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Linking land use and transportation in a rapidly urbanizing context: A study in Delhi, India[1]

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Abstract. Cities in developing countries like India are facing some of the same concerns that North American cities are: congestion and urban growth. However, there is a sense of urgency in cities like Delhi, India in that this growth is far more rapid as both urbanization and motorization are ongoing processes that have not yet peaked. In this paper, we examine land use change and its relationship with transportation infrastructure and other planning related variables in a spatial context. We estimate land use change models at two different scales from separate data. Cellular automation and Markov models were used to understand change at the regional scale and discrete choice models to predict change at the local level. The results suggest that land use in the Delhi metropolitan area is rapidly intensifying while losing variety. These changes are affected by industrial, commercial and infrastructure location and planners and policy-makers need to better understand the implications of location decisions. We also examine these results in the context of a policy framework for data-based planning that links land use and transportation models for Delhi.

1. Introduction

Delhi is one of the most polluted cities in the world according to the Asian Development Bank (ADB/UNESCAP 2000). The WHO (1992) notes that traffic congestion in the city is high and traffic related fatalities are a major problem with an average of 5 fatalities a day. Private car ownership is on the rise, though it is low compared to developed countries. The mix of vehicles on the roads is unique in that road space is shared by non-motorized as well as motorized vehicles. Traditionally, transportation related air quality policies in developed countries like the US have emphasized cleaner vehicle and fuel technologies and alternatives to single occupant vehicle travel such as car-pooling and mass transit. Kessler and Schroeer (1995) note that traditional highway projects are justified on the grounds that they will increase speeds and

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improve air quality. However, as running emissions are declining as a portion of total mobile source emissions, minor improvements in vehicle speeds contribute little to the overall emissions picture. As India adopts the Euro III and IV guidelines new vehicles will eventually get cleaner. However, the sheer numbers of people and vehicles forecasted in the future for Delhi and its environs (Kokaz et al. 2001) indicate that congestion will continue to worsen even if new highways are built. Thus, congestion and air quality need to be tackled through other alternative policies.

Gakenheimer (1999) notes that mobility and accessibility are declining in most of the cities in the developing world. He suggests that these cities have a stronger land use transport relationship than developed cities. Bartholomew (1995) notes that the LUTRAQ (Making the Land use, Transportation, Air Quality Connection) study found a significant relationship between land use mixing and auto ownership and mode choice and that pedestrian friendly locations encouraged more walking. Delhi already has relatively mixed land uses and high fuel costs. A large proportion of trips are walking or bicycle trips and 40% of the trips are less than 5 km in length and 50% of all motorized trips are by public transport (Mohan & Tiwari 2000). However, accessibility is poorly distributed, as it is in many developing cities of the world (Gakenheimer 1993). Matching land use development to feasible transportation capacity, jobs housing balance to put workers within range of jobs and efficient mixed uses are all possible strategies for linking land use and transportation planning that can address the air quality problems of Delhi. These linkages need to be at the regional level and local level so that they can inform planning decisions which have in recent times been based on ideology. In this paper we use empirical data to analyze the change in land use between the years 1962–1999 and its relationship to transportation characteristics. These characteristics include the presence of highways and railroads to address the future location of population and employment in the Delhi metropolitan area.

2. Land use change models

Models of urban structure have historically incorporated transportation infrastructure in their formulation. Warren (1993) notes that Harris and Ullman's multiple nuclei model in 1945 referenced road transportation. Mayer (1969) illustrated the impact of different time periods with their different transportation models on urban spatial structure. Warren (1993) also suggests that other secondary features besides transportation corridors such as the history of development, topography, riparian and water features will influence the morphology of a city's land use development. While such theoretical descriptions are useful in understanding the overall structure and form of cities, planners need to understand this relationship empirically. In particular these studies need to address the issues that face planners in developing countries like India.

Studies of land use change in developing countries (Ji et al. 2001; Kundu et al. 2001; Serneels & Lambin 2001) emphasize land cover change rather than land use change and tend to study rural/urban change rather than intra-metropolitan level land use change. Others have used cellular automaton (CA) and Markov models to simulate socioeconomic effects on land use change (Clarke & Gaydos 1998; Wang & Zhang 2001). While land cover change is clearly very important to understanding environmental changes at the macro-level, the planners in the Delhi region need to understand changes at the regional and metropolitan level for effective provision of infrastructure.

Fischer and Sun (2001) point out that land-use changes are directly linked with economic decisions. Therefore, they adopt an economic framework as the organizing principle for their models predicting regional land use in China. Another such example is found in the work of Zhang and Landis (1995). They use a discrete choice framework to study land use change by county in the San Francisco Bay Area between 1985–1990. The results of their models indicate that distance from the central business district (CBD), proximate uses, site topography, population growth are important explanatory variables. Chomitz and Gray (1996) also estimate the probabilities of alternative land uses as a function of land characteristics and distance to market in Belize using a discrete choice framework.

