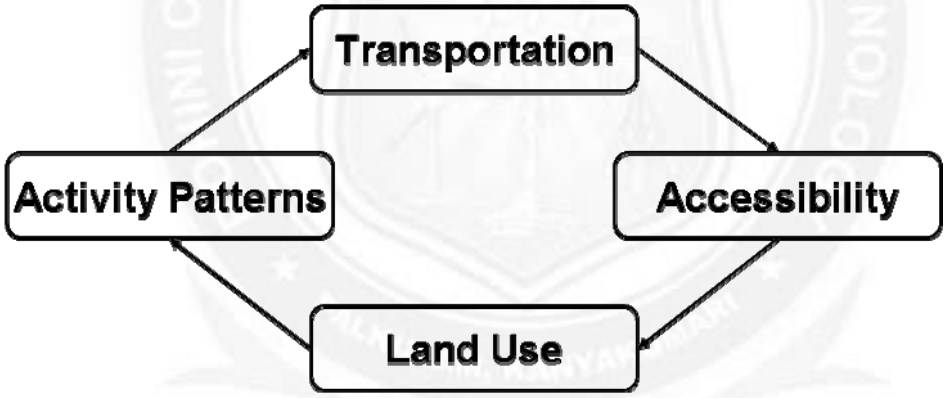
1.4 LAND USE TRANSPORT AND MODEL INTEGRATION

INTRODUCTION

Land use characteristics and transportation are mutually interrelated. The use of the term land use is based on the fact that through development, urban space put up a variety of human activities. Land is a convenient measure of space and land use provides a spatial framework for urban development and activities. The location of activities and their need for interaction creates the demand for transportation, while the provision of transport facilities influences the location itself. Land uses, by virtue of their occupancy, are supposed to generate interaction needs and these needs are directed to specific targets by specific transportation facilities. The following diagram explains the transportation land use interaction



Land use means spatial distribution or geographical pattern of the city, residential area, industry, commercial areas and the space set for governmental, institution or recreational purposes. Most human activities, economic, social or cultural involve a multitude of functions, such as production, consumption and distribution. These functions are occurring within an activity system where their locations and spatial accumulation form the land uses. So, the behavioral patterns of individuals, institutions and firms will have an impression on the land use.

Land use system

The essential components of the land use system in terms of land use transport modeling are location and development. The urban land use is largely modeled by simulating the

mechanisms that effect the spatial allocation of urban activities in the city. A number of other important economic concepts underpin land use transport models, serving as proxies for the complex interactions and motivations driving urban location. Among these are the ideas of bid rent, travel costs, inertia (stability of occupation of land), topography, climate, planning, and size.

Transport system

The second major component of a land use transport model, simulated along side land use is the transport system the traditional way of characterizing the transportation system in urban simulation models is a four stage process. The process begins with modeling travel demand and generating an estimate of the amount of trips expected in the urban system .the second phase trip distribution allocates the trips generated in origin zones to destinations in the urban area. The third phase is modal split. Here trips are apportioned to various modes of transport. The four stage simulation processes concludes with trip assignment module that takes estimated trips that have been generated, distributed and sorted by mode and loads it on to various segments of the transport network.

Factors affecting transport land use relationship

1. Urban land development
2. Dominance of private vehicle ownership
3. Context of land use and transportation decision making
4. Different time contexts for response.

1.4.1 CLASSIFICATION OF LAND USES

The representation of this impression requires a typology of land use, which can be formal or functional as explained below:

Formal land use representations are concerned by qualitative attributes of space such as its form, pattern and geographical aspects and are descriptive in nature.

Functional land use representations are concerned by the level of spatial accumulation of economic activities such as production, consumption, residence, and transport, and are mainly a socioeconomic description of space.

Land use, both in formal and functional representations, implies a set of relationships with other land uses e.g. commercial land use has relationships with its supplier and customers. While relationships with suppliers will dominantly be related with movements of freight, relationships with customers would also include movements of passengers. Since each type of land use has its own specific mobility requirements, transportation is a factor of activity location, which in turn is associated with specific land uses.

