders and personal/private riders.

Modal split methods include:

a) Probit Model

b) Logit Model

4. Trip Assignment:

Trip assignment is fourth and final phase of the four-stage modelling. Travelers will choose the route which will take minimum travel time, minimum travel distance dependent on the traffic volume on the road. The following are commonly used traffic assignment models.

1. All or nothing assignment
2. Multiple route assignment model
3. Capacity restraint assignment model
4. Capacity restraint multipath route assignment model
5. Diversion curves technique model

MODULE 2

1. Describe how the study area is divided into Zones and mention the factors to be considered while dividing area into zones.
2. List the various methods available for data collection. Explain a) Home Interview Survey b) Registration Number Survey
3. It is required to find origin and destination detail for the given study area. Choose the appropriate methods and explain any three methods.
4. Discuss the various inventory required to collect information related to travel facilities

MODULE 3

1. Explain the various factors governing the trip generation.
2. State the important criteria for the evaluation of regression equation with relative assumption made in analysis of trip generation and discuss the limitations of multiple linear regression analysis and the suitability.
3. Enlist the different methods of trip distribution and discuss the method which considers the average value of trip as the future distribution
4. Discuss the methods to distribute the interzonal trips based on growth factor.
5. The distribution of present trips among zone 1,2 and 3 are given in O-D matrix below. The future trips generated in zone 1,2 and 3 are expected to be 360, 1260 and 3120 respectively. Distribute the future trips among various zone using i) Uniform factor Method ii) Average growth factor method and draw the conclusion based on result.

O/D	1	2	3
1	60	100	200
2	100	20	300
3	200	300	20

6. Determine the future trip distribution by Furness method from the following data (upto two iteration)

O/D	1	2	3	4	Future Trips
1	-	50	60	30	280
2	40	-	70	20	390
3	20	60	-	40	300
4	50	70	30	-	220
Future Trips	200	500	340	150	

7. The following table gives trip distribution between four zones 1, 2,3 and 4. Estimate the future interzonal trip between the four zones. (upto two iteration)

	1	2	3	4	Future Trips
1	10	20	15	18	140
2	21	16	17	14	150
3	30	21	25	27	200
4	10	9	16	13	100
Future Trips	150	120	180	160	

MODULE 4

1. The total trips produced in and attracted to the three zones A, B, and C of a survey area in the design year are tabulated below

Zone	Trip Produced	Trip Attracted
A	2000	3500
B	3500	4800
C	4800	2000

   It is known that the trips between two zones are inversely proportional to the second power of the travel time between zones, which is equally 25 min. If the trip interchange between zones B and C is 300. Calculate the trip interchange between zones A-B, A-C, B-A and C-B
2. Explain Opportunity model of trip distribution.
3. A self-contained town consists of four residential areas A, B, C and D and two industrial areas X & Y. The trips from home-work generated by each residential area are as follows

A	B	C	D
1000	2250	1750	3200

There are 3700 jobs in industrial estate X and 4500 in industrial estate Y. It is known that attraction between zones in inversely proportional to the square of the journey times between zones. Calculate and tabulate the inter zonal trips for journey from home to work. The journey time in minutes from home to work are as follow:

Zone	X	Y
A	15	20
B	15	10
C	10	10
D	15	20

4. Explain the factors affecting Modal Split
5. With the flow diagram explain Pre-distribution modal split
6. With the flow diagram explain Post-distribution modal split.
7. The calibrated utility function for travel in a medium city by automobile, bus and metro is given by $U= a – 0.002X_1 -0.005X_2$; X_1 = Cost of travel(Rs) , X_2 = Travel time (min)

Calculate modal split for given values

Mode	a	X_1	X_2
Automobile	-0.3	120	30
Bus	-0.35	20	45
Metro	-0.40	60	35

Is a parking fee of 10/- per trip is imposed on automobile, what would be the split to the other two modes?

MODULE 5

1. State traffic assignment and its applications? Explain its general principle.
2. Explain the following
   All -or-nothing assignment b) Methods of capacity Restraint
3. Discuss the important considerations for selecting land-use model
4. Explain the concept of Lowry derivative model with a flow diagram.
5. To overcome congestion on the urban street network, a motorway is proposed. The travel time from one zone centroid to another via the proposed motorway is estimated to be 10min where as the time for same travel via existing street is 18 min. the flow between the two zone centroid is 1000veh/hour. Assign the flow between the new motorway and existing street.
6. Explain the following
   a) Capacity Restraint Method b) Diversion Curves