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Need for RS / GIS Based Urban Fringe Land Value Evaluation Observations from a Tier II City in India

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Abstract: ***As cities grow in terms of area and population, several changes take place within the city and in the surrounding areas. There is excessive demand for land on the rural urban fringe leading to haphazard development. The city and the fringe, although administratively fall in different areas, for the residents of the fringe, there is hardly any difference between them as the mobility is unrestricted and the use of municipal services takes place in the fringe without paying for it. Spiraling urban land prices, as stated by the United Nations Habitat Conference, is the most serious of the problems faced by developing countries in the urbanization process. There is a need to develop mechanisms using RS & GIS tools to regulate the land prices on the fringe.***

Keywords: land use, land acquisition, surveying, compensation, municipal facilities, spatio-social networks

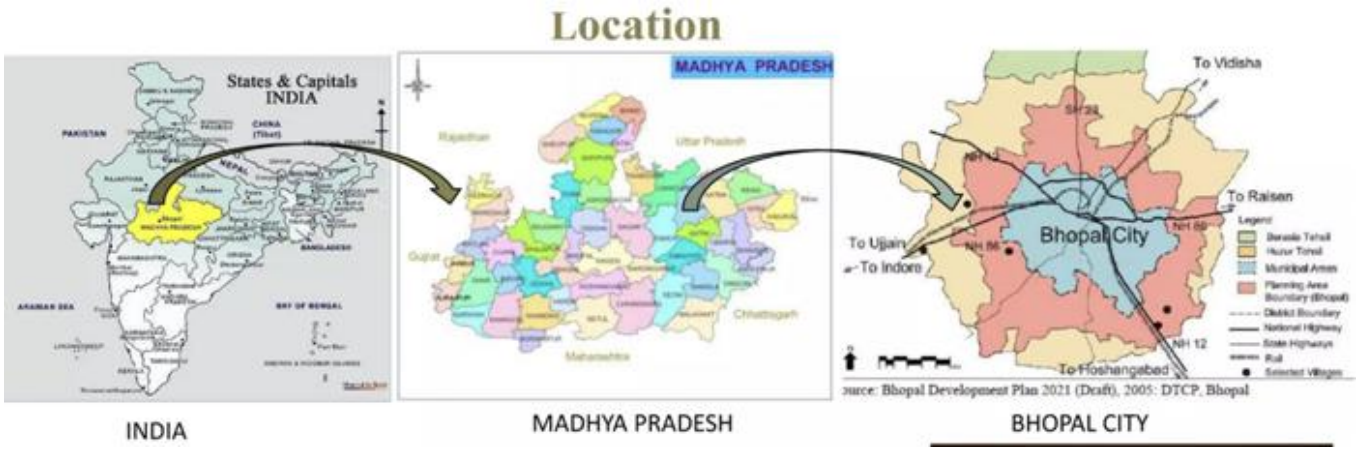
1. Introduction

Urban areas are complex multi-dimensional systems evolving out of an interaction of multiple agents at several levels. In a city, at any given singular moment of time, several transformations tend to occur simultaneously at various levels. In order to understand any particular city, we need to understand and study various processes that underlay spatial and social networks. It is on the basis of these processes that the human brain makes mental images rooted in spatio-temporal context, which justify events of the past and their need for the future. These mental images lead to transformations in a city which are reflected over space and time. As cities grow in terms of area and population, several changes take place within the city and in the surrounding areas.

The fringe areas are generally within the jurisdiction of the panchayat, which have neither the financial resources nor the technical expertise to plan and manage the rapidly developing fringe. The urban authorities also ignore the problems of fringe as it falls outside their limits. Thus, the city and the fringe, although administratively fall in different areas, for the residents of the fringe, there is hardly any difference between the two and their movement is unrestricted and they use the municipal services without paying for it. The property and service taxes are relatively higher in the city than in the fringe area and, therefore, attract industries which intensifies development. Since this fringe zone falls neither under the urban local body nor the rural panchayats, the dynamic situation of the fringe leads to haphazard development.