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The movement of people and goods in a city, referred as traffic flow, is the joint consequence of land activity and the capability of the transportation system to handle this traffic flow exactly like that of principle of demand and supply. There is a direct interaction between the type and intensity of land use and transportation facilities provided. Ensuring efficient balance between land use activity and transportation capability is primary concern of urban planning. Land use is one of the prime determinants of movement and activity i.e. trip generation which needs streets and transport systems for movement. This will lead to increased accessibility which further enhances value of land and land use.

Different Land Use Models

The purpose of land use transport models is to assess the policy impacts in terms of the implications of the future growth patterns on both land use and travel related issues .For

this purpose, several researchers have developed various models with different theoretical backgrounds and data requirements. From the early developments of land use transport models to the latest state of art, can be broadly classified into three categories

(i)Early models (ii) Intermediate era models (iii) Modern era models.

Early Land Use Transport Models

There are several techniques which are representatives of earliest efforts in the development of urban development models and which continue to serve (either in original or modified form) a great number of transportation studies .These techniques are quite simple generally deal with aggregate relationships .These are developed primarily for location of residential activities. In addition many of these techniques can be applied without using computer or simple programs can be prepared for use on a computer .Thesesimple techniques are considered most practical use in smaller urban areas because they require less time, cost and data.

1. The **Activity Weighted Technique** allocates activity growth in population to share ofthe particular activity which already exists in the zone .This technique assumes that the present trends continue and allocates activity growth in proportion to the present share .Therefore, the zone with highest present share will be allocated with major share in future. It is clear that existing size as a proxy for the future development potential leads biased allocation. This technique is suitable for short term planning.
2. The **Density Saturation Gradient Method** (Hamberg, 1959) is based upon the axiom that there are regularities in the in the activity distribution about the central place. The Density Saturation Gradient Method (DSGM) can be used as a tool for the analysis of existing land use structure and also for use in forecasting land use structure. The forecast is basically a trend projection of the existing land use and density structure in the region. The method is based essentially on the regularity of the decline in density and the percent saturation with the distance from the Central Business District (CBD).This method depends equally upon the relationship between distance and present saturation. Though the DSGM is complete in itself, this technique demands more subjective inputs and allows only for a cursory and limited consideration of policy and other planning decisions.

3. The simple **Accessibility Model** (Hansen, 1959) is based upon concept that the more accessible an area is to various activities and the more vacant land area has greater growth potential. Thus growth in a particular area is hypothesized to be related to two factors; the accessibility of the area to some regional; activity distribution, the amount of land available in the area of development. This accessibility of an area is an index representing the closeness of area to all other activity in the region .All the areas compete for the aggregate growth and share in proportion to their comparative accessibility positions weighted by their capacity to accommodate development as a measure by vacant usable land.
4. The **Intervening Opportunities** (Lathrop, *et al*, 1965) model, spatial distribution of an activity is viewed as the successive evaluation of alternative opportunities for sites which are rank ordered in time from an urban center .Opportunities are defined as the product of available land and density of activity. This model presumes that the settlement rate per unit of opportunity is highest at the point of maximum access. The concept of an opportunity for a unit of activity involves both land and measure of the intensity of use of that land.
5. The **Delphi Technique** is a methodology for eliciting and refining expert or informed opinion .The general Delphi technique involves the repeated consulting with a group of individuals as to their best judgment as to when or what type of an event is most likely to occur and providing with them systematic reports as to the totality of judgments submitted by the group. The responses of all participants are assembled, summarized and returned to the group members, inviting them to reconsider. This information and revised estimates may be circulated to the participants for additional anlysis. The procedure varies considerably among specific applications but the primary result is that it produces a consensus of the judgments of a majority of informed individuals while avoiding the bias of leadership influences , face-to-face confrontation, or group of dynamics. Group of participants, are expected to clarify their own thinking and the final decisions, according to the theory, it will tend to converge by narrowing the range of estimates in response to the most convincing arguments. Delphi is likely to involve more time and expense than the conventional methods of forecasting.

All the early models are often considered as low cost models using simple theories. Early developments of land use theory are simple techniques without much complexity. Each of them has a sound basis and provides a reasonable estimate of land use. How ever they do not cater for interaction of many variables. Some of these techniques have been improved later for much better modeling strategy. It may be seen from the inherent theories of this group of models, there is a broad city-wide philosophy which operates the model and then zonal allocations are derived by proportioning. Each of these models appears logical for urban land use forecasting or activity allocation.