While detailed models of land use change using discrete choice models are more desirable in terms of their economic decision framework, detailed data is often not available for Indian cities including Delhi. Therefore, we compromise by formulating a CA and Markov land use change model for the Delhi region to estimate overall trends and then zoom into a smaller area within the metropolitan area to estimate discrete choice models. The metropolitan level models estimate both intensification and loss of variety in land use as both play a role in urbanization characteristics that impact travel (Sheehan 2001). Both models are further described in the following section.

3. Land use change in Delhi

In this section we first examine land use change within the CA and Markov modeling framework for the Delhi region and then look at land use change within Delhi with the help of discrete choice models. The former modeling technique is useful because land use and transportation data are not available for the entire region. The discrete choice models need more detailed data that were available only for the 538 km^2 that make up the central parts of Delhi (the entire city covers an area of about 1500 km^2.

3.1. *Cellular automaton and Markov model*

A Markovian process is one in which the state of a system at a later time can be predicted by the state of the system at an earlier time. A CA is a cellular entity that can independently vary its state based on its previous state and that of its immediate neighbors according to a specific rule. Population data from UNEP Global Resource Information Database for 1987 and the Oak Ridge National Labs (ORNL) Landscan Population Density product for 1998 were used for forecasting urbanization in 2010 using a CA and Markov land use change model developed in the Geographical Information Systems (GIS) software IDRISI®. Urbanization was modeled based on density, which was classified as:

1. rural (<1000 persons per km^2)
2. suburban (1000–5000 persons per km^2)
3. urban (>5000 persons per km^2)

Rural suitability was based on availability of moisture, average annual rainfall, access to streams and other sources of water, soil type, agricultural productive potential, slope and land cover suitability to agricultural use. Urban and suburban suitability was based on identification of macro-economic zones in close proximity to existing cities (larger cities have a higher "attraction" than smaller cities). These locations fall into the two density types (urban or suburban) based on existing urban centers, proximity to water sources, low slopes, and proximity to roadways and railways. Data from the Earth Satellite Corporation (2000) were used for generating the suitability maps.

Suitability maps for each urbanization type were considered the objective of the final forecast. For each density category, the suitability maps of all other categories are masked and for each masked image a filter is used to weight contiguous areas so that they develop using the same rules. The area requirements for each density category are taken from the transitions areas file developed using a Markov model that is based on past development trends. Finally, an overlay is applied to all the results and the base density map. The results predicted by this model are indicated in Figure 1 for Delhi. It is apparent from the maps that if current growth rates continue, the predicted level of urbanization suggests a mega-city with very high densities.

Clearly, the CA/Markov based model is a simple simulation model. It does not use detailed data on income, employment or other socioeconomic characteristics that may be relevant to land use change. Also, it may not be useful to those planning at the intra-metropolitan level where micro-level changes in

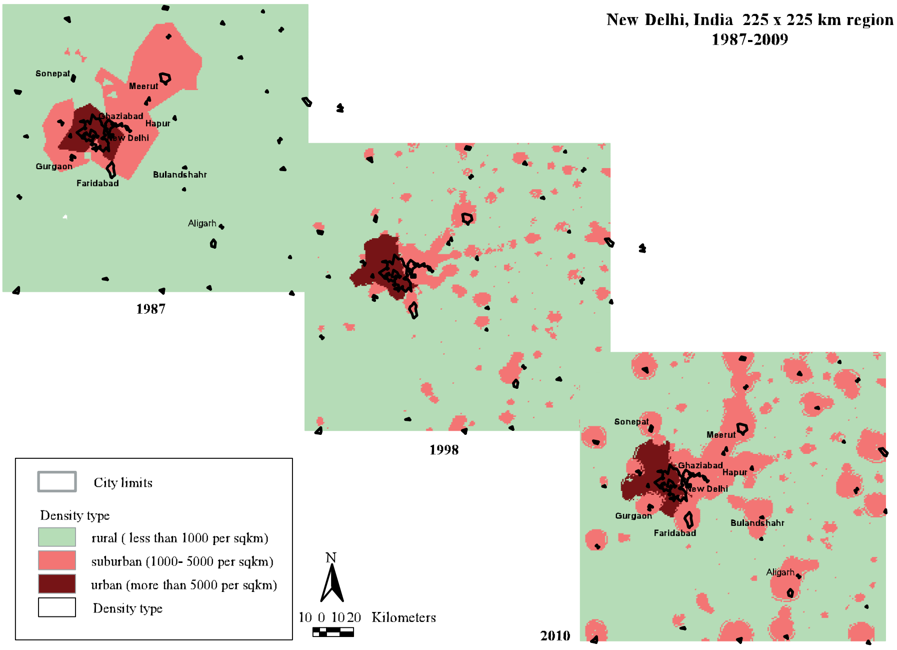

Figure 1. Urbanization based on the CA–Markov model.

land use may be more important. For this reason, we look at more detailed land use changes for Delhi and examine these changes within a discrete choice framework.