2. Study Area

Bhopal, the capital city of Madhya Pradesh, is a tier II city facing fast pace of transformations. Several locational, administrative and economic factors are contributing towards it. This city with a history of around three hundred years underwent a sudden change in 1956 when it was declared the state capital. Several complex forces became operative in the culmination of developmental processes that were added forcefully to the unchallenged metropolitan status. The sudden increase in population growth rate was experienced in the decade of 1951-61, which was 118 per cent. This trend of very high population growth rate is still continuing - with the result that the population which was 200,000 in 1961 was raised to approximately 2 million in 2011.The same happened to the area of the city which increased from 94.72 sq km in 1961 to 463 sq km in 2011. This expansion of urban areas is ofcourse on the neighboring rural areas. The emergence of this fringe zone with its complex problems of adjustments in between rural and urban ways of life leads to serious land-use problems - loss of agricultural land, unauthorized urban sprawl, high land values, speculation in land and related problems. In the case of Bhopal city, the dynamics of change from rural to urban use is so fast, that the resultant need and complex uses coupled with shortage of land have led to speculation and increase in land values. The ever- growing difference between the demand and supplies of housing sites have increased the pressure of fringe areas tremendously leading to proliferation of unauthorized development of residential, commercial and industrial land use.



3. The Problem

As land prices near the city center are beyond the reach of middle/low income group people, they look for land outside the city limit. The speculator who holds the land for quick profit starts selling it by parceling it as unauthorized colonies, without any municipal services. The buyers who are in urgent need for housing, build houses on unserviced plots, whereas others hold the plot without use in anticipation of infrastructure development. Unplanned development of fringe areas leads to the lack of public facilities, public open spaces, health centers and schools and degradation of environment - as the required sanitary and water disposal services are not provided. Agricultural land around the city is eaten away and the agriculturists and workers are forced to undergo occupational transformations. In this process, the Green Belt areas which are generally demarcated in the Master Plans also get sacrificed by encroachments. Industrialists, cooperative housing societies, individuals and speculators enter into direct deals with farmers for sale of their lands. Urban land-use almost always represents a much more intensive use of land than is made by any agricultural system of production. In consequence, the price paid by developers for agricultural land in the right location for conversion to urban uses is usually far more than the farmer making his living from agriculture in his lifetime.

Wherever a free market in land exists, or a revision in land-use zoning regulations is anticipated, speculative situations develop. The farmer operates within a particularly uncertain farming environment and land may lie idle while the farmer awaits the right offer or the developer the right time to develop. As a result, statutory authorities are encouraged to pass legislation to control the pattern of land conversions and to reduce the level of private speculative gain which, in practice, is usually passed on to the community in the form of higher house prices. Paradoxically, if legislation reduces the supply of building land, the land prices increase manifolds due to scarcity assuming an uncontrolled proportion. Spiraling urban land prices, as stated by the United Nations Habitat Conference, is the most serious of the problems faced by developing countries in the urbanization process. It is very interesting to watch "plots for sale" boards along the roads in the fringe. Daily newspapers flash advertisements for the sale of plots. As stated above, land transactions involve land, money, men, institutions etc. It is dependent on various other factors like rate of urbanization, generation of employment, development of infrastructure availability and environment of the region. The fast growth of Bhopal is giving rise to immigration. Several proposed industrial estates in the vicinity within a radius of 25-35 kilometers have accelerated the process of urbanization.

