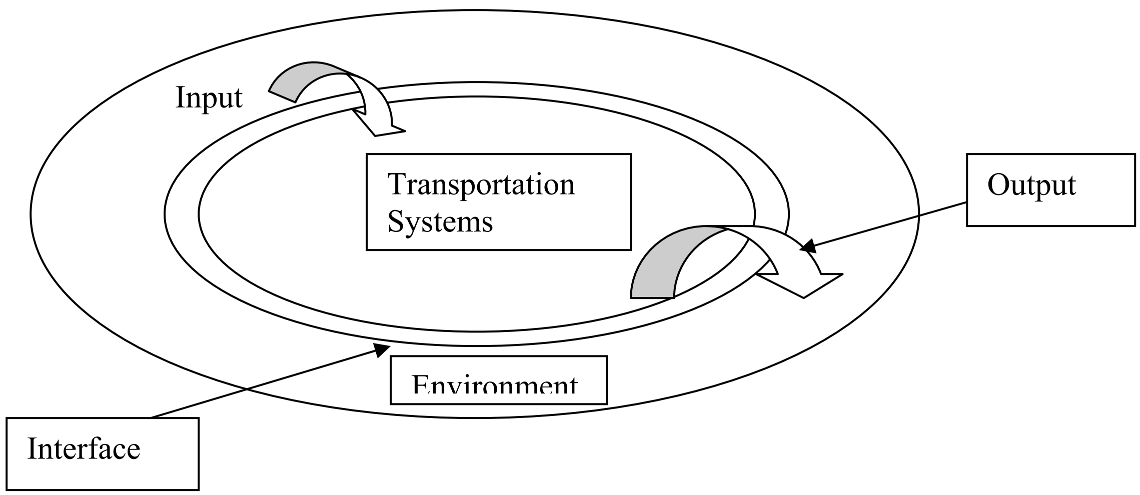
System Environment Ensemble:

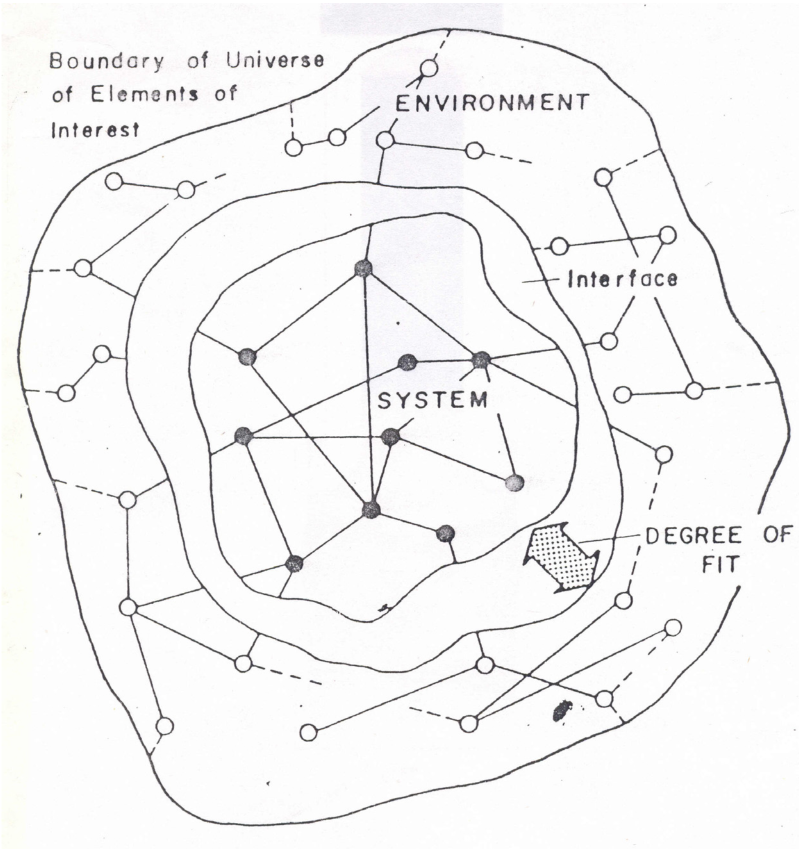
A system may be defined as the set of components, activities and entities that is organized meaningfully in such a manner as to direct the action of system under inputs towards specific ***goals*** and ***objectives.***



Note: Inputs and Outputs can be + ve or –ve

- Urban Transportation System is a system responding to social and economical factors. These factors are again influenced by transportation system
- The land use development with the environment influence the transportation system
- The changes in transportation system may also cause changes in landuse development
- Changes may come both in system and environment .If these are less the environment balances it , hence the system is in stable position

➢ If the changes are high the system may not be in equilibrium. Then the system may completely collapse.



The system environment ensemble.

Boundary of Universe of elements of Interest:

The aim of transportation problem definition step is to define the interface between the system and its interface.

To identify a rule or criterion which may be used by planner to identify the optimal system, by the following,

- System Objectives
- System Standards
- System Constraints

- System Inputs
- System Outputs
- Value Functions
- Decision Criterion

<u>System Objectives</u>

It may be conceived as a lower order goal which at least conceptually capable of being measured.

Before start of plan we set some objectives and these should be achieved at the completion

<u>System Standards</u>

A standard is a lower than objective and represents a condition that is capable of both measurement and attainment.

These are lower order limits beyond which performance is rejected.

<u>Constraints</u>

The constraints on a system may be defined as the characteristics of the environment that limit the extent of feasible solutions.

