ALTERNATIVE MODEL FOR PERI URBAN DEVELOPMENT OF BHOPAL

A DISSERTATION

Submitted in partial fulfilment of the requirements for the award of the degree of

MASTER OF URBAN AND RURAL PLANNING

By

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CANDIDATE'S DECLARATION

I hereby certify that the work which is being presented in the dissertation entitled **ALTERNATIVE MODEL FOR PERI URBAN DEVELOPMENT OF BHOPAL** in partial fulfillment of the requirement for the award of the degree of **MASTER OF URBAN AND RURAL PLANNING** submitted in the **Department of Architecture and Planning** of the Institute is an authentic record of my own work carried out during the period from Aug2003 to May 2004 under the supervision of **Dr. Nalini Singh.**

The matter embodied in this dissertation has not been submitted by me for the award of any other degree.

Place: Roorkee

Date: May 31, 2004

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This is to certify that the above statement made by the candidate **YATIN CHOUDHARY** is correct to the best of my knowledge.

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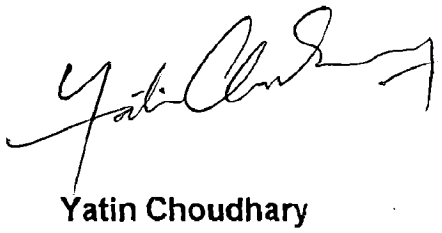

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CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF MAPS

(Source of data for maps primary census abstract 1991, 2001)

CHAPTER 1

INTRODUCTION

1.1 GENERAL

In India, growth of urban population during the past decade indicates higher growth for metro cities. There are 7 mega cities (4 million plus) and 28 metropolitan cities in the country. The urban population has been growing at a much higher rate than the total and the rural population and as a result, its proportion in the total population has increased from 10.85 percent in 1901 to about 27.78 percent in 2001. [1]

Rapid urban development and increasing land use changes due to increasing population and economic growth in developing cities need attention of the physical planners. Increasing congestion in cities because of increase in population and in-migration owing to urbanization has resulted in deformation of growth of cities. The cities are expanding in all directions resulting in large-scale urban sprawl and changes in urban land use. During the phase of rapid expansion the largest share of total growth is accounted by the fringe area as urban sprawl, ribbon development, or leapfrog development. The spatial pattern of such changes is clearly noticed on the urban fringes or city peripheral rural areas, than in the city centre. Inadvertently this is resulting in increase in the built up area and associated changes in the spatial urban land use patterns causing loss of productive agricultural lands, forest cover, other forms of greenery, loss in surface water bodies, depletion in ground water aquifers and increasing levels of air and water pollution.

1.2 IDENTIFICATION OF PROBLEM PERI URBAN AREA: AREA OF RURAL TRANSFORMATION AND ENVIRONMENT CHANGE

Bhopal is the capital of Madhya Pradesh and is nerve center of the socio-economic and political life of the state. Today it is among the fastest growing cities of India. Rapid social change has forced small agricultural communities to adjust to an urban or industrial way of life in a very short time. the urban growth dynamics consists of increasing intensity of use of land in : already developed areas, filling of undeveloped pockets of land within the developed areas, development on the

periphery of developed areas, and merger of outlying settlements as the developed areas expand. Most of the time, especially during the phase of rapid expansion of the city, the largest share of total growth is accounted by the development in the fringe areas. Environmental stresses in peri-urban areas of Bhopal are related to the spread nature of peri-urban settlement, pollution from a variety of industrial and residential sources, increase in traffic on roads & inadequate infrastructural resources to cope with the rapid development.

Following issues have been distinguished as topics for research. The first of these concerns the need to refine the concepts relating to rural-urban fringes and rural transformation due to urbanization. Land-use issues and the pressing problem of how land degradation should be interpreted in a rural-urban fringe. How local and extra-local influences interact to determine land-use patterns in the peri urban areas. The final part discusses the environmental implications of the growth of metropolitan cities for the urbanizing villages.

1.3 AIM AND OBJECTIVES OF THE STUDY

1.3.1 Aim

The aim of this thesis is to study the growth pattern of peri urban development of Bhopal, to develop alternative model for peri urban development of Bhopal.

1.3.2 Objectives

With aims in view, following set of objective have been identified for this study:

- To refine the concepts relating to urban rural fringe and peri urban transformation due to urbanization
- To analyze how local and external factors interact to determine land-use patterns
- To identify the drawbacks of present peri urban development of Bhopal
- To develop alternative models for peri urban development of Bhopal through recommendation and policy guidelines

1.4 SCOPE AND LIMITATIONS

1.4.1 Scope

The thesis focuses on the peri urban area of Bhopal. These areas have fast changing environmental and socio-economic conditions brought about by urbanization. The population of urbanizing rural area is confronted with new problems and possibilities regarding their livelihood and living conditions. In Bhopal lot of developmental activity is going on in these areas, in lack proper development plan, conditions in this area are degrading rapidly. In the light of this fact, for improving the living conditions, the thesis focuses on finding alternate model for peri urban development in Bhopal city considering land-use pattern, physical infrastructure improvement, transportation and suitable legislation and land use policies.

1.4.2 Limitation

A study of this magnitude requires a team of surveyors and staff for collection of the basic data and requires sufficient time. This study has this basic handicap on this account. The other major technical limitations are listed below:

- Non publication of District Census Handbook, 2001, till December 2003.1st and 2nd paper is published, the 3rd paper is scheduled to be published in April 04. This data will be used in 4th stage presentation of thesis.
- Study is primarily based of the secondary data and information, though primary data will be collected through proper sampling from study area
- Due to limitations in carrying out detailed survey and collecting data from primary source at individual level, the study has been based on personal observation and information along with some data collected during course of informal discussions with resident citizens and development officers of the area.
- Reluctance and hesitation on the part of persons including private builders and developers active in fringe areas as well as peri urban areas

- Lack of infrastructure and paucity of time to collect information from primary sources by detailed survey

1.5 RESEARCH METHODOLOGY AND DATA SOURCES

1.5.1 Research Method

Methodology adopted covers following stages

- Study of evolution and growth of Bhopal city with its historical background
- Identification of the peri-urban area and problems related to these areas
- Literature survey and parallel study carried out earlier for another similar town to draw out relevance to this study
- Finalization of field survey / study tools and analytical techniques
- Analyzing mechanism and dynamics of peri urban area of Bhopal
- Identification of drawbacks of present growth pattern
- Development of alternative of peri urban development for Bhopal

The methodological sequence as emerged from the methodology adopted has been depicted diagrammatically in a flowchart as shown in figure.1

1.5.2 Data

Required data pertaining to this study will be collected from secondary and primary sources. In order to draw upon a comprehensive range of information, the study makes use of a variety of resources and methods. The census data and other records are used to get a more general picture of the population profile and employment structure. Interviews of residents and sellers in weekly market are also used.

1.5.2.1 Primary data sources

Survey is conducted in the study areas for collection of first hand information regarding the presence of amenities, infrastructural facilities in the study areas identified as peri urban area of Bhopal city

1.5.2.2 Secondary data sources

Secondary data sources: Secondary sources include information and figures from census documents, publications, and the media.

Census data: Census data provide useful information at the village level and, more generally, about the land and population in the area. Census data are used to categories the urban villages within the rural-to-urban continuum on the basis of land use and occupational characteristics.

1.5.3 Primary survey: The basic household survey provides basic information about the peri urban population. The basic household survey includes variables on the following subjects:

- Demographic structure (age, type of household, number of children) - Education - Occupational characteristics (type of work, place of work) - Living standards. - Land / Residence ownership - Transportation - Environment and amenities

1.5.4 Analysis

Detailed analysis will be done with the help of GIS tools and techniques to understand the pattern of development and influence of internal and external drivers of peri urbanization,.

1.5.5 Findings

Findings will be evolved based on analysis , result and discussion.