The existing system of land value evaluation

Traditional economic theory states that farmland values are determined by the discounted stream of future rents. So, in rural areas where agricultural land is only used for agricultural production, land prices are not influenced by the demand for its use in urban activities. However, if there is the possibility of future development driven by urban necessities, then one needs to account for the expected return related to those changes in the current land value. Those necessities do not only include urban sprawl and expansion, but also the purchase of land for portfolio diversification and the push by urbanizations for developments capable of creating food and energy. The market value of properties in areas where land-use changes are likely to occur intrinsically has an element of hope value. Besides that, the amenity value of farmland is relevant. Not only are there natural amenities that influence the value of farmland, but also a land parcel itself may constitute a natural amenity for the surrounding properties. Furthermore, there is not enough liquidity in the real estate market to keep its players updated, and information asymmetry enhances the differences between the property's value and its sale price. This fact threatens the concept of fair value. Hence, traditional economic theory is only able to partially value farmland, because agricultural land values are driven by a complex set of factors.

Although agriculture plays a big role in economic development and sustainability, agricultural producers are less keen to remain in the sector because of its increasingly challenging environment. The continuity of the sector depends on the funding of their projects, preferably by using agricultural land as collateral. Thus, farmland valuation becomes essential for all the people involved in the process: not only the farmers, but also financiers, investors, and ultimately consumers. Farm real estate is a significant source of value in the farming sector and in the typical investment portfolios of families that live off agriculture. In this regard the work of some economists on the increasing land value of

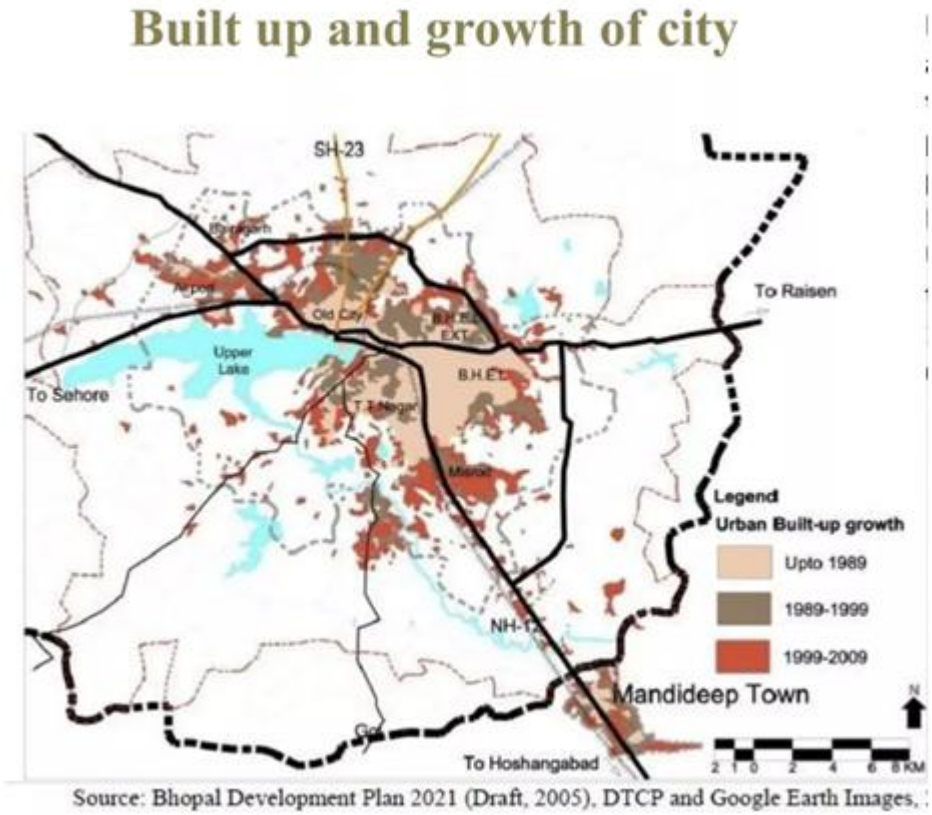
the cities and their fringe area may be quoted. Alonso (1964) has considered two variables, quantity of land and amount of disposable income devoted to land and transport cost. If the amount of service is constant and the relationship between quantities of land distance is considered, the price of land decreases with increasing distance from the city center while the quantity of land consumption increases. But, if the transport cost also increases with increasing distance, then, the amount of land to be purchased decreases. In the case of Chicago city, Yeates (1969) also determined the increase in land value along with increasing distance. The value of agricultural land varies according to its quality, location and surroundings.