3.2. *Discrete choice model*

Land use data derived from IRS (Indian Remote Sensing) satellite data for the years 1962, 1990, and 1999 (MLInfomap 2000) were used to observe changes in land use at a more micro-level. As Figures 2 and 3 indicate there are many differences in the proportion of land use within the 112 wards over approximately 500 km^2 that make up the central part of the state of Delhi. In Figure 2 the loss of open space is evident during 1990–1999 over the entire area. However, in Figures 2 and 3 the changes in the proportion of land use devoted to open space and residential area appear to be more significant in the northern parts of the study area. The south (where the higher income groups live) is less affected in terms of loss of open spaces. Figure 4 indicates a loss of land use variety all over the study area in the second period. To quantify these changes in land use, discrete choice models were estimated. Discrete choice models are extensions of linear regression models where the dependent variable is of qualitative choice.

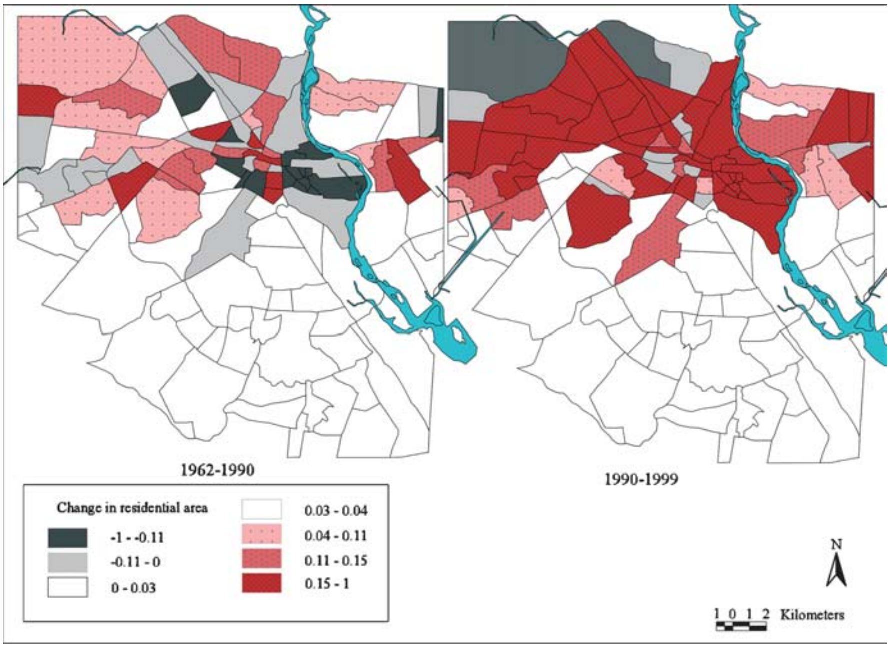

Figure 2. Change in open space area as a percentage of the wards for two time periods (1962–1990, 1990–1999).

The geographical unit's change over the two time periods 1962–1990 and 1990–1999 is estimated as a binary ''choice''. For the model presented in this paper the geographical unit is a 0.5×0.5 km grid cell derived from a raster map of the metropolitan area's land use. Stratified random samples of 1000 and 500 grid cells were obtained from the 10,000 grid cells that define the city in an attempt to reduce variance by increasing the average distance between sampled grid cells. Stratification allowed for all the electoral wards in the city to be represented in the sample. Several samples were drawn and all had similar results in terms of direction and significance of the coefficients. Clearly, this does not completely avoid the problem of spatial autocorrelation. Future versions of the model that may be used to forecast land use changes for planning purposes will need to include lagged spatial variables that could compensate for the spatial autocorrelation problems in the estimators (Fotheringham & Rogerson 1994). Models estimated at the ward level also resulted in coefficients that were similar in terms of direction to those predicted at the grid-cell level though many were not significant.