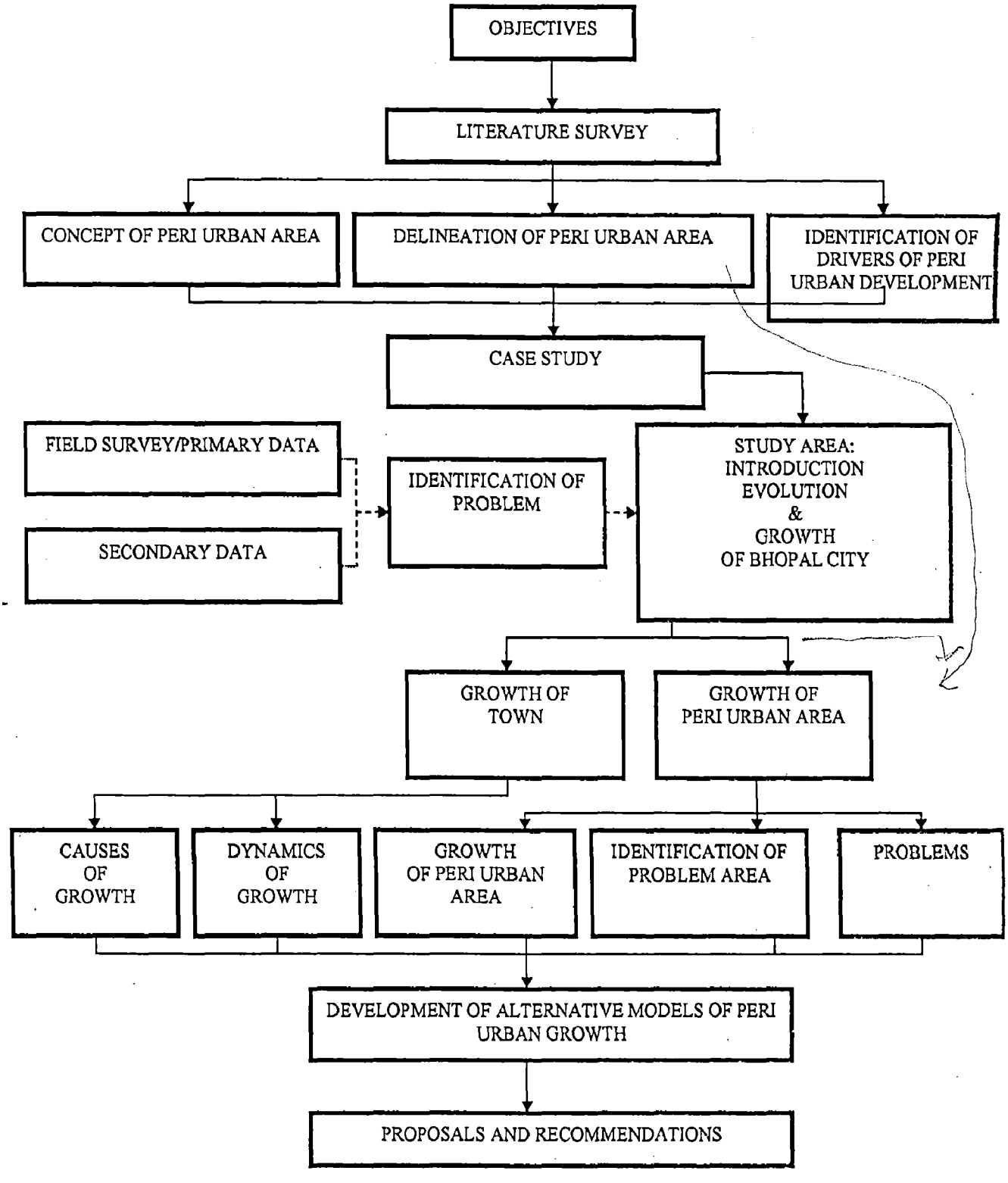
1.5.6 Recommendations

A set of recommendation guidelines will be made for the development of peri urban areas of Bhopal city

1.5.7 Conclusions

The present study will be concluded with the possible alternative model of peri urban development of Bhopal city with an aim to provide best solution of future growth of city

Figure 1.1 **METHODOLOGICAL SEQUENCE**



LITERATURE REVIEW

2.1 GENERAL

Development of peri-urban areas has received substantial attention world over; it has been visualized as inevitable and even desirable to help decongesting the mother city to achieve a better quality of life. It was realized that the process of overcrowding of cities could not be solved by increasing the intensity of use of land within, but by opening up the hinterland with adequate road network with public transport system to allow people to live in the peri-urban areas.

2.2 PERI URBAN TYPOLOGY

It is understood that the urban growth dynamics consists of increasing intensity of use of land in already developed areas, filling of undeveloped pockets of land within the developed areas, development on the periphery of developed areas, and merger of outlying settlements as the developed areas expand. Most of the time, especially during the phase of rapid expansion, the largest share of total growth is accounted by the development in the fringe areas. These areas outside the development authority limit, which are related to the mother city for jobs and services etc., are considered as peri-urban areas. [2]

The term peri-urbanization refers to a process in which rural areas located on the outskirts of established cities become more urban in character, in physical, economic, and social terms, often in piecemeal fashion. Peri-urban development usually involves rapid social change as small agricultural communities are forced to adjust to an urban or industrial way of life in a very short time. High levels of migration are an important driver of social change. Rapid environmental deterioration; large-scale, often haphazard, land conversion; and infrastructure backlogs are major challenges associated with peri-urbanizing regions. [ibid]

In spatial terms, peri-urban areas can de defined as, the transition zone between fully urbanized land in cities and areas in predominantly agricultural use. It is

characterized by mixed land uses and indeterminate inner and outer boundaries, and typically is split between a numbers of administrative areas. [ibid]

The peri-urban zone begins just beyond the contiguous built-up urban area, the land that can be characterized as peri-urban shifts over time as cities, and the transition zone itself, expand outward. What frequently results is a constantly changing mosaic of land use. Peri-urban development almost always involves wrenching social adjustment as small agricultural communities are forced into an urbanized way of life in a short time. As well, rapid increase in population creates enormous demand, and expectations, for community and social services. Environmental stresses in peri-urban areas can be significant, related to the spread nature of peri-urban settlement, pollution from a variety of industrial and residential sources, as well as motorization; and inadequate infrastructural resources to cope with the rapid development.

The peri-urban area is still generally considered as a transitional zone between city and countryside, often described "not as a discrete area, but rather as a diffuse territory identified by combinations of features and phenomena. These areas are always difficult to define and, moreover, they are also bound with problems inherent to both rural and urban worlds. A sharp distinction between urban and rural settlements generally assumes that the livelihoods or the inhabitants can equally be reduced to two main categories: agriculture based in rural areas and manufacture and services based in the urban centers. Yet recent research suggests that, even where activities can be described as either urban or rural and are spatially separated, there is always a continued and varied exchange of resources between urban and rural areas. The sectoral interaction consists of rural activities taking place in urban areas (e.g. urban agriculture) or traditionally "urban" activities as manufacturing and services taking place in rural areas.

2.3 DEFINITION OF PERI URBAN DEVELOPMENT

Peri-urbanization cannot be defined in static terms. But can be identified as a process under way. Key characteristics of this process include:

(i) Changing local economic structure, encompassing a shift from an agriculturally based to a manufacturing-dominated economy.

(ii) Changing employment structure, shifting from agriculture to manufacturing.

(iii) Rapid population growth and urbanization,

(iv) Changing spatial development patterns and rising land costs. Peri-urban areas are characterized by patchwork development and mixed land use, with large amounts of land still in agricultural use. The influx of investment and land speculation sends land costs skyrocketing.

Definition of urban rural fringe given by Ramachandran (1989) "the rural-urban fringe is an area of mixed rural and urban populations and land uses, which begins at the point where agricultural land uses appear near the city and extends up to the point where villages have distinct urban land uses or where some persons, at least, from the village community commute to the city daily for work or other purposes"

the peri urban area of a city extends from the urban boundary (no rural land use) to the area where most villages show a majority of workers engaged in non-agricultural occupations (many of whom commute). This definitions is used in the dissertation for delineation of peri urban areas of Bhopal city

2.4 URBANIZATION AND ITS IMPLICATIONS FOR LAND USE IN PERI URBAN AREA

Urbanization because of increasing population pressure within the city takes away agricultural and other land from the villages and convert them to urban land use on the periphery Land use characteristics of the transforming areas on the periphery of cities in chronological order are as follows.

- 1. Rural: land use and occupations are dominated by agricultural orientation
- 2. Occupational change: high proportion of non-agricultural occupations (of whom there are many commuters)
- 3. Increasing urban land use: urban land-use types start to dominate
- 4. Urban: the land is almost entirely urban with very less agricultural land use

2.5 DRIVERS OF URBANIZATION

The drivers of peri-urban development in Indian context are broadly due to the following factors:

- Due to industrial location policy of not allowing more industries within the metropolitan area, and easy procedure of conversion of agricultural land for industrial purpose, extensive amount of land in fringe areas is procured for industrial purposes. This phenomenon triggers peri-urban development in close proximity to the industrial locations.
- While formulating the development plan proposal, total land requirement is generally worked out with certain assumption of optimum population density, assuming all the land earmarked for urban development will actually be developed before expanding beyond the urban development limit. But in reality this does not happen always, and, further, as there is a lot of vacant land held for speculation purpose also, development spills beyond the development agency's boundary. In many cases, restrictive zoning regulations like agricultural zone along the fringe areas of the urban development authorities, due to developmental pressures, results in leap-forging of the authority limit.
- Restrictions on development within the city on account of Urban Land Ceiling Act (which has only recently been repealed and the benefits of which are yet to be observed), development control regulations, long and cumbersome procedures for obtaining approval and permission for development, also encourage peri-urban development.
- Because of availability of land at relativity lower price compared to the main city, housing in the peri urban area is more affordable to the middle class and more spacious for upper-income group.
- While the overall urban growth is the major cause of growth in peri-urban areas, more detailed scrutiny reveals that the population in peri-urban areas consists of mainly rural-urban migration and urban-urban migration. This can be attributed to changes in attitudes, lifestyle and standard of living which induce movement away from high density and congested areas. Also, socio-economic

factors like communal harmony, law and order situations lead to the shift of population to the outer areas.

2.6 CHANGING ENVIRONMENT CONDITIONS FOR RESIDENTS IN URBANIZING PLACES

In terms of migration and urbanization peri urban environments play a mediating role between rural and urban. The changing environment conditions in the peri urban areas are result of rapid development of the area combined with not so fast growth of physical and social infrastructure. Being outside the urban boundary there is absence of any institutional structure for provision of infrastructure, peri-urban areas lack proper roads, Street lights, drainage and sewerage system, stable power supply, educational and health facilities, open spaces and recreational areas. In absence of proper physical and social infrastructure the peri urban area is often susceptible to the cultural degradation. Peri urban environments are places of dynamic social change because of rapidly changing occupational pattern.