<u>Inputs</u>

The inputs to a system may be defined as those characteristics of the environment that a system must transform into outputs in the light of system objectives

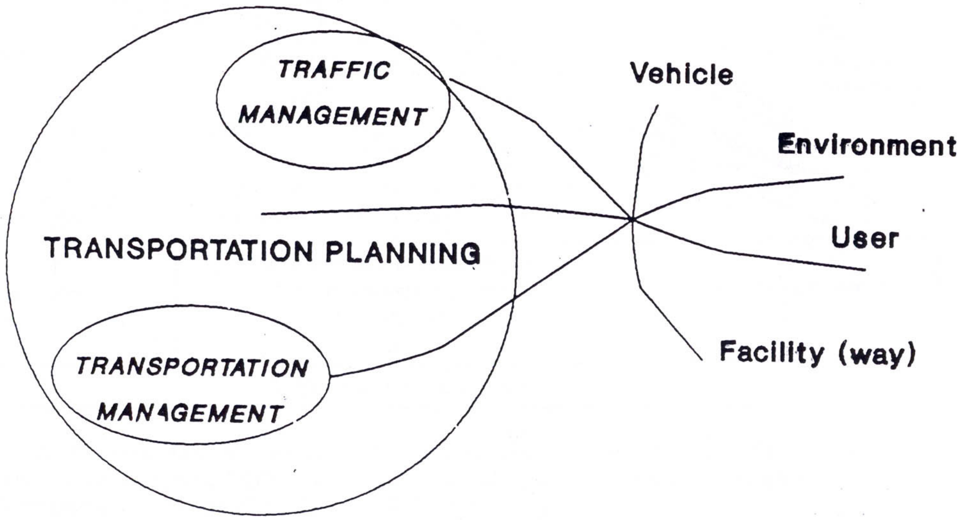
<u>Outputs</u>

The output of a system may be defined as thiose characteristics of a system that influences the system directly

Output = f^n (System Inputs and System Properties)

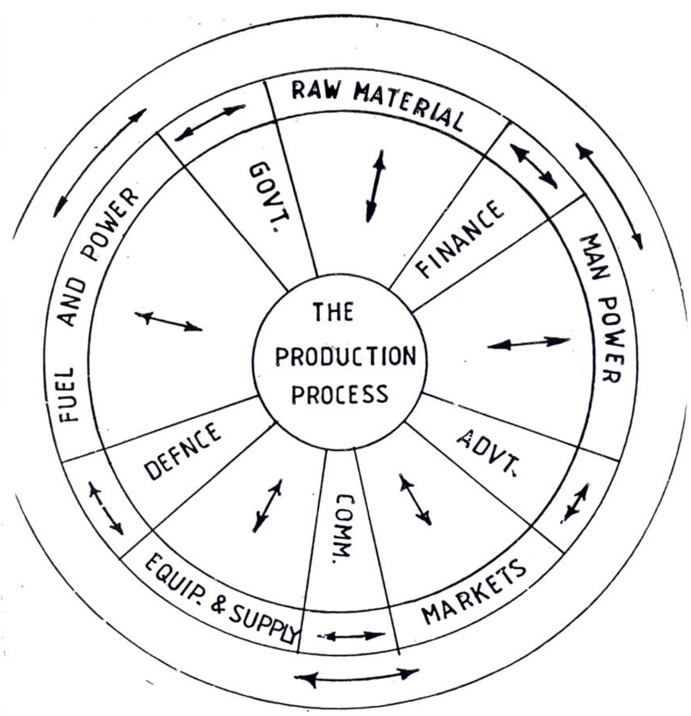
Value Function

A value function may be defined as a procedure for mapping the magnitude of an output variable into the units of value in which objectives are measured.



Transportation Management

Fields of Transportation Engineering



WHEEL OF INDUSTRY
ARROWS SHOW THE INTEGRATING AND CO-ORDINATING FUNCTIONS OF TRANSPORTATION

Measure Of Effectiveness (MOE):

It is a measurement of degree to which an alternative action satisfies the objective. It is also known as the **Figure Of Merit** (**FOM)**.It includes goals, objectives, values, criterion. It includes Measures Of Cost (MOC) as one of the subsets. Effectiveness an be determined by criteria known as standard. Always it has a positive impact and obtained from consequences of analysis.

Measure Of Cost (MOC)

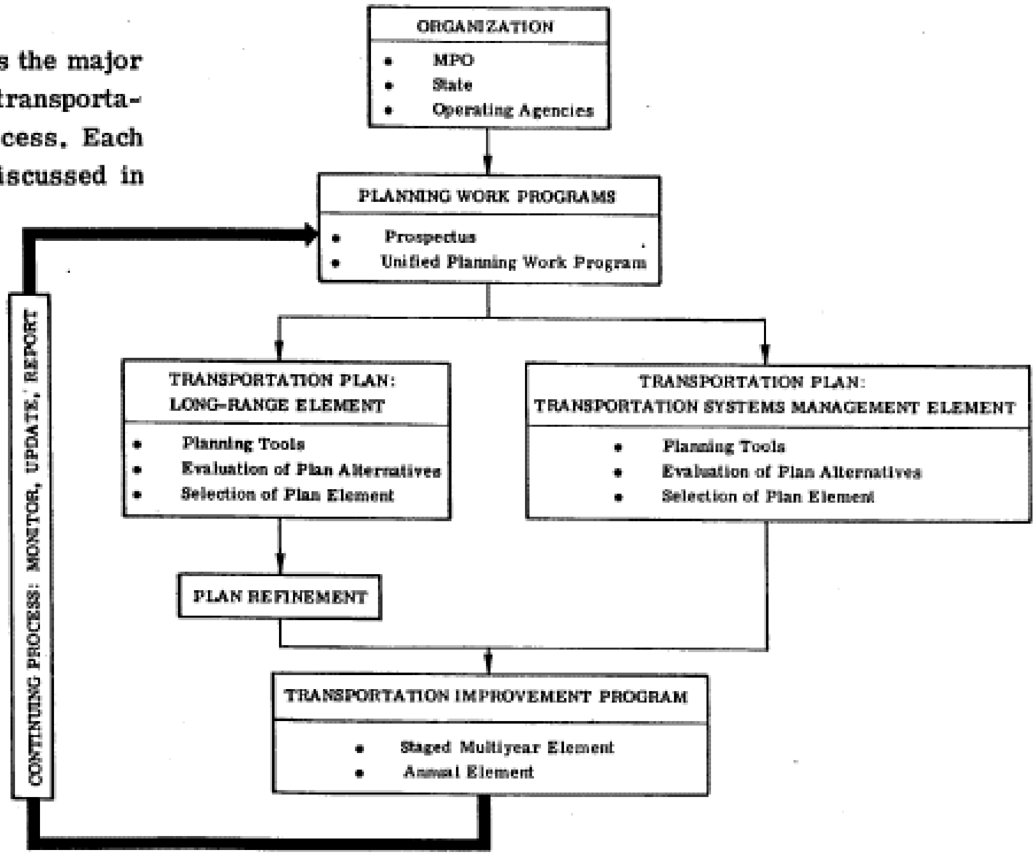
The measure of benefits forgone or opportunities lost for each of the alternative measure of cost. Standard of MOC represents the cutoff point beyond which performance is rejected .It belongs to MOE. MOC has a –ve impact and consequences of decisions.