The dependent variables (0/1 discrete where 1 indicates change and 0 indicates none) were:

1. Intensity of land use: Went up if it went to higher rent use (from open to residential to office/commercial/light industrial parks)

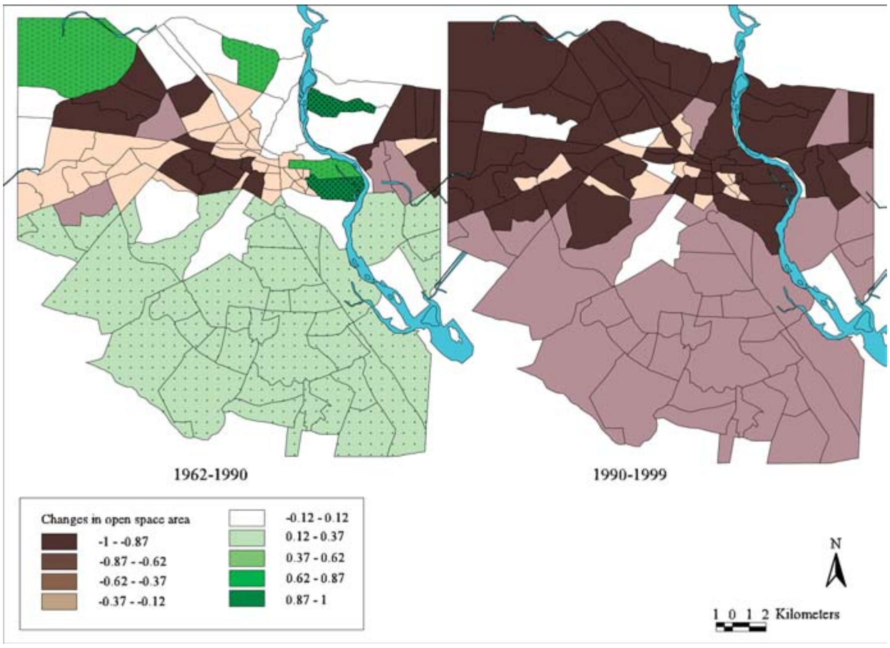

Figure 3. Change in residential area as a percentage of the wards for two time periods (1962–1990, 1990–1999).

2. Variety of land use: Went down if the types of land use categories within 2 km of a grid cell decreased from base year.

It should be noted that open space includes agricultural land, designated green belt areas and non-cultivable land that were not yet developed at the time of base year. Industrial parks include light industry and the so-called "regional parks" and do not include heavy industry. Intensity change is estimated in two ways: the hierarchical change model which considers changes from open to residential to commercial to office and light industrial parks while the other model estimates change from open to residential to any higher use. Both models do not account for land used for the purpose of heavy industry and warehouses. The local governments discourage the location of heavy industry in these relatively central locations within the city. Their continued presence in many parts of the city is not examined in this paper as they are not a source of high rent to the land owner.

Independent variables included:

1. Initial land use (open space or residential or developed for commercial/office) in base year
2. Straight line distance computed using GIS from

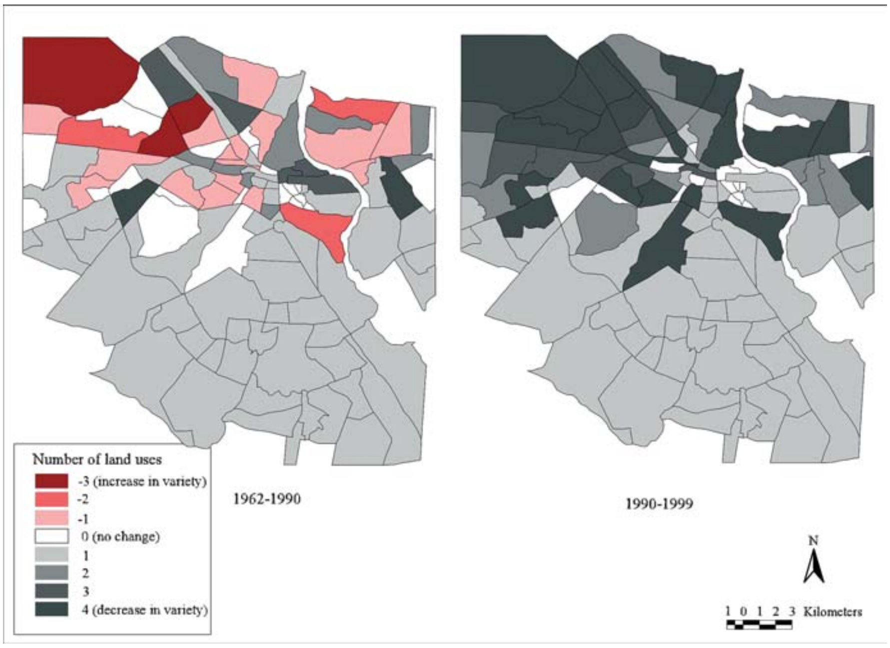

Figure 4. Change in land use variety by ward for two time periods (1962–1990, 1990–1999).