2.7 PERI-URBAN DEVELOPMENT IN INDIA

In India, spatial changes within most of the cities through redevelopment of existing land, or by expansion into new areas in the periphery, or a combination of both, are neither physically planned nor managed well. Usually, the availability of infrastructure is the primary factor which guides the general development pattern. Development usually happens along transportation corridors and in areas where the infrastructure network is strong. [3]

India is experiencing a relatively moderate pace of urbanization compared to other developing countries. Today, India remains a largely agricultural country: the share of agricultural workers in the workforce has barely decreased: from almost 73 per cent in 1971 to 70 per cent in 1991. Meanwhile, the share of population living in urban areas increased from 20.2 per cent in 1971 to 23.7 per cent in 1981 to 26.1 per cent in 1991 and to 30.5 percent in 2001. Within this, the large and medium towns and cities are growing at faster rates than the small ones. In absence of any urban planning policy for peri urban areas, Indian cities grow in an unregulated and haphazard manner. Since largest share of growth is accounted by the development

in the fringe area, these area are particularly vulnerable to unregulated and haphazard growth. Urban sprawl promotes the spread of urban land use into the rural-urban fringe and draws a larger number of people into the rural-urban interface. And even though the growth rate is not rising steeply, the absolute increase in urban population is very large, having tripled from 109 million in 1971 to 306.9 million in 2001. In the course of development, it is likely that out of the enormous number of rural people lacking opportunity in the economically underdeveloped places where they usually come from, many will continue to migrate to the cities, and as a result Metropolitan cities grow beyond imaginable proportions. Mumbai Delhi Bangalore and Hyderabad are examples of such rapid expansion of cities. However for every city that serves a particular function there is an optimal size and population. Uncontrolled urban sprawl can not be warranted, basically because they rapidly change the character of the peri urban area. If the urban sprawl goes uncontrolled it can disrupt the balance between the peri urban area and the urban area. Urban issues therefore warrant and should receive increasing attention. [ibid]

2.8 THE CASE OF BHOPAL CITY DEVELOPMENT

The capital of Madhya Pradesh, Bhopal, is a city where indisputable economic progress related to urbanization is accompanied by tremendous environmental concerns, congestion, poverty, and housing shortages. Bhopal is among the cities showing highest growth in the last century in the country but this massive growth has also given the cities some undesired consequences like congestion in the core of city and, increasing spread of city, haphazard growth in the fringe area and rapid urbanization of immediate rural areas. Today the settlements in the peri urban area of the city face new problems of massive development activity by private developers. These peri urban areas which can be described as lungs of the city, are faced with changing land-use pattern increasing congestion and pollution. The peri urban areas are dependent on the main urban area for lot of urban services and in turn they provide services to the urban area mainly perishable goods, like dairy products, poultry, and vegetables, etc. If the balance of give and take between the urban and peri urban area is disturbed the health of both areas is affected.

CASE STUDY

3.1 STUDY OF PERI URBAN AREAS OF AHMEDABAD BY UTPAL SHARMA & SHOBHIT TAYAL (LITERATURE BASED CASE STUDY I)

3.1.1 Introduction

Ahmedabad is the seventh largest city in India and second largest in western India. Today, Ahmedabad's limits have grown to cover an area 33 times larger than that of the old city limits. A rapid appraisal of peri-urban areas of Ahmedabad city shows that much of the development is around a cluster of villages on western side. The city of Ahmedabad is typical radiocentric city. However a number of historical constraints have pushed the formal center (CBD) towards western side of Sabarmati river while industry and low income housing have been developing in the eastern suburbs

In case of Ahmedabad, the dominant sector behind the developments within the city is private sector. While the role of the public sector has been limited to implementing development schemes or town planning schemes. The major setback in Ahmedabad case is in the pace of synchronization of urban planning schemes and actual development. Within urban development authority limits, development has taken shape before the development plans have been implemented. Hence, the provision of infrastructure comes later. The major problem is that the public sector has to reshape development plans

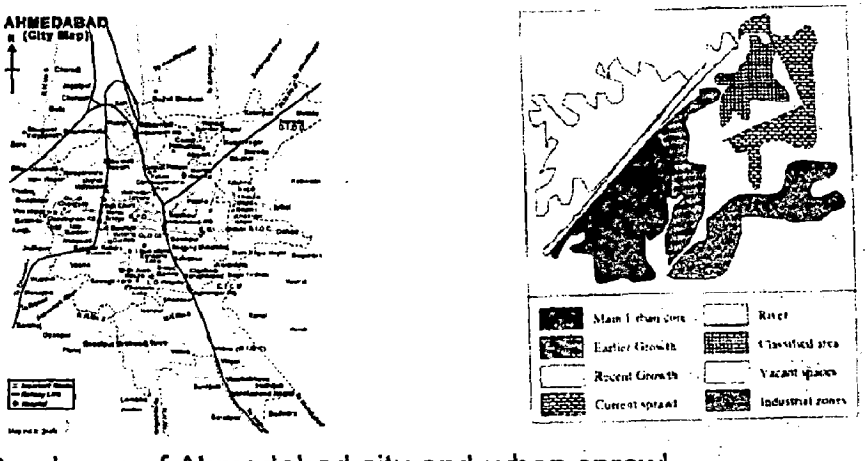


Figure 3.1 Road map of Ahmedabad city and urban sprawl

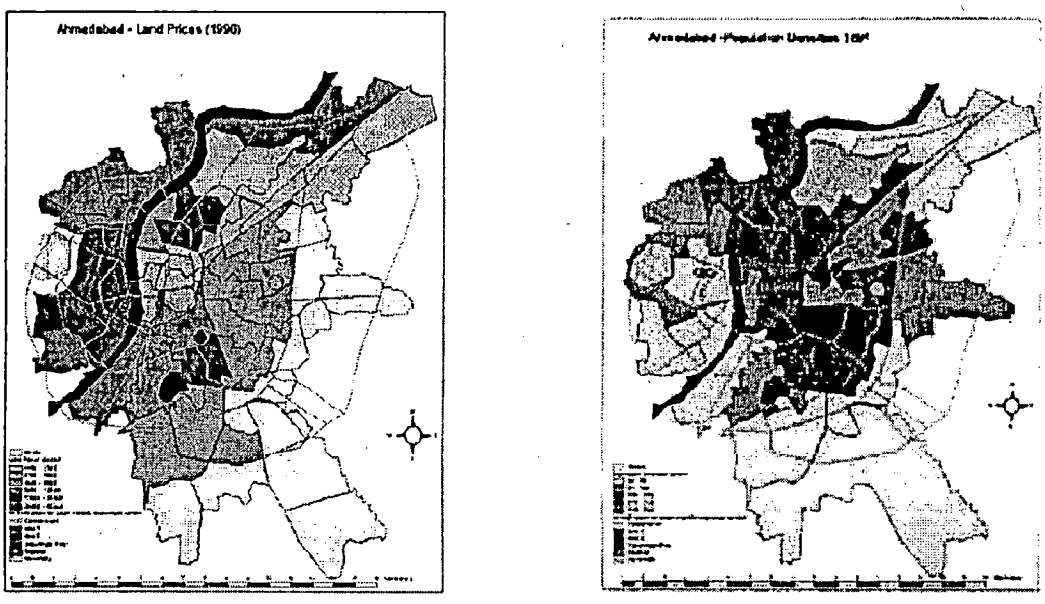


figure 3.2 Land price and population density map of Ahmedabad

before their implementation, which becomes increasingly complicated and expensive in terms of time and effort. The factors behind the fringe development in western Ahmedabad which make the private sector more active and dynamic are:

- The resources and low price of land;
- Proximity and connectivity with Ahmedabad city by road and public transport;
- Proximity of western fringe stretch close to Gandhinagar city;
- Availability of land and greener areas, freedom from congestion and pollution of the city;
- Minimal planning regulations, freedom from rigorous approval and permission problems from Ahmedabad Urban Development Authority and Ahmedabad Municipal Corporation and
- Till recently, loopholes under Land Ceiling Act in acquiring land.

3.1.2 Important Features of the Existing Development in Ahmedabad

a. The urban development in the fringe area of western Ahmedabad continues without any guidelines due to absence of any statutory development of the area.

b. Regulatory mechanism for haphazard development is coming op with residential colonies in the vicinity of industrial units.

c. Residential development is occurring along the transportation corridors. Thus existing transportation corridors and/or availability, of access has spurred ribbon development.

