

MODULE- 1

Urban Transportation Planning

Definitions: Planning: The process of working out, beforehand, scheme, program, or method for the accomplishment of an objective.

Urban Transportation Planning

1. Understand how decisions to build transportation facilities are made
2. Understand basic elements of the transportation planning process.
3. Understand basic elements of travel forecasting

Common Types of Urban Land Uses

Urban land uses classified as:

1. Residential.
2. Commercial. ex. Shopping centers *change with times*
3. Industrial.
4. Institutional. ex. Educational, governmental
5. Recreational.
6. Agricultural.

A set of alternative transport plan is then generated for that horizon year . These plans incorporate varying nature and amount of transport facilities. The operating characteristics of each alternative in the horizon year are then estimated in the form of flows on each link of the horizon-year networks. The usual criterion for choice among the alternatives is that the difference between the collective benefits to users (in the form of reduced travel impedance) and the money costs of constructing and maintaining these facilities should be a maximum.

Basic Elements of Transportation Planning

Situation definition Inventory transportation facilities, Measure travel patterns, Review prior studies. Problem definition Define objectives (e.g., Reduce travel time), Establish criteria (e.g., Average delay time), Define constraints, Establish design standards Search for solutions Consider options (e.g., locations and types, structure needs, environmental considerations)

Analysis of performance For each option, determine cost, traffic flow, impacts Evaluation of alternatives Determine values for the criteria set for evaluation (e.g., benefits vs. cost, cost-effectiveness, etc) Choice of project Consider factors involved (e.g., goal attainability, political judgment, environmental impact, etc.)

Specification and construction Once an alternative is chosen, design necessary elements of the facility and create construction plans

Example 1: Planning the relocation of a rural road (simple, yet good enough to explain the steps...)

Step 1: Situation definition:

➤ to understand the situation that gave rise to the perceived need for a transportation improvement

Step 2: Problem definition

Purpose of the step: Describe the problem in terms of the objectives to be accomplished and translate those objectives into criteria.

Example:

Objective = Statements of purpose: Reduce traffic congestion, Improve safety, Maximize net highway-user benefits, etc.

Criteria = Measures of effectiveness: Travel time, accident rate, delays (interested in reductions in these MOEs).

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Step 3: Search for solutions

Step 4: Analysis of performance

Estimate how each of the proposed alternatives would perform under present and future conditions.

Step 4: Ranking of alternatives (in terms of MOE)

Step 5: Evaluation of alternatives

Determine how well each alternative will achieve the objectives of the project as defined by Criteria.

Step 6: Choice of project

❖ Based on the alternative evaluation in Step 5, we will choose the best alternative for design and eventual construction. The best choice may not be built because of opposition by the people of the community that is affected.

Step 7: Specification and construction

❖ Once the project has been chosen, a detailed design phase is begun, in which each of the components of the facility is specified.

System and environment

A system may be defined as a set of components that is organized in such a manner as to direct the action of the system under inputs toward specific goals and objectives. An environment may be defined as to set of all

components outside a system, which both influences the behavior of the system and which in turn is influenced by the behavior of the system.

System all modes for urban transportation

- Bus
- Transit
- Taxi
- Passenger car.
- Etc.

We can classify them as follows:

1. Urban passenger transportation system.
2. Urban public transportation system.
3. Urban goods transport system.
4. Urban intermediate public transport system.
5. Urban personal transport system.

The urban transportation system may be thought as responding to the social and economic forces that exist in urban areas. This urban socioeconomic environment is in turn influenced by the characteristics of the transport system. The role of the system planner may be conceived, in general way, as the direction of his efforts to design a system that achieves maximum integration, or degree of fit between the system and its environment.

Example (1)

Goal : Maximize mobility of people and goods

Related objectives:

1. Minimize travel time.
2. Minimize travel cost.
3. Provide adequate frequency of service.
4. Provide adequate system capacity.
5. Provide adequate system safety.
6. Provide adequate system reliability.

Related Standards:

1. The travel time by public transport between major activity centers not exceed 30 minutes.
2. The travel time cost by public transport not to exceed 15% of travel cost of private transport.
3. The frequency of public transport service on any route to be not less than 3 per hour.
4. The peak hour occupancy of public transport vehicles not exceed the permissible limits.
5. Fatal accidents involving public transport vehicles to be less than 1% of the total.