Closest commercial, open space or residential land uses in base year,
Highway network,
Railway network,
Central Business District (CBD),
District centers

3. Road density of the ward in which geographical unit is located
4. Population density in base year (and employment density when available)

The probability of change in variety (downwards) or intensity (upwards) is modeled as a logit probability model:

$$\log\left(\frac{P_{ij}}{1-P_{ij}}\right) = \beta_j X_{ij} \tag{1}$$

where P_{ij} is the probability that geo-unit i will change over time interval j; X_{ij} is the vector of socioeconomic and physical characteristics related to the geo-unit i at base time for interval j; and, β_j is the estimated coefficients for time period j associated with the vector X_{ij}.

This framework assumes that as land use intensifies, higher values will be obtained for rent (from open to residential to commercial or office or light industrial). Likewise, as land use variety decreases a more homogenous mix will result in higher rent especially as it turns to commercial, residential and office uses. The utility functions are assumed to include attributes that are unobservable and hence may be modeled stochastically (Zhang & Landis 1995). The independent variables are not believed to be related to each other – CBD, designated district centers, highway and railway locations have remained the same over the last 30 years as have the major road networks used for road density calculations (unpaved roads are not used for the analysis).

4. Discrete choice model results

The results of land use intensity change (Tables 1 and 2) confirm that land use change in the two time periods were indeed very different. Both models (and both sample sizes) have high ρ^2 with several significant coefficients. Locations that were initially residential or open space were significantly likely to not

Table 1. Logit model estimated for land use change upwards during the 1962–1990 period.

Independent variables	Estimated coefficient (n = 754)		Estimated coefficient (n = 381)	
	Hierarchical change	Any change	Hierarchical change	Any change
Constant	2.3**	2.2**	2.6*	2.2
Initial use residential	−3.6**	−3.1**	−4.8**	−4.1**
Initial use open	−3.9**	−4.6**	−5.9**	−5.9**
Average distance to commercial (m)	−16.5	2.0	−60.8	−45.9
Average distance to residential (m)	46.7	25.8	131.3**	129.3**
Average distance to open (m)	−59.1	−27.7	−70.0	−36.7
Average distance to highway (m)	−9.6	−23.4**	−21.9*	−25.2*
Average distance to railroads (m)	15.6	27.9**	−15.4	−16.2
Average distance to CBD (m)	−0.2	4.2	4.0	8.7
Average distance to district centers (m)	9.6	7.8	18.8	4.6
Road density (roads per m^2)	2.2e−03**	1.8e−03**	2.6e−03**	2.4e−03**
Population density 1962 (people per m^2)	1.5e−04	3.9e−04	5.9e−04	7.3e−04*
Model statistics				
Percent correctly predicted	81	90	88	89
ρ^2	0.46	0.62	0.56	0.62
Percentage of cells with change	20	10	19	13

* Indicates significance at 10% level.
** Indicates significance at 5% level.

Table 2. Logit model estimated for land use change upwards during the 1990–1999 period.

Independent variables	Estimated coefficient (n = 720)		Estimated coefficient (n = 356)	
	Hierarchical change	Any change	Hierarchical change	Any change
Constant	3.0**	14.4	4.3**	11.9
Initial use residential	−5.0**	−10.7	−6.8**	−11.9
Initial use open	−6.1**	−15.9	−6.3**	−14.7
Average distance to commercial (m)	33.7	113.1	−29.2	208.9
Average distance to residential (m)	−56.8	−22.1	−53.9	−214.9
Average distance to open (m)	0.1	2.4	−52.1	150.8
Average distance to highway (m)	−6.5	60.8**	14.2	81.9**
Average distance to railroads (m)	2.4	−24.6	39.7**	31.7
Average distance to CBD (m)	2.2	−21.3**	1.4	−30.6*
Average distance to district centers (m)	38.2**	−20.1	35.8*	12.1
Road density (roads per m^2)	0.2e−03	−0.7e−03	0.1e−03	−2.1e−03
Population density 1990 (people per m^2)	0.2e−03**	0.1e−03	0.3e−03**	3.4e−03
Employment density 1990 (jobs per m^2)	−0.5e−03**	−0.2e−03	−0.9e−03**	−9.0e−03
Model statistics				
Percentage correctly predicted	87	96	89	96
ρ^2	0.53	0.84	0.62	0.86
Percentage of cells with change	44	0.84	0.62	0.86

* Indicates significance at 10% level.
** Indicates significance at 5% level.

change in both time periods. Distance from residential, commercial or open uses was not significant in the later time period. However, in the first time period of 1962–1990 locations close to residential land use were likely not to intensify.