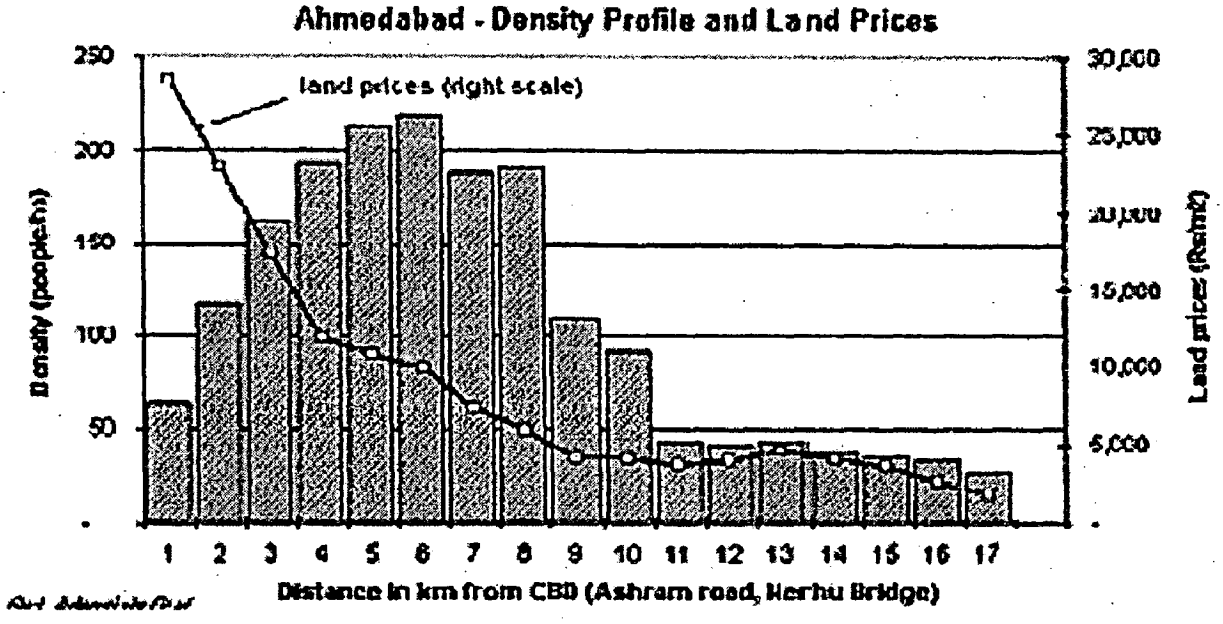


figure 3.3 Ahmedabad density profile and land prices

d. The residential development is progressing at a rapid rate. However development of social facilities, open spaces and infrastructures has not kept pace with it.

e. It has been observed that the overall built environment lacks character and cohesiveness.

• The low intensity but high quality luxurious developments are noted at frequent interval.

• The quality of physical environment in terms of infrastructure such as waste water disposal, storm water disposal, street light, educational and health facilities, fire fighting and recreational areas is rather poor and inadequate.

• The bare minimum infrastructure needed for selling the houses and plots has been provided by the promoters and organizers of the scheme. In some cases, even access to the plots is provided by the developer.

- The development pattern within the scheme of pockets is of low-rise high density in character, with a view to minimizing the financial burden of infrastructure provision. Even in these areas the management and maintenance of infrastructure is inadequate and poor, as it is left to the users. This, however, does not apply to the other luxurious schemes.

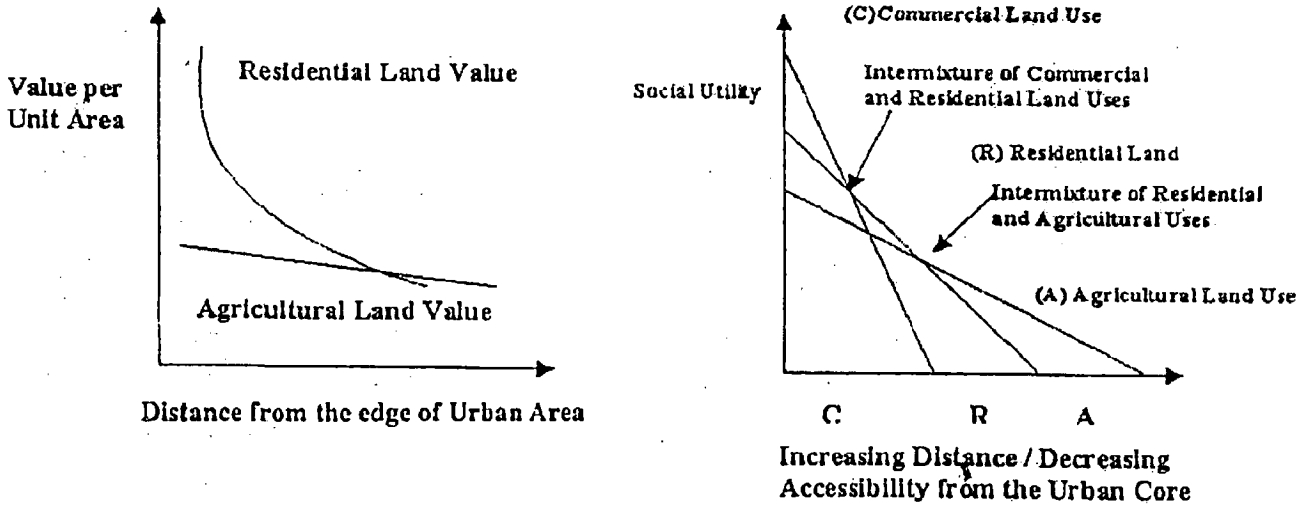


figure 3.4 Distance and land value graph

3.1.3 Regulatory environment pertaining to land and housing development in Ahmedabad

The Ahmedabad municipal limit includes all the developed areas of the city, and already a framework exists for planning, and controlling of development and provision of infrastructure. The Ahmedabad Urban Development Authority is there to take care of the area' beyond the municipal limits, which are already witnessing or likely to witness the process of urbanization. For development in the pen-urban areas, permissions have to be taken from the district panchayat or the taluka panchayat. There are basically two major components; one is non-agricultural (NA) permission, and secondly non-agricultural building permission (NABP). Non-

agricultural permission is given by the taluka panchayat or the district panchayat, For 'he non-agricultural building permission, technical opinion is being taken from the Town Planning and Valuation Department (TP & VD). as the district panchayats do not have any technical staff. Technical opinion from the Town Planning and Valuation Department is given on the basis of the development control regulations (DCR) of Ahmedabad Urban Development Authority, or of the other nearest development authority, whichever is applicable. The revenue department has procedure for conversion of rural land to the urban use.

It has been observed that institutional complexity has been a major hurdle in the development of the pert-urban areas. Various legislative measures have been introduced by the central, state and local governments in the form of development control regulation, and building bye-laws to control and regulate the development of land and housing. There are sixteen major legislative tools, which affect the land and housing market directly and indirectly. New legislative tools are also being added e.g. coastal regulation tone (CRZ) has been declared as a part of Environmental Protection Act 1986. and which restricts developments in the coastal areas, Of these important regulating tools are The Gujarat Town Planning and Urban Development Act Land Revenue Code and Local Bodies Act. Regulatory provisions of these acts are largely implemented as part of, or along with development planning processes.

3.1.4 Strategies to implement peri urban development

Based on the detailed study, the following seven broad strategies have been identified:

I. Increase in jurisdictional limits of urban development authorities.
2. Delineation of high pressure zones.
3. Creating separate urban development agency.
4 Measures to facilitate private sector participation in land development.
5. Revising planning norms and development control regulations in pen-urban areas.
6. Revising regulatory measures, pertaining to land and housing development.
7. Financing and implementation mechanism for pen- urban development, measures to ensure public sector involvement and public-private partnerships

3.2 DELINEATION OF PERI URBAN AREAS OF PUNE (MAHARASHTRA) BY SANDEEP PARKHI (LITERATURE BASED CASE STUDY II)

3.2.1 Introduction: When the British captured Pune by defeating the Maratha (1818), the city was hardly 5 sq. km. The city gradually expanded during the British rule with the formation of Pune Municipality and the establishment of Pune, Khadki and Dehuroad cantonments. The city expanded explosively after the post independence period. The physical growth of the city and of the urban area since 1817 and the reasons therein are shown in the following table1. During the 180 yr period (1817-1997), the Pune urban area has grown from a mere 5sq.km to 700sq.km which is 140 times the original area. Table shows that between 1901 & 2001 (estimated) Pune's urban population has grown from 1.64 lakh to about 42 lakh (estimated figure for 2001) which is 25 times the original figure. The density of population of pune city was 8672 persons per sq. km (1981), whereas it was about 5000 persons per sq. km for urban area. [41]

3.2.2 Change in land use

During the 1970's the urban activities spilled beyond the erstwhile city limits and it was felt that for comprehensive and integrated planning, a metropolitan region converging on Pune be defined. Accordingly, Pune metropolitan region was established in July,1967. Pune urban area or agglomeration as recognised by Central Govt. includes the areas under Pune and Pimpri-Chinchwad corporations. Pune, Khadki and Dehu Road Cantonments and a few semi-urbanised villages on the periphery. The total Pune urban area is about 700 sq. km. The total area of Pune metropolitan region is 1605 sq. km. The study area more or less coincides with the metropolitan area. Hence for comparitive study, landuse figure for the metropolitan region has been taken into consideration (Table). Following changes appear striking between 1967 and 1998.

1. The area under settlement has increased 2-4 times during these 30 yrs.
2. The area under Agriculture and Grassland-Scrub has decreased by 31% and 39% respectively.

3. The area under 'Hills and Forests' and watersheets remain apparently same, though there are some encroachments over some hillslopes.

To conclude, the urban sprawl appears to be at the cost of Agriculture and Grassland-Scrub, especially the later

Development of fringe of Pune city

The origin of pune dates back to 2000years pune is known as Deccan queen , because of its old historical associations. Pune city's history goes back to 7th Century A.D. the origin of dominant human settlement lay in small village located in the southern part of he city which, today is the congested city core called 'Kasba peth' the dominant phases of growth can be stated as follows:

Till year 1820: the dominant area south of river 'Mutha kasba' developed into a 'peth' (coherent to Ward) under peshwas rule. By this time many other similar wards s grew into peths soon become specialized in certain economic activities

Development between 1820-1890: this was the phase when the setellement started expanding towards the south of the city and some development towards north along the west banks of river 'Mula'. During the same period , Pune Cantonment and Khadki Cantonment were established. The construction of Khandakwasla Dam in 1880 and Bombay - Pune railway line in 1856 were some of the development projects taken by British.