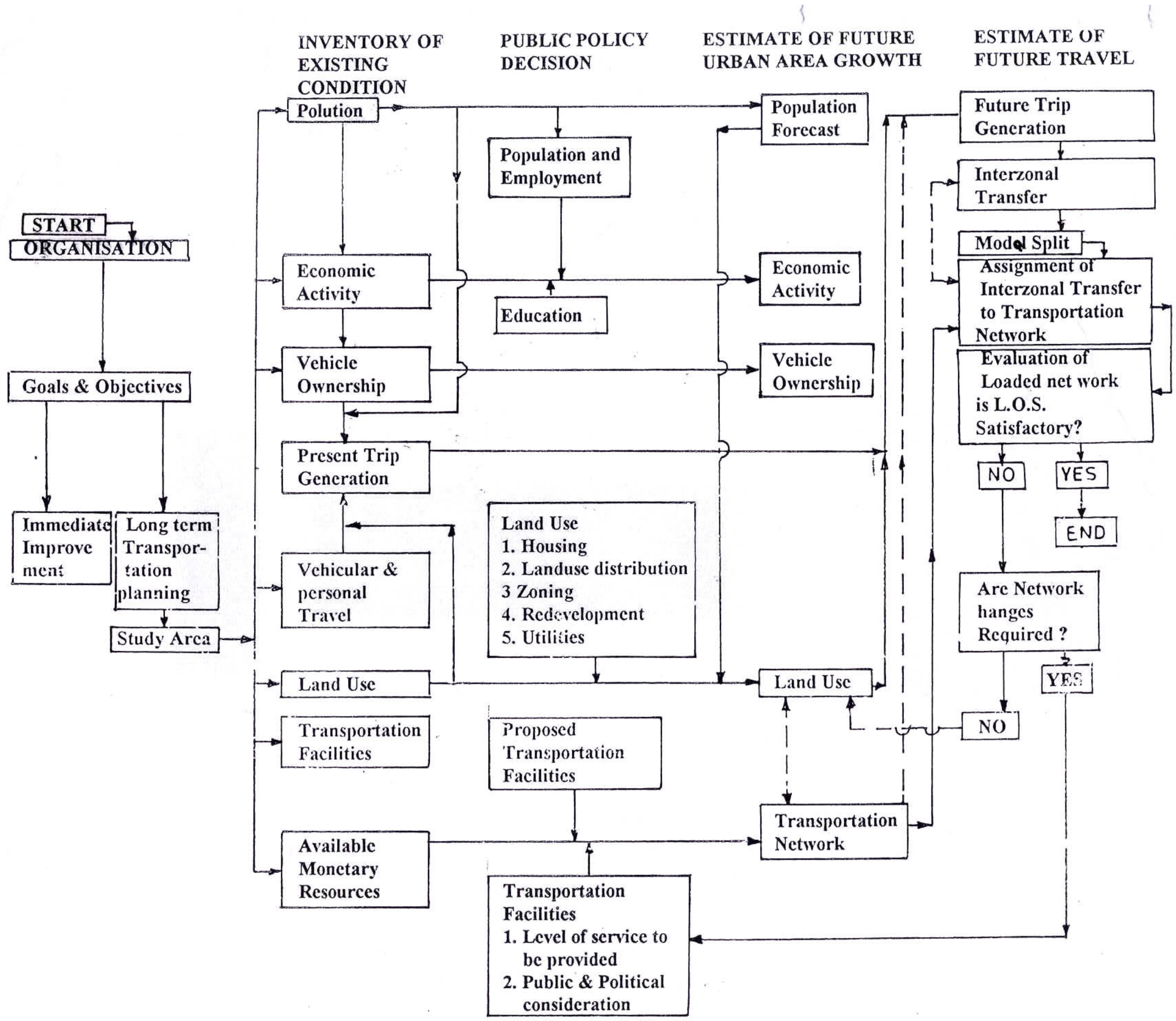
Planning Process:

Urban transportation planning is the process that leads to decisions on transportation policies and programs. In this process, planners develop information about the impacts of implementing alternative courses of action involving transportation services, such as new highways, bus route changes, or parking restrictions. This information is used to help decision-makers (elected officials or their representatives) in their selection of transportation policies and programs.