Distance to the CBD and district centers were significant only in the second time period of 1990–1999. In this period, the closer the site was to the CBD the more likely it was to intensify. During the same period, distance from district centers had the opposite effect in that, the closer the site was to the district center, the less likely it was to intensify. Significance of coefficients depended on the kind of model estimated. Land use change in terms of hierarchical change from commercial to office to regional parks was likely to happen close to the CBD though locations far from district centers were likely to intensify only in terms of changes from open space to residential to any higher use.

In the 1962–1990 period proximity to a highway was likely to mean intensification of land use. However, between 1990 and 1999 this coefficient was significant and positive indicating that intensification occurred away from the highways. Places with high road density tended to intensify in terms of land use in 1962–1990 but this variable was not significant in the second time period. Locations of high population density were more likely to intensify in the later time period though locations with high employment density were less likely to intensify. Locations close to railroads were not likely to intensify in both time periods.

The results of variety change models (Tables 3 and 4) confirm that changes in land use variety during the two time periods were also very different. The former model has a lower ρ^2 (0.24–0.26) indicating perhaps that the infrastructure related variables did not play a part in the homogenization of land

Table 3. Logit model estimated for land use variety change downwards during the 1962–1990 period.

Independent variables	Estimated coefficients $n = 720$	Estimated coefficients $n = 356$	Estimated coefficients $n = 141$
Constant	0.9	1.8*	−1.1
Initial use residential	0.2	0.2	0.4
Initial use developed	0.5*	−0.3	−0.8
Average distance to commercial (m)	48.6**	28.3	−25.6
Average distance to residential (m)	−102.3**	−97.0**	−78.9
Average distance to open (m)	64.8	106.7	−15.2
Average distance to highway (m)	15.3**	2.3	13.7
Average distance to railroads (m)	−8.1	2.4	14.9
Average distance to CBD (m)	−2.8	−3.9	−8.3
Average distance to district centers (m)	64.9**	64.7**	57.6**
Road density (roads per m^2)	−0.8e−03*	−0.2e−03	0.6e−03
Population density in 1962 (people per m^2)	−0.4e−03	−0.7e−03**	0.4e−03
Model statistics			
Percent correctly predicted	79	79	75
ρ^2	0.31	0.30	0.34
Percentage of cells with change	22	23	22

* Indicates significance at 10% level.
** Indicates significance at 5% level.

Table 4. Logit model estimated for land use variety change downwards during the 1990–1999 period.

Independent variables	Estimated coefficients (n = 720)	Estimated coefficients (n = 356)	Estimated coefficients (n = 141)
Constant	−4.9**	−5.4*	−7.8**
Initial use residential	0.5	0.7	−1.8
Initial use developed	1.1**	1.1	−1.5
Average distance to commercial (m)	258.1**	376.1**	573.9**
Average distance to residential (m)	333.9**	221.9**	−11.1
Average distance to open (m)	−74.5**	−16.8	−37.2
Average distance to highway (m)	19.5	32.2	21.2
Average distance to railroads (m)	−20.4	−23.4	−58.5
Average distance to CBD (m)	16.7**	5.9	21.9
Average distance to district centers (m)	−68.9**	−72.8**	−80.2
Road density (roads per m^2)	2.9e−03**	2.7e−03**	7.2e−03**
Population density in 1990 (people per m^2)	0.4e−03**	0.3e−03	0.6e−03
Employment density in 1990 (jobs per m^2)	−0.2e−03**	1.0e−03*	−2.3e−03
Model statistics			
Percent correctly predicted	92	93	97
ρ^2	0.74	0.75	0.83
Percentage of cells with change	89	90	91

* Indicates significance at 10% level.
** Indicates significance at 5% level

uses. Indeed this period did not indicate much loss in variety as Figure 4 indicates. The model estimated for the later time period has a high ρ^2 (0.72–0.76) and several significant coefficients. Unlike the intensity change models, the initial land use was less likely to affect decrease in variety. Distance of the grid cell from land devoted to commercial use was a factor in both time periods and proximity to such use strongly influenced the likelihood of loss in variety. Distance from residential land use had opposite effects in the two time periods. In 1962–1990, the farther a cell was from residential land use, the more likely it was to lose variety. In the next time period proximity to residential use meant that it was more likely to lose variety. Distance from open space was significant only in the second time period and the signs indicate that proximity to open space increased the likelihood of loss of variety. Population density had opposite effects in the two periods – higher population meant the likelihood of decrease in variety during the latter time period though high employment in a cell meant this decrease was less likely and had a stronger effect in terms of the coefficient.