Development between 1890-1950: the city developed considerably , equally in all directions with development along both the river banks as well as the newly established traffic corridor towards Mumbai , Satara , Ahmednagar . the first major step towards urban planning implementation strategy was the implementation of town planning schemes during this phase of development in the city

Development between 1950-2001 the city has been going through a rapid phase of expantion , specially with the growth of peri urban area. The Panshet Dam bursting disaster of 1961 forced many people to move away from the core of the city. Government organized housing was developed in the area s away from low-lying city core. The inclusion of 36 villages to Pune Municipal Corporation limits was a

major event in terms of physical expansion of he city. The development of Software Technology Park in the fringe area boosted development in the western part of the fringe. The main transportation corridors like, NH-4, NH-9 and others have become major areas of dominant development of housing.

From a initial form covering a small area around the Kasba Peth , Pune like other towns , has grown in size by successive annexations of peripheral areas .in 1960 and 1962, small pockets and parts of villages Katraj Dhankawadi, Lohegaon, Dapodi, Sutarwadi etc. were added. Simultaneously a large no of small scale industry outside the corporation limits . these units served as ancillary industries catering to larger industrial setup in nearby areas. Also a notable construction activity took place in the frnge area in the last two decades because of pressure of urbanization on the city and availability of houses at an affordable price. This development was very haphazard and thus to control this development and to give better facilities to the dwellers, the area was brought under the limits of Pune Municipal Corporation

TABLE 3.1: AREAL EXPANSION-PUNE CITY AND PUNE URBAN AREAS

	Area (Sq. km.)		
Year	Pune City	Urban Area	Reason for expansion
1817	5.0	---------	
1860	7.6	34.71	Formation of Pune Municipality, establishment of Pune and khadki cantonments.
1940	18.84	81.95	Establishment of Dehuroad cantonment
1950	125.75	188.86	Pune Municipal Corporation formed
1970	138.76	266.88	Pimpri-Chinchwad Municipal Council established
1982	146.00	314.11	Pimpri-Chinchwad Municipal Corporation formed
1997	440.00	700.00	Merging of 38 & 18 fringe villages in to Pune and Pimpri-Chinchwad Corporations respectively.

3.2.3 Delineations of fringe area

- Operational definitions
    1. The area that is left excluding the area under urban land as per ULCR Act is a land within municipal or relevant acting local body limits/ any land situated within the limits of an urban agglomeration and referred to as such in the master plan provided the use of land does not include use for agriculture from the total area within the region.
    2. The peripheral zone adjacent to an urban center, involved actively in the expansion of urban activity.
    3. An area notified either by state or central govt. as a part of total urban agglomeration with a population more than 1 lakh.
    4. A village or group of village forming a continuous spread lying within or outside the municipal limits of the urban center but lying within the revenue limits

Delineation of fringe area: M.W.Rodehaver's approach (1947)

- Definition of fringe: an area of transition between urban land uses and area devoted to agriculture
- Delineated on basis of ecological , social , cultural and demographic aspects
- Determinants used
    1. the percentage of non farming families to total no of families in an area of consideration
    2. Per sq. mile density on non farming population
    3. Per acre assessed value of land and building

Delineation of fringe area: Golledge's approach (1960)

- Noted six characteristics to demarcate urban fringe
    1. Intensive cultivation by mobile population with sparse to moderate density
    2. Pattern of land use
    3. Smallness of farm – bigger farmland shall lie outside the urban fringe boundary
    4. Rapid residential extension

TABLE 3.2: POPULATION GROWTH OF PUNE URBAN AREA

Year	Population (in lakh)
1901	1.64
1911	1.72
1921	1.98
1931	2.50
1941	3.24
1951	6
1961	7.37
1971	11.35
1981	16.86
1991	24.94
2001	37.55

SOURCE : CENSUS 2001

TABLE 3.3:- LANDUSE CHANGE AT PUNE METROPOLITAN REGION [47]

	Area Under Each Catagory (%)	
Landuse Catagory	**1967**	**1998**
Settlements	17.33	41.00
Agriculture	61.26	42.11
Watersheets	02.25	02.25
Hills and Forest	07.64	07.64
Grassland and scrub	11.52	07.00
Total	100.00	100.00

5. Lack of various basic services
6. Abundant provision for speculative buildings

Delineation of fringe area: Hindsmith's approach (1962)

- Delineated urban fringe on basis of 4 indices

1. Land subdivided but yet not developed or recorded by planning board
2. Farmland for sale for urban purposes as indicated by developers
3. Land in non-farm ownership, either idle or tenant farmed
4. Farm land assessed at a higher than normal farmlands.

Delineation of fringe area: U Singh's approach (1966)

- Defined the urban fringe of kaval in Uttar Pradesh using following factors
  - Change in land use patterns as regards to the city core
  - Change in the built form as regards the city core
  - occupational structure
  - Housing typology
  - Distribution of industrial and non farming activities
  - Limiting basic services
  - Distribution of educational activities
  - Types and pattern of streets

Delineation of fringe area: census 1961

From the Census of India, 1961 ,urban fringe can be delineated as a part of urban agglomeration, which includes a continuous urban spread and normally consists of its adjoining urban outgrowths, which is co-terminus with the urban fringe.

Urban Land Ceiling and Regulation Act 1976

the urban fringe is peripheral area notified either by state or Central government is as part of urban agglomeration with, population of more than one lakh and stipulated as five kilometer around the city.

3.2.4 Determinants followed for delineation of peri urban area of Pune

The following determinants stipulated to delineate the urban fringe of Pune are based broadly with the due consideration to demographic aspects, the residential land use and the density, the occupational structure ~nd the likely chances of

speculation. in land prices. The villages, which satisfy the following determinants, are hereby considered as a part of the urban fringe, thereby delineating the urban fringe of Pune as mentioned in the Table.

Determinant 1: Percentage of workforce engaged in non ,agricultural activities. Villages which exhibit a value above 20 per cent as per 1991 Census are categorized for selection in urban fringe.

Determinant 2 : In the cases where the population density is observed to be above 400 persons/sq.km in year 1996 is considered for the delineation of urban fringe.

Determinant 3 : Villages displaying a value above 5,000 persons as per Census 1996 are categorized in the delineation of urban fringe.

Determinant 4 : The land price is an important determinant in the delineation of urban fringe as it is the immediate repercussion of the demand for land. The villages which satisfy a value above Rs.200 per sq.ft. in year 2000 are selected for the categorization under the urban fringe. The application of these determinants for the delineation of urban fringe of Pune is expressed as follow

From the Chart, it can be seen that, out of the 36 villages that are recently been integrated, 16 villages score 3 or more to be a part of the urban fringe of Pune. These delineated areas [villages] forming the urban fringe can be considered as an example of the strong basis for the integration in the municipal limits.

3.2.5 Recommendations from case study

The following is a set of brief recommendations, described with the purpose of providing a guideline to understand the importance of urban fringe and its delineation in the process of statutory planning for Indian cities.

- The identification and delineation of urban fringe should be taken up as one of the primary activities in the process of formulation of Development Plan
- The basis of delineation should have a technical basis, and the other interventions that can hamper and delay the process such as political interests, real estate sector should be adequately taken care of during the process.

TABLE 3.4 Delineation of peri urban areas of Pune [ibid]

Village name	Determinant 1	2	3	4	Villages forming the urban fringe
Sector C					
Balewadi		✓			
Baner		✓	✓	✓	1
Sus		✓			
Mhalunge		✓			
Sector D					
Bavdhan Bk		✓	✓	✓	2
Bavdhan Kd	✓	✓			
Kothrud	✓	✓	✓	✓	3
Warje	✓	✓	✓	✓	4
Shivane	3	3	3		5
Kondhwa Dhawade					
Kopre		✓			
Sector E					
Hingne Kd	✓	✓	✓		6
Wadgaon Kd		✓			
Wadgaon Bk	✓	✓	✓		7
Nanded		✓			
Narhe		✓			
Dhayari		✓	✓		
Kirkatwadi		✓			
Khadakwasla		✓	✓		
Sector F					
Dhankawadi	✓	✓	✓		8
Katraj	✓	✓	✓	✓	9
Ambegaon Bk	✓	✓	✓		10
Ambegaon kd		✓			
Kondhwa Kd	✓	✓	✓		11
Kondhwa Bk	✓	✓	✓		12
Sector G					
Undri					
Pisoli					
Mohamadwadi		✓	✓		
Hadapsar	✓	✓	✓		13
Manjri Bk		✓	✓		
Mundhwa	✓	✓	✓		14
Sector H					
Wadgaon Sheri	✓	✓	✓		15
Kharadi	✓	✓	✓		16
Lohegaon		✓	✓		
Dhanori		✓	✓		
Kalas		✓	✓		

SPATIO - ECONOMIC DEVELOPMENT RECORD

LAND PRICES IN THE 35 VILLAGES IN THE F

Village	Land Value Rate
Sector-C	
Balewadi	150
Baner	300
Sus	80
Mhalunge	100
Average-Sector C	157.50
Sector-D	
Bavdhan Bk.	280
Bavdhan Kd.	100
Kothrud	450
Warje	375
Shivane	170
Kondhwa Dhav.	150
Kopare	100
Average-Sector D	232.14
Sector-E	
Hingne Kd.	180
Wadgaon Kd.	150
Wadgaon Bk.	210
Nanded	50
Narhe	45
Dhayari	180
Kirkatwadi	65
Khadakwasla	120
Average-Sector E	125.00
Sector-F	
Katraj	300
Ambegaon BK.	170
Ambegaon Kd.	100
Kondhwa Kd.	120
Kondhwa Bk.	190
Average-Sector F	195.00
Sector-G	
Undri	30
Pisoli	100
Mohamadwadi	75
Hadapsar	180
Manjri Bk.	100
Mundhwa	65
Average-Sector G	91.70
Sector-H	
Wadgaon Sheri	195
Kharadi	150
Lohegaon	175
Dhanori	80
Kalas	50
Average-Sector H	130

- The development plan for newly added villages should not be prepared in isolation, but comprehensively formulated with the Development Plan for the old as well as new limits.