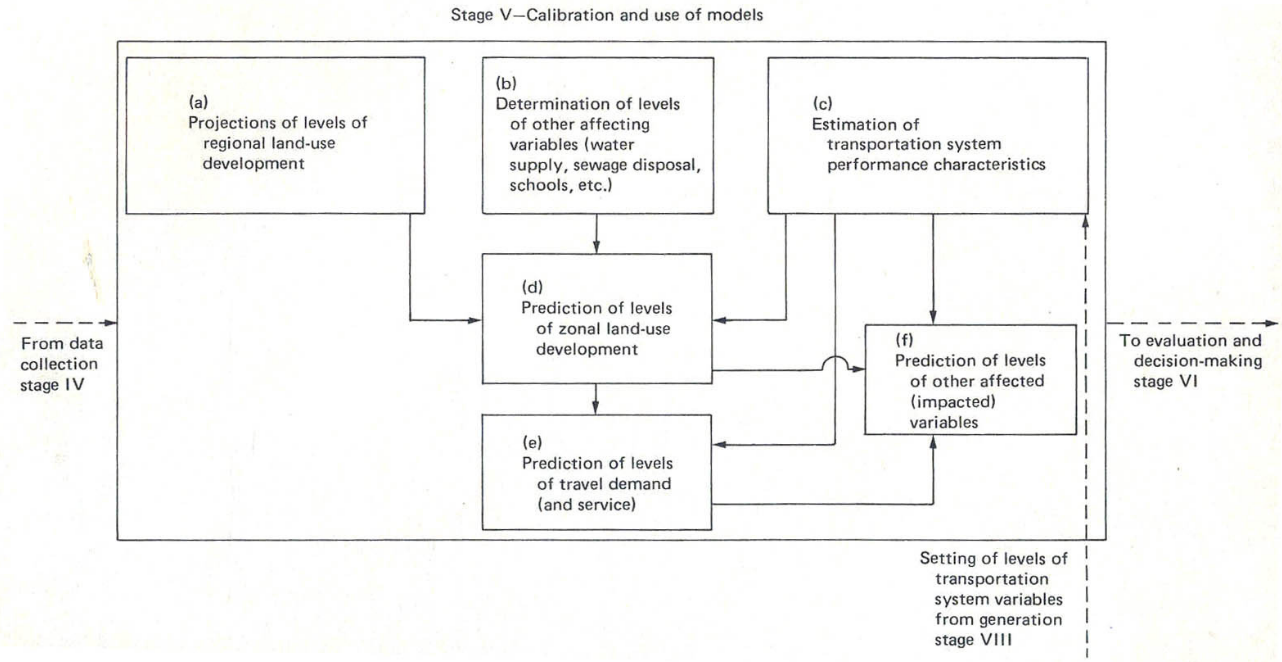
The planning process must operate within the framework of the goals and objectives of the study area. Early in the process, ways to promote interaction with public officials, public agencies are the citizens of the area must be defined to make sure that the goals and objectives reflect current community values.

This chart shows the major activities in the transportation planning process. Each step is briefly discussed in this section.

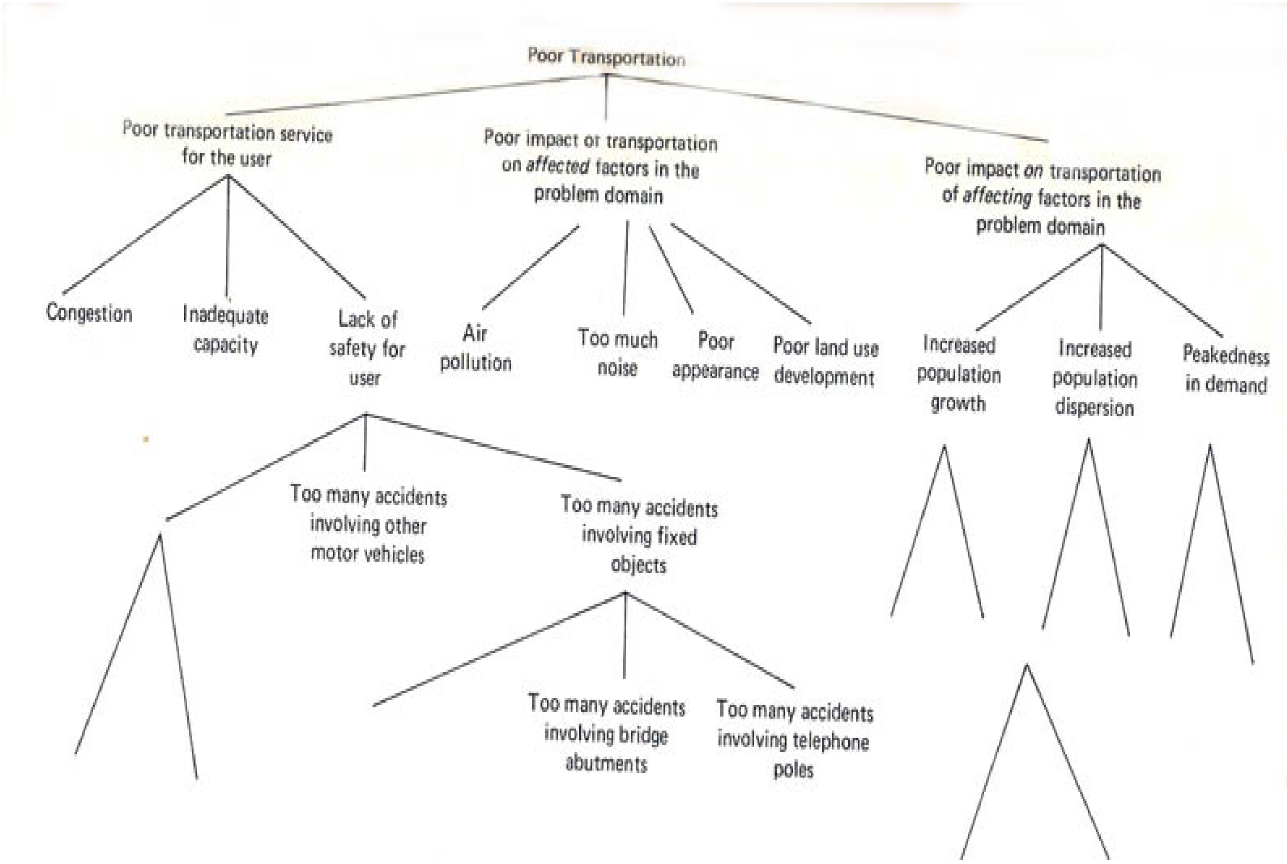




Deductive Planning Process



Six major phases in the calibration and model use stage of the transportation planning process



A hierarchial view of Transportation Problems

Quiz:

1. The long-range element of the transportation plan is primarily concerned with capital-intensive improvements. True or false_______?

2. Adopting development policies that complement efficient transportation systems is an example of the long-range element. True or false?______________________________

3. In plan refinement, we are concerned with specific ___________in which improvements are planned.

4. The__________________ _______________ corridors is a statement of improvements to the transportation system in the next few years

Answers:

1. True
2. True
3. Corridors
4. Transportation Improvement Program

Problems in Problem Domain Affecting Transportation:

A problem for an individual or group of individuals is the difference between the desired and actual state.