6. At least 95% of public transport operation to be as per the published time schedule.

Definition of Study Area

Urban area

1. Population not less than 5,000.
2. Non-agricultural workers not less than 75% of the total workers.
3. Population density not less than 400 per sq. km.

Towns with population of 0.1 million and above are termed as cities.

Urban Area Boundary Zone Centroid Land use parcel or traffic zone

Transportation Survey

The first stage in the formulation of a transportation plan is to collect data on all factors are likely to influence travel pattern. The work involves a number of surveys so as to have:

1. An inventory of existing travel pattern.
2. An inventory of existing transport facilities.
3. An inventory of existing land use and economic activities.

Definition of the Study Area

The study area for which transportation facilities are being planned is first of all defined. Transportation planning can be at the national level, the regional level or at the urban area level.

For planning at the urban level, the study area should embrace the whole contribution containing the existing and potential continuously built up areas of the city. The imaginary line representing the boundary of the study area is termed as the external cordon line. The area inside the external cordon line determines the travel pattern to a large extent and as such, it is surveyed great detail. The land use pattern and the economic activities are studied intensively and detailed survey (such as the home-interview) are conducted in this area to determine the travel characteristics. On the other hand, the area outside the cordon line is not studied in such details.

Selection of External Cordon Line

The selection of the external cordon line for urban transportation planning should be done carefully with due to consideration to the following factors:

1. The external cordon line should circumscribe all areas, which are already built up, and those areas, which are considered likely to be developed during the planning period.
2. The external cordon line should contain all areas of systematic daily life of the people oriented towards the city center and should in effect be the commuter shed.

3. The external cordon line should -be continuous and uniform in its courses so that movements cross it only once. The line should intersect roads where it is safe and convenient for carrying out traffic survey.

4. The external cordon line should be compatible with the previous studies of the areas studies planned for the future.

Zoning

The defined study area is sub-divided into smaller areas called zones or traffic zones.

- The purpose of such a subdivision is to facilitate the spatial quantification of land use and economic factors, which influence travel pattern. Subdivision into zones further helps in geographically associating the origins and destinations of travel.

- Zones within the study area are called internal zones and those outside the study area are called external zones.

- In large study projects, it is convenient to divide the study area into sectors, which are sub divided into zones. Zones can themselves be sub divided into sub- zones depending upon the type of land use.

- A convenient system of coding of the zones will be useful for the study. One such system is to divide the study area into 9 sectors.

The central sector CBD is designated 0, and the remaining eight are designated from 1 to 8 in clockwise manner. The prefix 9 is reserved for the external zones. Each sector is subdivided into 10 zones bearing numbers from 0 to 9.

Roads External Cordon line

For ex. It would be helpful, if the following points are kept in view when dividing the area into zones:

1. The zones should have a homogenous land use so as to reflect accurately the associated trip making behavior.

2. Anticipated change in land use should be considered when sub- dividing the study area into zones.

3. It would be advantages, if the subdivision follows closely that adopted by other bodies (e.g. census department) for data collection. This will facilitate correlation of data.

4. The zones should not too large to cause considerable errors in data. At the sometime, they should not be too small either to cause difficulty in handling and analyzing the data.

As a general guide, a population of 1000-3000 may be the optimum for a small area, and a population of 5000- 10000 may be the optimum for large urban areas. In residential areas, the zones may accommodate roughly 1000 households.

5. The zones should preferably have regular geometric form for easily determining the centroid, which represent the origin and destination of travel.
6. The sectors should represent the catchment of trips generated on a primary route.
7. Zones should be compatible with screen lines and cordon lines.
8. Zone boundaries should preferably be watersheds of trip making.
9. Natural or physical barriers such as canals, rivers, etc. can form convenient zone boundaries.
10. In addition to the external cordon lines, there may be a number of internal cordon lines arranged as concentric rings to check the accuracy of survey data.

Screen lines

Running through the study area are also established to check the accuracy of data collected from home- interview survey. Screen lines can be congenitally located along physical or natural barriers having a few crossing points. Examples of such barriers are river, railway lines, canals, etc.

Types of Movements

The basic movements for which survey data are required are:

1. Internal to internal.
2. External to internal.
3. Internal to external.
4. External to external.

For large urban areas, the internal to internal travel is heavy whereas for small areas having a small population (say less than 5000) the internal to internal travel is relatively less. Most details of internal to internal travel can be obtained by home interview survey. The details of internal- external, external internal and external- external travels can be studied by cordon surveys.