3.3 STUDY OF URBAN SPRAWL AND RIBBON DEVELOPMENT OF INDORE CITY (M.P.) S.K. PATHAN, R.J. BHANDARI, J.G.PATEL, P.S DHINWA, V.P. KULSHRESHTRA, SUBHASHISH BENARJEE AND D.LGOYAL (LITEARTURE BASED CASE STUDY III)

3.3.1 Introduction: The study area covers the very prominent district of the central province (M.P.) of India. The Indore district with following Geographical co-ordinates. Longitude 750-46' to 750-57'E and latitude 220-37' to 220-50'N. Indore is also called as the commercial capital of Madhya Pradesh (Central Province) because it is a prominent business centre and at present it is spread on about 19325 ha of land. Two to three decades back it was spread only on 2482 h. similarly, the population of Indore City has increased about 28% in the last two to three decades. The total influx form the villages of Indore district is about 2.2% and from other cities is about 1.2%. Influx from other district is about 9.6% and other villages of districts is about 20.2%. The overall influx is about 42-43% per decade.

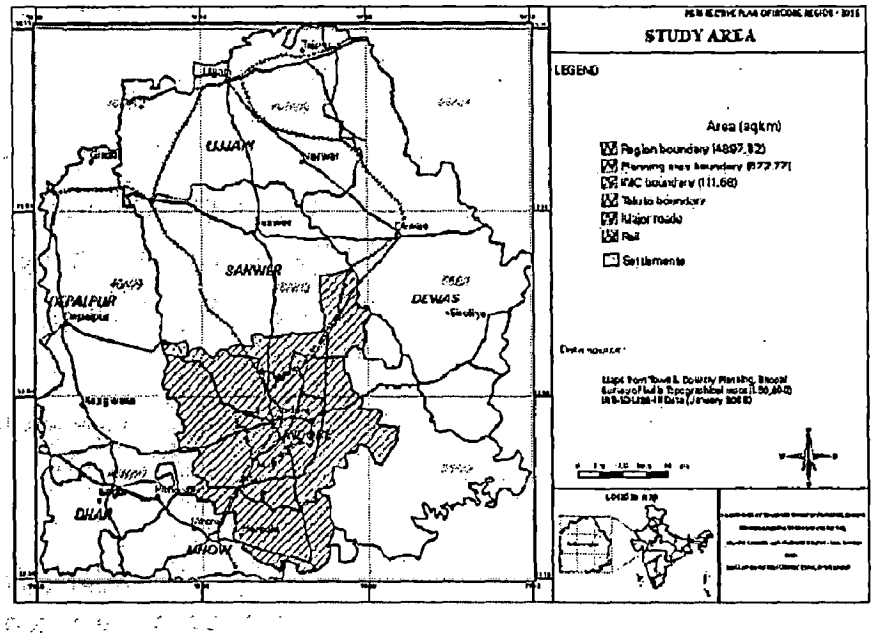


figure 3.5 Planning area Indore region

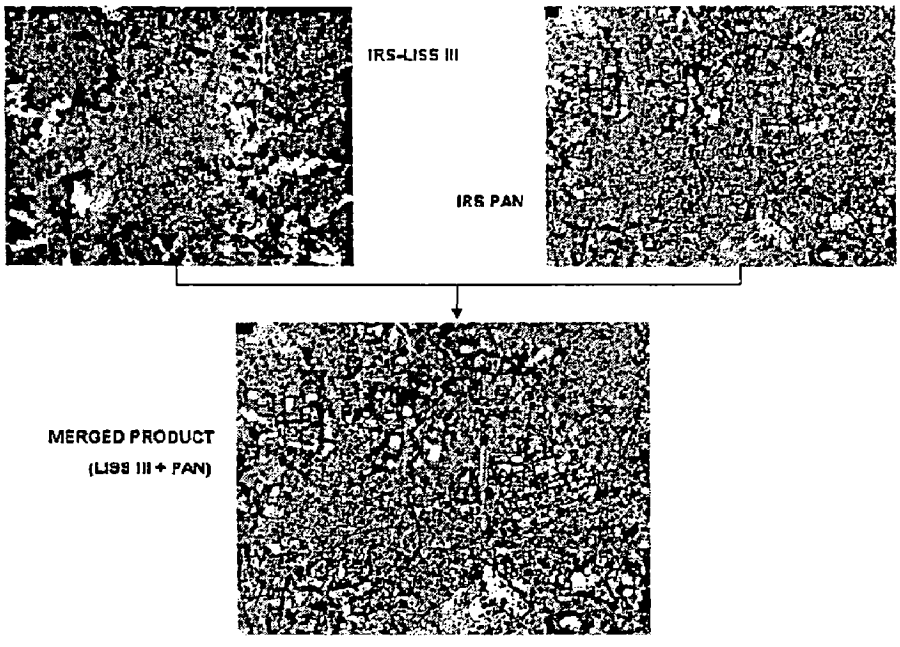


figure 3.6 Remote sensing data of study area

3.3.2 Population changes in study area

The study of demographic pattern plays a major role in the preparation of sustainable urban development plan. This type of study helps to assess the past and present growth trends and to estimate the future growth. The knowledge of basic demographic trend, in the area to be planned, is very essential to perceive the problems and exact needs of the area. It gives the idea about living conditions of the people and their immediate needs of basic amenities which planner should attend while preparing development plan. Therefore, the analysis of demographic factors in relation to various urban functions facilitate the requirement or need for housing, industry, commerce, amenities and recreation.

Growth of Population

The population data collected from the year 1971 to 2001 census is presented in Table 4. This table also shows growth rate of population in per cent for periods 1971-81, 1981-91 and 1991-2001.

TABLE 3.5 POPULATION AND GROWTH RATE OF INDORE PLANNING AREA

Year	Indore Municipal Corporation Population	Growth rate %	Indore Planning Area Population	Growth rate %
1971	537000		646744	
1981	829327	54.44	949921	46.87
1991	1091618	31.63	1271218	33.82
2001	1626297	48.98	1893865	48.98

(Source - Census data)

TABLE 3.6 POPULATION PROJECTIONS FOR YEAR 2011

	AREA ha	POP1991 census	POP2001 census	POP2011 projected
Old planning area (IMC + 37 villages)	21419	1109000	1626297	2358372
Indore Planning Area(IMC+37 + 115 Villages)	89761	1271218	1893867	2712533

Data source : Census 1971-2001 data

TABLE 3.7 URBAN SPRAWL PERIOD AND AREA

Sr. No.	Year	Area in Ha	Physical Growth(ha)	Growth (%)	Annual average Growth(%)
1	1975	2284	2284		
2	1990	6115	3831	167.73	11.18
3	1996	7758	1643	42.88	7.14
4	2000	10425	2667	162.32	40.58

(Source IRS LISS II, IRS LISS III, Panchromatic data and SOI maps)