GOALS ---- OBJECTIVES = PROBLEM

These transportation problem have been divided into **three classes**

A. The problems that are direct transportation service problems
B. Those in the problem domain **affected by** transportation
C. Those problem domain **affecting** transportation

A. Transportation Service Problems:

1. Congestion
2. Inadequate Capacity
3. High User Cost
4. High facility Cost
5. Low rate of return
6. Lack of Safety
7. Lack of privacy
8. Discomfort

B. Problems In the domain affected by Transportation

1. Air Pollution
2. Noise
3. Visual Intrusion
4. Poor Appearance
5. Increase in cost of abutting land
6. Excessive right of way and relocation requirements
7. Inappropriate and undesirable development

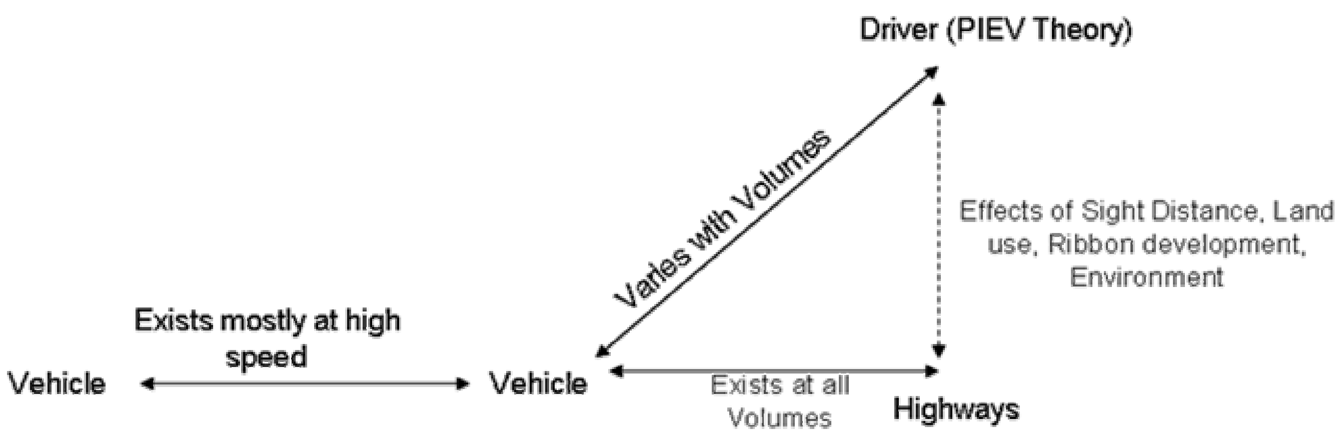
8. Moral, religious and biological problems
9. Unequal impart and certain population groups

C. Problems In the domain affecting Transportation

1. Increased population growth and dispersion
2. Increased automobile ownership
3. Packed ness in the amount
4. Time of Travel

Components of System

- Users
- Vehicle / Carrier
- Roadway / Facility
- Environment



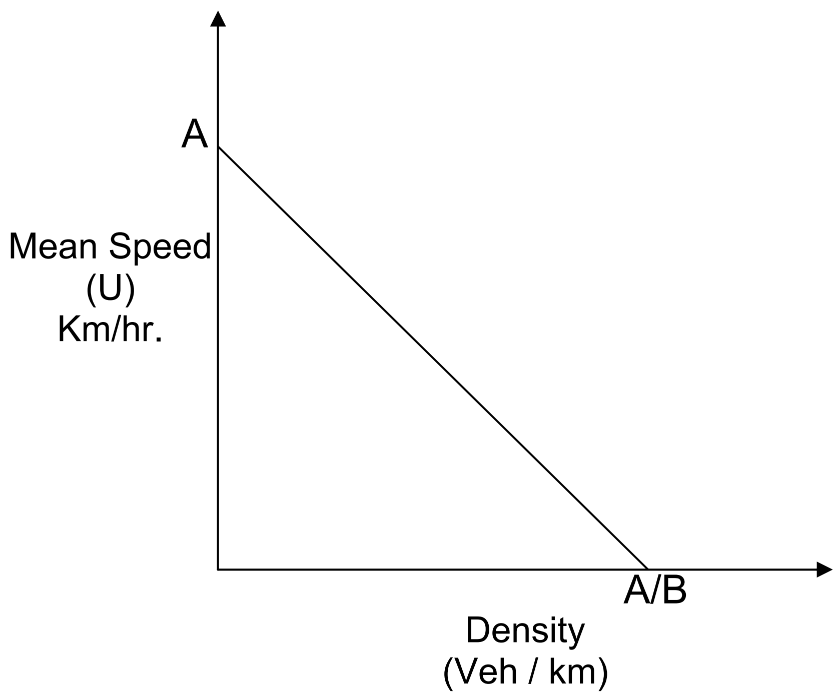
Traffic Volume (q): It is the number of vehicles passing a given point in a unit point of time. (Unit- veh/hr.)

Traffic Density (k): Number of vehicles per kilometer. (Unit – veh/Km)

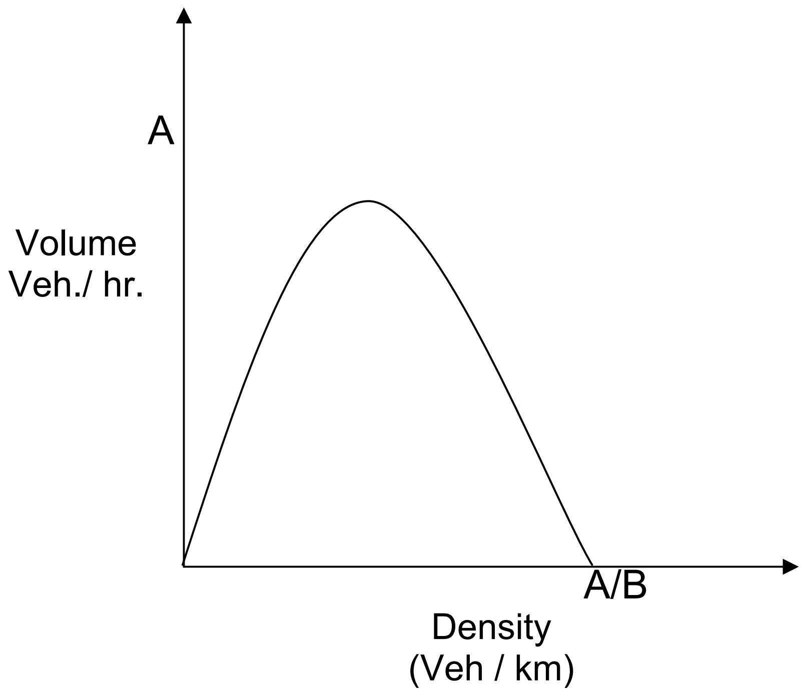
Speed (v): The distance covered per unit of time. (Unit- Km/hr)