Proximity to a highway was significantly likely not to decrease variety in the later time period. High road density was also likely to result in a decrease in land use variety during the latter time period. Distance from the CBD was significant only in the latter time period and indicated that cells far from the CBD were more likely to lose variety. On the other hand, locations close to district centers were less likely to lose variety during 1990–1999 though they did tend to lose variety in the earlier time period.

In summary, the results indicate that the location of highways, the CBD and district centers along with current land uses, did impact land use change in terms of both intensity and variety, and in both time periods. While the period between 1962 and 1990 followed the conventional trends of densification of land use close to commercial areas and in locations with high road density, the trends observed in 1990–1999 were more complex. The results also appear to indicate that the city is currently intensifying in terms of use but not losing variety close to the CBD and in high population density central locations. High employment locations and designated district centers, highways, or railroads do not appear to be affecting land use change in the second period. Intensification therefore, appears to be occuring in locations that are relatively congested (CBD) or in locations that have poor road/railway infrastructure. The models also indicate a loss of variety as land use homogenizes in high population and road density locations. Though the model indicates that existing residential locations are not likely to lose variety (especially in terms of density mix), open spaces are losing variety and homogenizing (most likely to non-green belt uses). The CBD is also likely not to lose variety though designated district centers are homogenizing. Thus on the one hand, the commercial CBD will continue to attract trips and be a varied mix of office and commercial uses but the secondary CBD are not attracting intensification of use and remain largely residential.

The land use changes in the first period were linked to those in the second time period through hierarchical choice models that assume that land use change in 1990–1999 (second period) is conditional on that in 1962–1990 (the first period). However, the results indicated that this was not a valid assumption. It is likely that a shorter time period such as 1990–1995 could be linked with 1995–2000 since the growth in Delhi during this time period was more rapid. More land use and transportation data for the years between 1990 and 2000 needs to be collated and analyzed in order to test this theory and may be a possible method to forecast land use changes more formally for planning decisions.

5. Policy implications and conclusions

The probabilities predicted by the land use change models we estimate in this paper are mapped in Figures 5 and 6. The map indicates that the probability of land use change in terms of both intensification and variety loss predicted by

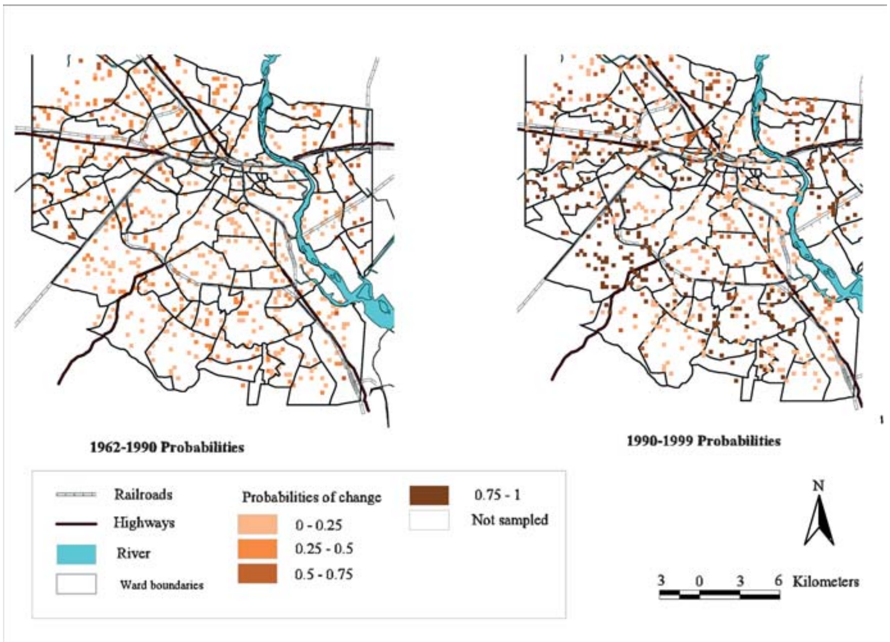

Figure 5. Probability of land use intensification for sampled grid cells estimated using logit model.