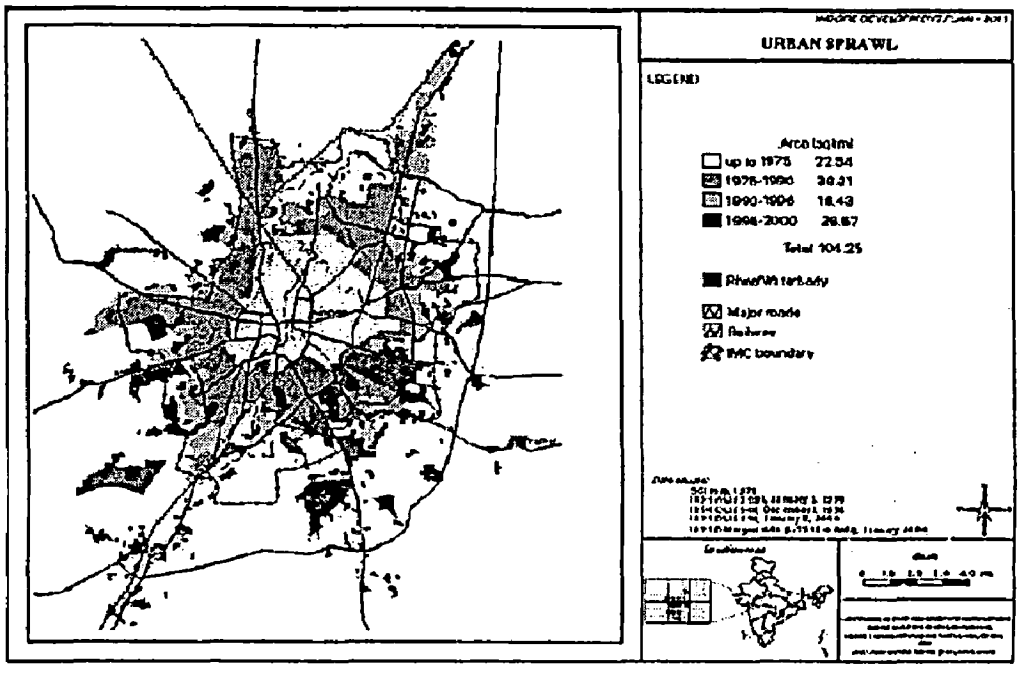


figure 3.7 Urban sprawl map of Indore city

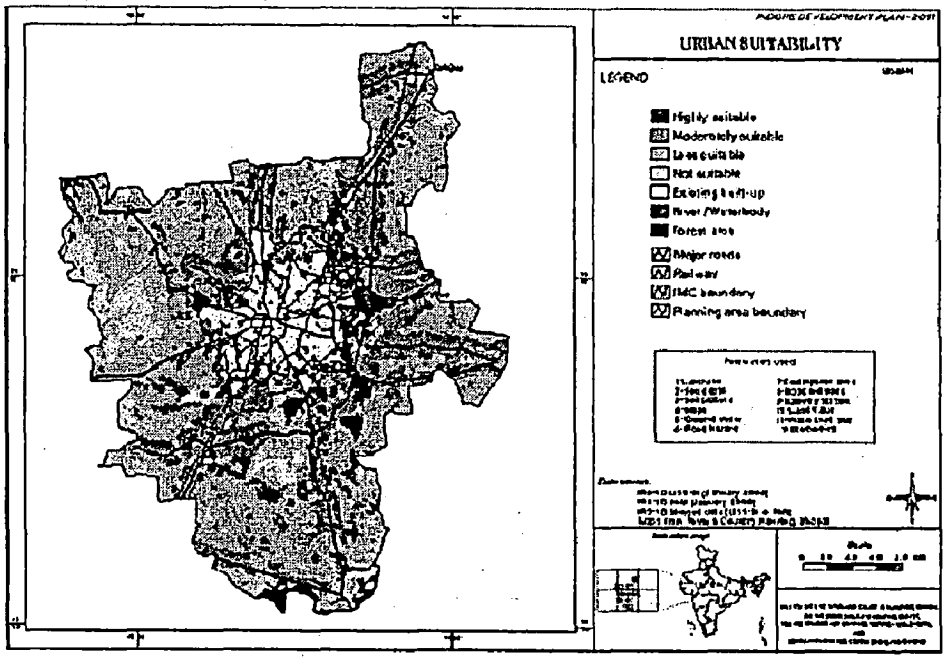


figure 3.8 Urban development suitability map

TABLE 3.8 DISTRIBUTIONS OF EXISTING LAND USE AND UDPFI NORMS

Sr. No.	Landuse types	Area (ha)	% of present land use	% of land use as per UDPFI norms
1.	Residential	5545.86	61.87	35-40
2.	Commercial	428.59	4.78	4-5
3.	Industrial	781.86	8.72	10-12
4.	Recreational	157.65	1.76	18-20
5.	Public and semi-public	1663.73	18.56	12-14
6.	Transportational	386.27	4.31	12-14
7.	Agriculture & water bodies			Balance
8.	Others			--
	Total	8963.96	100.00	100

(Source : Urban Development Plans Formulation & Implementation(UDPFI) guidelines, Volume – 1, Ministry of Urban Affairs & Employment, Govt. of India)

3.3.3 Results and discussions:

As the study area is surrounded by the big industrial areas, it has a greater impact of urbanization, concretion, population influx, industrialization, loss of agricultural land, increase in traffic density etc. has caused serious environmental problems to the in

habiting population. Otherwise also Indore is called as the commercial capital of State and is the most urbanized district. It is bounded by Ujjain in the North, Dewas in the East and Dhar (Pithampur) in the West. Being the central part of the above named industrial sector, the study area receives heavy influx of population. The commercial centre, Indore, was spread over an areas of about 2,482.5 ha., out of which 2,182.5 ha. was under residential units and 300 ha. under industrial units in 1965. (Ref IDA Report 1965). But in the last two to three decades the study area expanded to the extent of 19,325.5 ha. out of which 17,787.5 ha. lies under residential and 1,538 ha. under industrial units. The spontaneous increase in urbanization, concretion, loss of agriculture land and increase in population is given in the following Table.

TABLE 3.9 STATISTICAL DATA OF OVERALL GROWTH STUDY AREA

S. No	Year	Population (Approx)	Area in ha.			%Increase in Ind.	%Increase in urban	Loss of Agri.
			Urban	Ind.*	total			
1.	1965	4,20,000	2182.5	300	2482.5	27.66	113.85	2568 ha
2.	1970	5,72,000	4667.5	383	5050.5	150.00	67.91	3786 ha
3.	1985	11,00,000	7837.5	993	8830.5	5488.00	126.95	6546.5
4.	1990	17,00,000	17787.5	1538	19325.5			
5.	1995	21,50,000						

*- Industrialization

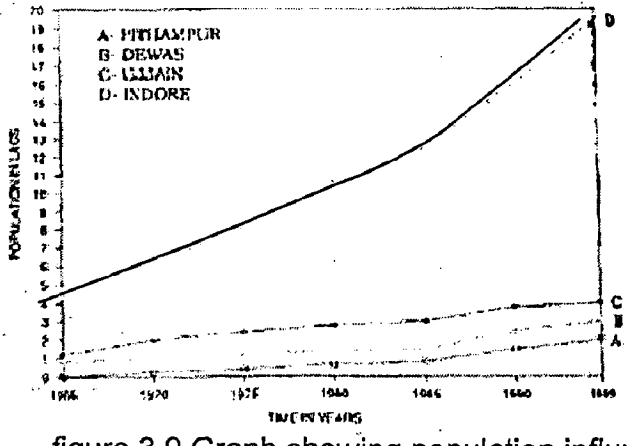


figure 3.9 Graph showing population influx

Dewas, the district headquarter of the Distt. Dewas in the North of the study area on the NH-3 was a usual town spreading over an area of about 852.5 ha. in the early 60's. The industrial area was only about 277.5 ha., whereas the residential area was about 575 ha. In the era development from 1970 to 1985, in the span of 15 years, Dewas expanded exponentially, and heavy industrialization took place owing to the subsidy provided by the State Gov. under the rural area of upliftment scheme. As a result of this by the year 1990-91, this area developed into a prominent industrial state, spreading over an area of about 3,357.5 ha. With the rapid industrialization and urbanization the population of Dewas city increased by 116% per decade. And in the last two decades about 2,505 ha. of fertile agricultural land was lost Similarly, in the mid 60's to early 70's, Pithampur, Sagore and Bagdun were the well known villages in the Dhar district with a population varying from 1500 to 2000. In the mid 70's the Govt. of M.P. plan to develop industrial estate for the automobile industries, in a view to create a DETROIT IN INDIA. For this, Govt. provided the subsidy to the industrialist coming forward.

Further, in the span of 15 years, i.e. in mid 80's Pithampur industrial estate partly developed and spread over an area of about 2,530 ha. In the last 5 years i.e. from 1985 to 1991, Pithampur has shown rapid development of industrialization and is finally spread over an area of 52,825 ha. This increase in industrialization and its impact is directly born by the fertile agricultural land which got converted. Likewise the other district Ujjain has also grown exerting the pressure on the study area. The degradation of agricultural land is not only confined around the cities but it is rapidly consuming the land on either side of the National as well as the State Highways giving rise to urban sprawl. During the normal course of development of urban settlements, the rural settlements continued to merged with them. Likewise there were 27 villages in the vicinity of study area and all of them merged and are now under the municipal limits. With an area of about 158.20 sq. kms. Out of which 140 sq. km. was the fertile agriculture land. With this the total study area covers about 214 sq. kms. Which is totally accountable as urban sprawl.

3.3.4 Impact on environment:

This rapid urbanization has exerted a great pressure on the ecology and the living environments as well as on the natural ecosystems of the study area. The increased interference in the natural ecosystems has caused undue, unnatural calamities and hazards to the human life. Specially in the study area the fact of environment development has been neglected just to keep the personal gains at first preference. If the "Phenomena of development without destruction" is followed during the development of the healthy environment along with the urbanization, the environmental and its related problems can be solved to a great extent. Major factors contributing in the deterioration of the environment are as follows:

(1) Increase in population. Biggest problem is the ever increasing population of the country, state or an area. Due to this population explosion, the limited natural resources get deflated at a faster rat, thus bringing into force the economics of scarcity. To meet the ever increasing demands of food, fibre and fuel of the population, a greater part of the natural resource vanished. As the study area is biggest commercial and business centre the whole state, it receives a large influx of population from the other neighboring areas, with the intention of better living standards thus, congesting the whole place day after day. To meet the regular demands of urban population, a great amount of pressure is exerted on the limited natural resources which erases them from the base itself. The large part of the population living in slums and dwellings gives rise to sanitary problems, which is the direct cause of pollution of healthy surrounding environment. The use of coal, wood and cowdung is the main source of fuel which increases the amount of Carbon-di-oxide, Carbon monoxide and smoke in the atmosphere.