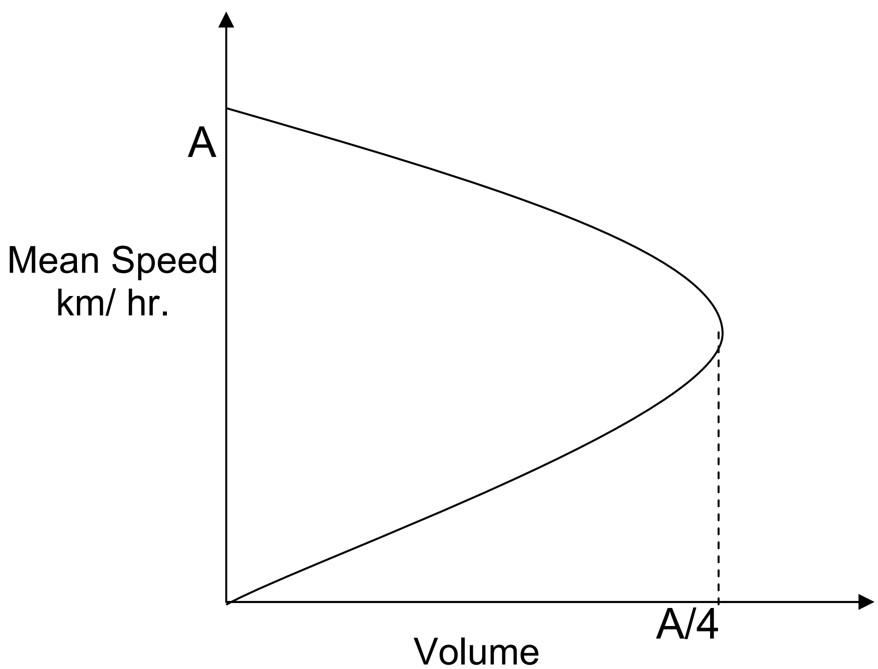
Relationship: **q = k*v**

$$U = A - B*K \text{ where } k = (U-A)/-B$$



$$q = k.U = k(A - Bk) = Ak - Ak^2$$





Environment:

Environment may be defined as the st of all components outside a system which both influencecs the behavior of the system and gets influenced by the behavior of the system.

Sl No	**Problem Solving**	**Transportation Planning**
1	Problem solving lacks foresightness to take advantage of the forthcoming innovations	Problem definition and Objective relevant to planning condition :They change themselves ,so innovations are used
2	It is not Programmed Basis	Usually Programmed basis
3	Our concern may be for the dimension and performance of a vehicle to be replaced within a shorter period of timr from now	We may be concerned with about location and capacity of Mass Transit
4	Breadth of problem : eg parking, congestion	Study of broader situation:eg whole city
5	Immidiate solution is required .so it is completed within shorter period	Implemented Sequentially

Challenges in transportation systems

1. Human behavior
2. Size of the problem
3. Multi modal
4. Selection of technology
5. Multi objective, Multi criteria, Multi sectroal
6. Value of System
7. Squeezing space availability
8. Environmental Aspects

Concept of a Model

Def: "Something which in some respect resembles or describes the structure or behavior of its real life counterpart"

It's "**Abstract of Reality**"

Types of Models

1. ***Iconic Models:*** Models which are having visual geometric equivalents (Example: Model Airplane)

2. ***Analogical Models:*** Models in which there is a correspondence between elements and actions in the model and those in reality but no physical resemblance.
   (Example: Football Play diagram)

3. ***Symbolic models:*** Models which compactly and abstractly represent the principle of reality.
   (Example: F=m*a)

In general, for any situation one model consists of 5 sets of elements

X_i =Variable over which designer has complete control

Z_j = Variable over which designer has no control

Y_k = Variable over which designer has indirect control

R_m = general relationship between above materials

P_n = (Coefficients, constants, exponents) i.e. Parameters

Symbolically a model M is represented as

M = f ($X_{i,}$ $Z_{j,}$ $Y_{k,}$ $R_{m,}$ P_n) for all i, j, k, m, n

Example on Bus Line Operation:

Suppose the monthly revenue “r” from a given bus line operation depends on the fare charged “f” and monthly passengers “p”

Then r = f* p----------------------(1)

It is found that the number of passengers riding the bus in any month is a function of the amount of rainfall and the bus fare with the relationship

$$P = \frac{b}{(1+i)f^{\phi}}$$ -----------------------(2)

(1+i)----- because if no rain is there then D^r

b and ϕ are parameters from the past data

Suppose it is found that P=10000 in a month with no rainfall and the fare as Rs 1.00

From equation 2 we got b=10000

Step-2

Let us assume that the past data have shown that there are 40000 passengers in a month when there is no rain and the fare is Rs 0.50

Then from equation 2 ϕ=2.0

Step 3

ϕ = 2.0

b = 10000

r = f* p

$$r = f * \frac{b}{(1+i)f^{2}}$$

$$r = \frac{b}{(1+i)f}$$ ------(3)

Now $r_{new} = \frac{1000}{(1+i)f}$ ------(4)

Step-4

Searching further we find that the equation (4) holds good for high income riders, the proper relationship may be

$$r_l = \frac{12000}{(1+i)f}$$

Total revenue

$r_t = r_h + r_l$

$= 22000/(1+i)f$

Step-5

When i=1 and f = Rs 2.00

Then r_t =Rs 55000 per month.