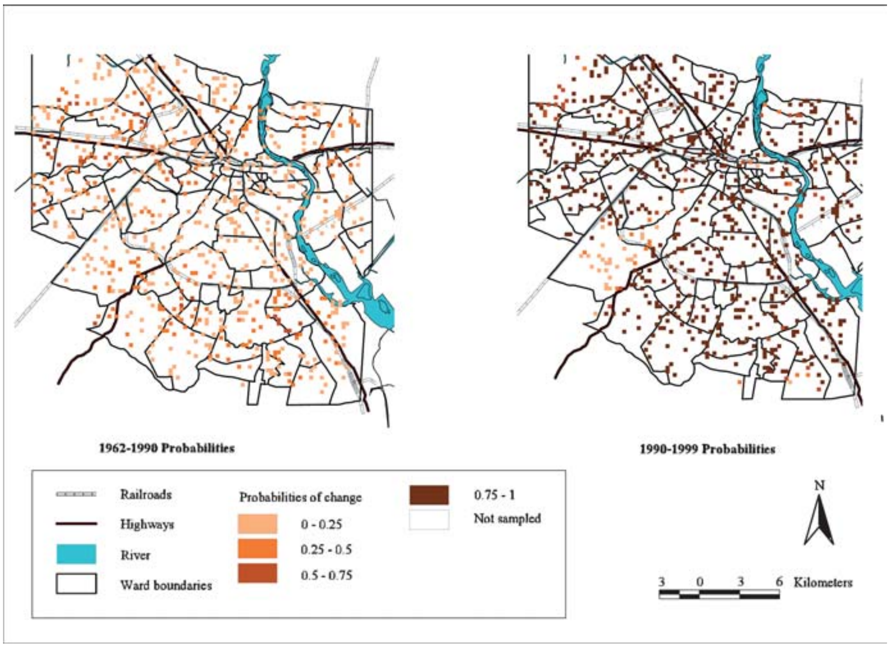

Figure 6. Probability of land use variety decrease for sampled grid cells estimated using logit model.

the models in the last 10 years are much higher than those predicted for the model estimated for 1962–1990. Thus, Delhi faces not only expansion in terms of its city limits as indicated by the results of the CA simulation model, but also intensification in the use of its land area. The data and the models indicate that industrial and office location, highway location, road density and district center locations are all significant in affecting land use change.

The question to be asked in Delhi is, who is planning for these characteristics that could affect future land use change? The 2001 Master Plan for Delhi (Delhi Development Authority 1990) estimates a population of 12.8 million people in 2001 living in a low-rise, high-density city. The Master Plan suggests the introduction of a hierarchical system of commercial activities to accommodate required shopping, commercial offices and recreational needs that would minimize the average trip lengths. This included the provision of district centers to serve as a focal point for multi-nodal activities. The Census of India (2001) on the other hand, indicates that the population of the city of Delhi alone is 14 million (with an estimated agglomeration of 17 million in the surrounding metropolitan area). The tiered system of commercial activity hierarchy has not been implemented and the CBD continues to be the major hub with a fall in the variety of land uses near the district centers and residential areas that could result in higher trip lengths.

As trip lengths increase, in a city where a large portion of the population is unable to own a motor vehicle, public transit may be the only available option. Sarna and Sarin (1995) note that Delhi has the largest number of buses of any city in the world. About 5000 buses were on the roads in 1985, approximately three times the number that were present in 1973, with the current figure estimated to be about 10,000 (Tiwari 1999). However, the road system is reaching the maximum level of its ability to accommodate buses and traffic management measures such as high occupancy and bus only lanes may be a necessity to attain reasonable speeds beyond the very low speeds projected for current motorization growth rates (Kokaz & Rogers 2001). The recently developed Metro subway line will serve only a small part of the city and cannot serve commuters who increasingly travel longer distances. Also, this subway system is not currently linked with the major bus routes as part of a coherent transit system.

The Master Planning process in Delhi has not been supported by data collection. The current plan for 2020 (Government of India 2001), like its predecessor (DDA 1990), does not appear to be based on a concerted data analysis effort on the part of the several agencies in Delhi responsible for planning. There have been no visible attempts to collect relevant transportation and land use data. The lack of reliable data is a major drawback to the planning efforts in Delhi and most other Indian cities. Recent data for even simple transportation and land-use planning exercises such as origin-destination studies and transit surveys are not available.

Our research, even with limited data, is able to show that land use changes are happening rapidly and are impacted by infrastructure such as highways, roads and current locations of land use. Preliminary results of models linking air quality to land use characteristics and weather conditions for Delhi indicate that the land use characteristics of the location where the air quality is measured is significant in affecting air quality as measured through ambient air quality levels (Sikdar 2001). However, in the absence of relevant traffic counts and other transportation data these models remain preliminary. Clearly, there is a need for similar studies linking land use and transportation in a coherent fashion. Further, as more data becomes available publicly as part of the planning process, these models could be linked with transportation and air quality dispersion models to predict the future locations of environmental "hot-spots" in the city. This idea of a data-based land use and transportation plan for Delhi instead of one based on ideology alone, must be incorporated into the planning process.

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