4. Methodology

This study of land pricing is based on the questionnaire survey conducted in 2001 along the fringe of Bhopal. Interestingly, the city of Bhopal forms a circular pattern with several networks of roads and railways radiating out from the city Centre. The development of Bhopal is more directed towards the southern direction mainly due to the well developed infrastructure (both social and physical) and nearness to work centers and commercial areas. The increase of land prices corresponds to the development activity and the prices of colonies located closer to the city and public transport have risen fast. The survey was done in the village along the road/railway lines beyond the municipal boundary of Bhopal. The selection of villages was done on the basis of stratified random sampling. The entire tehsil was divided into seven sectors on the basis of road and railway lines and the villages were selected in a way that some villages fell within the urban agglomeration boundary and some beyond it. The maximum limit for the selection of a village was the administrative boundary of Huzur tehsil. A sample of 500 households was selected from thirteen locations beyond the municipal boundary and nine locations beyond the urban agglomeration boundary. The rates as fixed by the government registrar's office and rates prevalent in the market in the private sector were compared. The comparison is also done at temporal level, i.e. from 1994-95 to 1999-2000 a period of five years. Since a direct impact of the people's desire to purchase land/house in or around Bhopal is reflected on the land diversion cases, secondary data to this effect was collected from the collector's office from 1961 to 2001. Once the primary and secondary data were collected, processing was done. The annual percent change of land price has been derived by:

Where,
r = Pn-Po * 100/ Pox n
r = annual percent change
Po = initial price
P = price at the end of the period
n = time in years

The following factors were told to be responsible for this pattern of choice:
(a) Well developed infrastructure both social and physical, (b) No natural or man-made barrier and good living environment, (c) Good accessibility, (d)People living in the capital project area (C.P.A.) are basically government servants/officials and after retirement they give priority to settle in the same direction near the Capital Project Area, (e) First private residential sector-Area Colony acts as a status symbol, (f) Nearness to the work centers and commercial areas, government offices, administrative area at Area hills, New Market, Major Shopping center at M.P. Nagar, Press complex, Bhopal University etc., (g) Development of new railway station at Habibganj, and (h) Industrial growth center at Mandideep (20 km).The development is taking place both, within the planning area and outside the planning area.



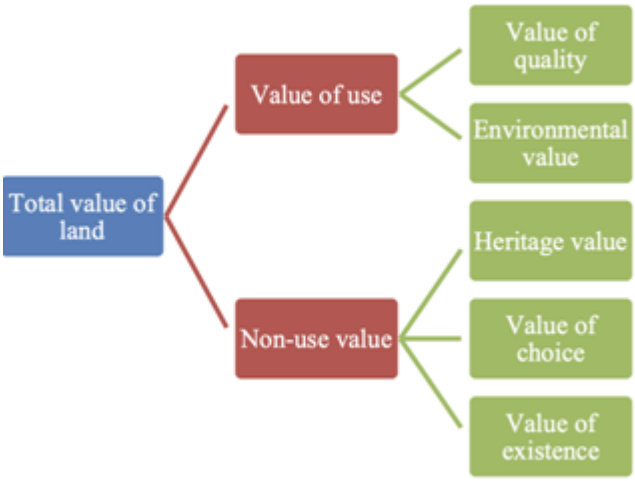
Source: Bhopal Development Plan 2021 (Draft, 2005), DTCP and Google Earth Images,

The factors responsible for development outside the planning area are: (a) No urban land ceiling, (b) No land-use control, (c) Land value is less in comparison to the master plan area, (d) Not much legal controls/regulations, (e) Easy availability of land for infrastructure development, (f) Nearness to developed area.