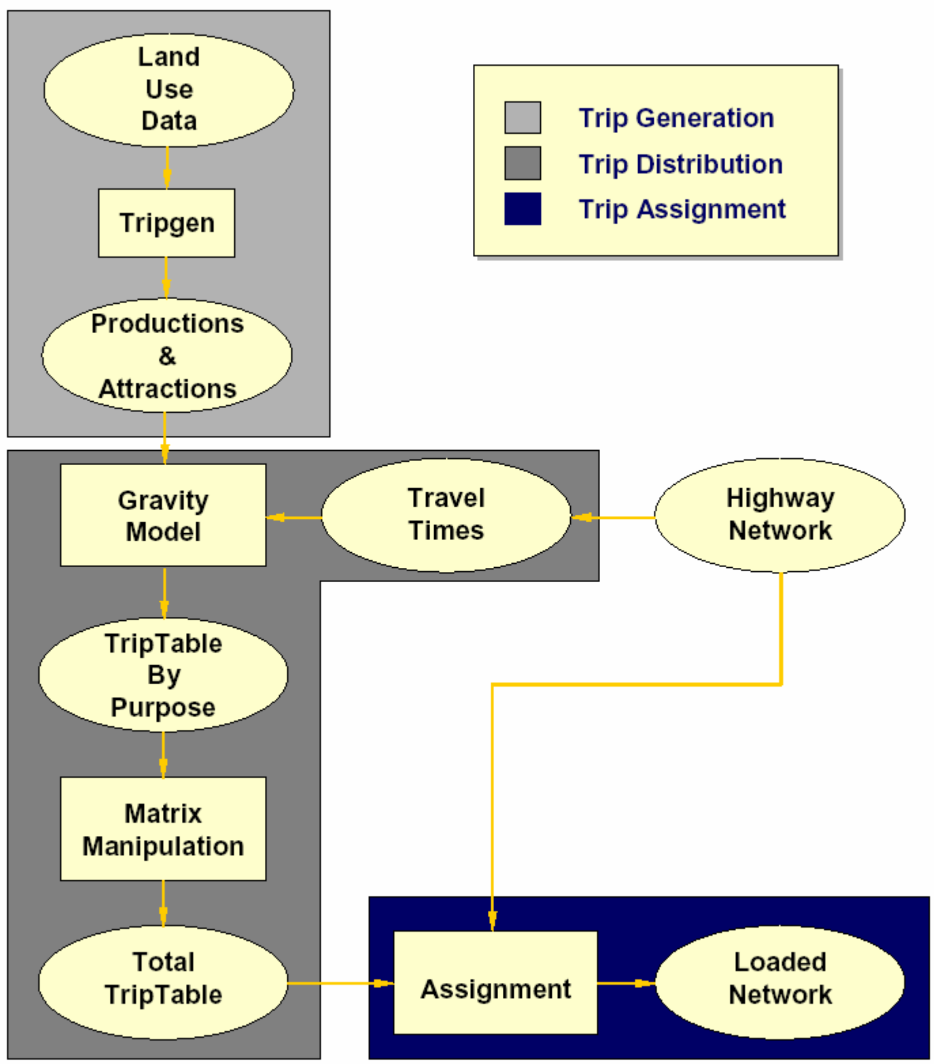
Like this it goes on

Here X_i= fare (Planner has Full Control)

Z_j =Rainfall (Planner has No Control)

Y_k = Passengers and Revenue (Planner has partial Control)

Travel Demand Modeling Process:



Trip Generation:

The first is the definition of the basic unit of travel demand: the *trip*. **A trip is defined as the movement of an individual from a single origin to a single destination for a single purpose.** The journey from home to work is an example of a single trip.

To predict the amount of travel that will take place in the forecast year, or to analyze current travel, the planner must understand -and quantify -- the relationship between present urban activity and present trip-making.

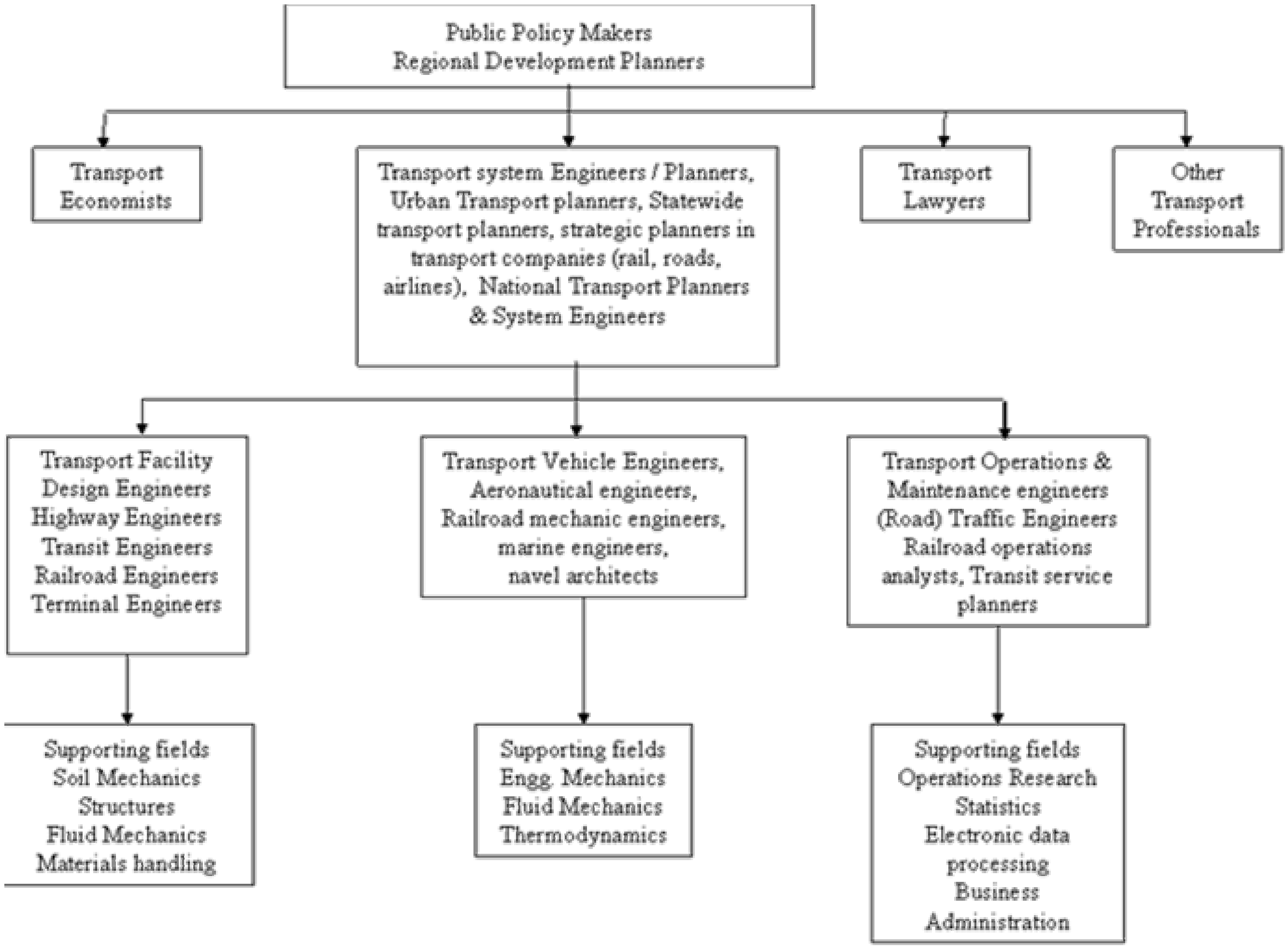
In the trip generation phase of transportation planning, the planner is concerned only with the number of trip ends. A trip end is defined as the beginning or ending of a trip; therefore, a trip from home to work has two trip ends. The other characteristics of trips -- destinations, modes and paths -- are considered in other phases.