From the observations, it can be easily stated that further expansion of Bhopal city is more likely to occur in the southern direction. More and more villages from the Standard Urban Area are going to be assimilated into the municipal limits of Bhopal. The planning limits of Bhopal according to the TCPO include a larger number of villages towards the north, in order to balance out the expansion but despite it, people have greater preference for areas in the south. The increasing demand of land plots on the one hand and the high land price now commanded by the agricultural land in the southern fringe has increased the sub- division of land as the value of agricultural produce cannot compete with the lowest growth rate of land value. Hence, a large number of cases are being recorded for land diversion under the' Land Diversion Act of 1959 under section 172 whereby the use of agricultural land can be diverted to non-agricultural usage. This non- agricultural usage can be residential, industrial, commercial or institutional. The diversion of such agricultural land brings forth a number of changes in the land-use and along with these changes come a chain of various other changes that finally change the.

Need to Change the Land Value Evaluation System

The characteristics of land resources can be summarized as natural characteristics, economic characteristics and human characteristics, according to which many functions and USES of land resources can be derived and evolved. Specifically, land resources have been widely accepted in the production and load features, and also includes some other functions, such as wildlife habitats, biodiversity conservation, protecting the ecological environment, an ethical and moral education base, and the value of the natural landscape. The value of these functions is hardly reflected in the current market price system. Its value composition is shown in figure below:



These functions and purposes can be integrated into two final functions or purposes: the first is as Spaces with human production and life, which provides a kind of bearing. Secondly, directly or indirectly to provide the production and life of the human needs of the product or resources, such as all kinds of mineral resources, food, that is, land resources have a productive function. Under the strategy of sustainable development of resources and environment economic theory, resources include land resources in addition to be able to bring to mankind the direct material comforts direct

function, there are many cannot bring contemporary material directly enjoy the non-use value of function, and as the land resources gradually reduce, this produces the use value of the function will be more and more apparent.

The process for determining the land prices should use remote sensing and geographic information system technology to identify the hotspots of the urban-rural fringe and then determine land price. Firstly, the boundary range of urban and rural areas in a city is analyzed and determined, and the land in this region is graded and evaluated by spatial analysis and mathematical statistics. On the basis of the DSR model, the land grading factor system of urban and rural fringe areas should be established, and then the types of each factor should be analyzed. According to the specific situation of urban and rural fringe areas in a city, the analysis method of GIS and traditional analysis method should be combined to quantify each factor. Finally, the land grade of urban and rural fringe areas in the city can be identified and land priced determined.

5. Conclusion

The above discussion brings to a logical conclusion that (1) Land values get affected by three variables, i.e. (a) accessibility, (9) physical factors, and (c) institutional factors; (2) if these three showing a positive growth the land demand would also show a positive increase irrespective of land value. The above variables are noted features are seen to be occurring in the case of Bhopal, city too. The concept of socio-spatial dialectic (Soja, 1980) clearly seems to be operating in the city whereby a two-way process is going on in the city in which people create and modify urban spaces while at the same time being conditioned in various ways by spaces in which they live and work. Government should formulate land policy in a way, so that people belonging to different socio-economic conditions have an access to land and housing in the city. The speculation in land should be curtailed and middlemen to be stopped in operation of land dealings.

Spiraling urban land prices, as stated by the United Nations Habitat Conference, is the most serious of the problems faced by developing countries in the urbanization process. There is a need to develop mechanisms using digital based information including RS & GIS tools to regulate the land prices on the fringe. On-the-spot reliable information about the basic condition of parcels of land such as their price and location, is mostly unavailable. There are great demands for land price information supply and deep processing. Providing information sources is one of the crucial aspects for reducing transaction costs. The information related to the use, the ownership, and the value of the land using cadastral and land registry is available with the municipalities and governments. Traditionally, the public accesses such information by inefficient means. Some more effective information technologies are required to improve this situation. Many information systems aimed at land monitoring and management have been built in recent years but very few of them are specialized in providing urban land price information to the public. Most of these information systems used by local governments have been developed mainly to enhance information gathering and management rather than dissemination of information.

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