Trip generation, then, is the process by which the transportation planner predicts the number

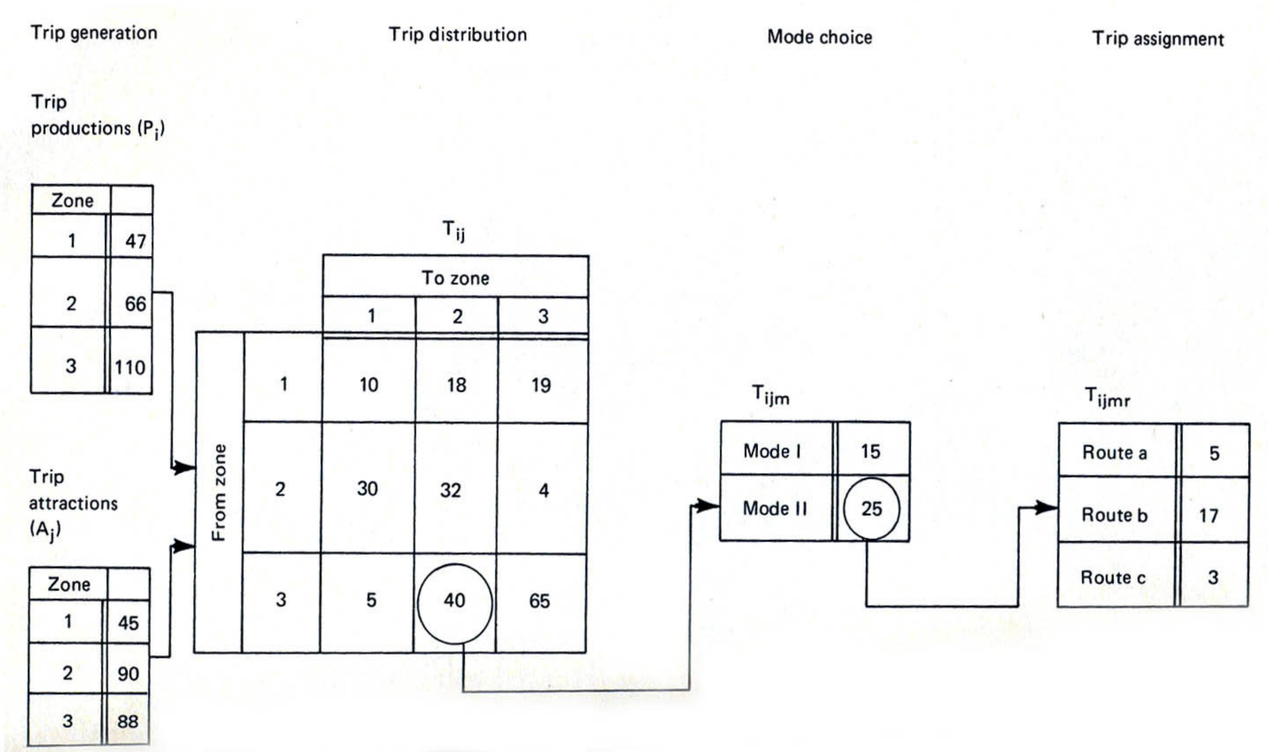
Measures of the amount of activity usually are not enough to develop a good relationship between activities and travel. The character of the activities is important, too.

For residential land uses, character is described in terms of socioeconomic variables like family size, family income, and car availability. Generally, high-income or large families make more trips than low-income or small families. And obviously, three-car families generally make more trips than one-car families.

For nonresidential activities, character reflects the type of activity; for example, industrial, retail, and commercial. As you can imagine, the number of trips that are generated by a major shopping center is usually higher than the number of trips that are generated by a warehouse of the same size.



Fields Of Transportation Engineering



Overview of Travel Demand Modelling

List Of Assignments

1. Learning of softwares:
   I. LIMDEP
   II. SPSS
   III. TransCAD
   IV. TRIPS
   V. ALOGIT

2. Web visit:
3. Intelligent Transportation System (ITS)
4. MacFadden's Website Visit.

Bus Line Operation: Speed – Flow Chart:

Solve By Regression Method

5. Trip Generation Models for Thane Region with the given data
6. Program for Shortest Path Method
7. Program for Growth Factor Methods
8. Program for Lowry Model
9. Description of Different Traffic Assignment Methods
10. Dial’s Method
11. ISGULTY Study
12. Lowry Model
13. Kirchoff’s Method
14. Entropy Maximisation
15. Urban Goods Transport Models
16. Leontif-Strout Method