(2) Increase in traffic density: This is also the directly related factor to the population. As the population keeps increasing the traffic density also keeps on increasing, giving rise to hazardous smoke and dust pollution. As the population of the study area is in between 16-18 lacs. The estimated number of vehicles is about ¼ of the total population, i.e. 3-4 lacs. If the total area of the roads is divided by the

total number of vehicles, an astonishing result about the traffic density can be found out. This increased density of Carbon-di-oxide and smoke in the atmosphere is becoming the cause of different diseases related to the skin and breathing.

(3) Land transformation: Owing to the heavy urbanization, concretion, industrialization, development etc., the natural cover of the land gets destroyed. Thus, the agricultural land gets transformed into urban settlements giving rise to temperature by corner effect and reflection. Development of residential colonies in the surrounding study area, is engulfing a large part of the agriculturable land. Agriculturable land at large is also encroached by farm houses, dairy farms, poultries etc.

(4) Deforestation: Destruction of natural cover in the vicinities of urban as well as sub-urban areas has caused tremendous problem to the environment. Forests are the main suppliers of oxygen to the atmosphere. They help n many ways in the preservation of healthy environment like, sedimentation of dust from the atmosphere, mitigation of climate, keeping the temperature low, humidifying the climate and thereby creating a scenic surrounding for urban settlements, exactly, adverse and opposite effects hamper the environment, if this precious natural resource is destroyed.

(5) Industrialization/Urbanization: The heavy and unplanned industrialization in the surrounding as well as in the study area has deteriorated the urban environment by various types of industrial pollution, viz. smoke pollution, chemical waste and solid dump. Dust pollution from the open stone quarries in the vicinity of the study area has also caused serious environment hazards to the local population.

3.3.5 Inferences from Indore study

- The Urban area in Indore has extended well beyond the present municipal limits.

- The general trend of growth from 1990 to 2000 was observed mainly along the transportation network. After 1990, the average annual growth rate has dropped to 7.14%, but increased during 1996-2000 up to 40.58% .
- Rapid commercial/industrial development has caused encroachment on productive agricultural land. Because of rapid urban development, the agricultural land in the surrounding villages of Indore Planning area was irretrievably lost.
- Additional area required for urban development for the year 2011 has been determined on the basis of population trends, distribution, density and the net area avail-able in each village for development.
- The projected population of the year 2011 will be 27,12,528. There will be an increase of about 8.18 lakh population by the year 2011. A population density of 150 persons/ha (carrying capacity of the region) has been considered for this

3.4 INFERENCES FROM THE CASE STUDIES

3.4.1 Issues in context of peri urban areas

Development plan of any city tries to contain all the developmental activities within a spatially defined area to help conserve the valuable agricultural land on the periphery, and, at the same time, it attempts to provide basic social amenities and infrastructure facilities to its inhabitants with optimum investment and easy accessibility. But despite of these provisions, development takes place in peri urban areas. The development pattern of the peri-urban area has strong relationship with the development plan of the city and tile direction of actual physical growth. In most cases, the boundary of the permissible developed area is rigid and inflexible and does not recognize the trend of growth of the city and the fact that development occurs extensively beyond the urban development authority limits. While the pen-urban areas provide outlet to the growth pressure on the city, there are some negative features that are cause of concern.

- Vast areas some of them with infrastructure and services within urban development authority limit remain under utilized.
- Being outside the boundary of the master plan and absence of any institutional structure for provision of infrastructure, peri-urban areas lack proper roads, Street lights, drainage and sewerage system, stable power supply, educational and health facilities, open spaces and recreational areas. There is a severe shortage of basic public services and the population living in the peri-urban areas depends heavily on the mother city for these services. With increase in the spread of pen-urban areas the commuting distances become longer, thereby putting additional load on transportation network.
- Low cost of land in peri-urban areas leads to inefficient planning and under-utilization of land.
- Public lands that would be needed for provision of infrastructure in future are not safeguarded. As a result, even when resources become available it

is very difficult, if not impossible, to provide infrastructure and social facilities in pen-urban areas. This is very common in case of roads and open spaces. These facilities are often inadequate as per the requirement of future. The random and haphazard nature of development leads to higher cost in provision of infrastructure.

- Large-scale violations of building regulations take place. Although applications and plans for development are referred to the relevant authorities (town planning and valuation departments, etc.) for technical opinion, generally there is neither any monitoring nor supervision of the development process.
- In the absence of treatment and sewerage system and use of septic tanks, there are potential health and safety problems in the longer run. As most of small scale developments have bore wells for water supply, possibility of ground water contamination is large.
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    - provision of infrastructure,
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    - drainage and sewerage system,
    - stable power supply,
    - educational and health facilities,
    - open spaces and recreational areas.
- Public lands that would be needed for provision of infrastructure in future are not safeguarded.
- As a result, even when resources become available it is very difficult, if not impossible, to provide infrastructure and social facilities in pen-urban areas.
- This is very common in case of roads and open spaces. These facilities are often inadequate as per the requirement of future.

- The random and haphazard nature of development leads to higher cost in provision of infrastructure.
- Large-scale violations of building regulations take place.
- In the absence of treatment and sewerage system and use of septic tanks, there are potential health and safety problems in the longer run.
- As most of small scale developments have bore wells for water supply, possibility of ground water contamination is large.

CHAPTER 4

PROFILE OF STUDY AREA

4.1 INTRODUCTION

Bhopal is the capital of Madhya Pradesh and is nerve center of the socio-economic and political life of the state. Today it is among the fastest growing cities of India. Bhopal, the socio-economic and political nerve center of Madhya Pradesh, is endowed with rich bounties of nature and has grown as a beautiful metro, center. Studded with lakes and lush green low profile hills, its unique land, form, lends distinct characters to the city.

Bhopal has a reasonably strong commercial base serving the needs of the capital and the region at large Bharat Heavy Electricals with its ancillary industries provides the sheet anchor of industry. Industries such as textiles, electronics, chemical and drugs, breweries, solvent extraction plants, agro-based industries and sophisticated products such as optical fibre and microfilm production have contributed to the economic base of the city. Mandideep and pilukhedi industrial growth centers are within the influence zone of Bhopal. Workers commute between Bhopal, Mandideep, Itarsi on the south and Vidisha, Basoda, Bina on the north axis daily. The daily commuter traffic by road between Bhopal and Sehore is intensive. These urban centres in the orbital zone act as satellites of Bhopal. Bhopal, the capital of Madhya Pradesh, is the administrative seat and political nerve center of the state. Many zonal headquarters of the Central Government, banks and financial institutions are located at Bhopal. Cultural, professional and research institution of a high order, academies and a university are located at Bhopal. The railway divisional headquarters, wagon repair workshop and EME center are located in the city. In other words there is strong base of employment in the service, market, industrial and transport sectors, Bhopal has a high order of infrastructure of health, education and research. A pool of professionals, technocrats, specialists and consultants is available at Bhopal.

4.2 HISTORICAL BACKGROUND OF THE CITY

The history of the Islamic principality of Bhopal starts in early 18th century when an Afghan Nobel Dost Mohammed Khan, who belonged to Mirza'i clan of existing indo Afghan border took service with Bahadur Shah, the last Mughal emperor of Delhi, came to Malwa and acquired a small village of Bairasia as military base in 1708.in 1723, dost mohammad khan broke loose from the Mughal power and assumed the title of 'Nawab' this was the official foundation of Bhopal state..

The princely state of Bhopal held an exceptional position among the so called 'native states' of India in 19th century. The main reason for this is an almost uninterrupted chain of female Nawabs inheriting the throne from their mothers. Bhopal was the only 'native state' in India where the succession passed to the eldest child, either male or female. As a result of four remarkable women reigned over the state of Bhopal for more than a century: Qudisya Behgam (1819-1837), Sikander Begam(1843-1868), Shah Jehan Begam(1868-1901) Sultan Jehan Begam(1901-1926). In the patronage of these remarkable women rulers Bhopal witnessed strong development of Islamic and cultural reforms.

4.3 PHYSICAL SETTING

Bhopal is the capital city of Madhya Pradesh state and is a nodal metropolitan center of the country due to its location and linkages to other major cities of the country. Bhopal is ideally located between Delhi and Mumbai along 77.35degrees East latitude and 23.25degrees north longitude and is well connected to other cities situated within and out side the state.

4.3.1 Physical growth of the city:

Historic Cities are increasingly being seen as 'cultural landscapes' emerging out of the Human-Environment interaction, and not solely as collections of isolated physical entities. Bhopal is no exception to that.

- In the case of Bhopal, the character of the city is defined by forms ranging from concrete physical forms to the more abstract cultural values that people may associate with a place.
- The walled city of Bhopal was self contained unit governing a very small principality.
- The basic regional functions taking place in spaces were related to administration.
- This function of administration still continues but with a wide change of scale.

Except for a few units not much industrial activity could settle in Bhopal. This was the first impact on physical form of disturbances. Special mention is being made in this period because in latter half of twentieth century. The whole country physical configuration was undergone a rapid change of urbanization and industrialization. Almost overnight, the core area had to function as the center for a whole lot of new spatial developments, with the increase in population at a tremendous rate the walled city had to assume the function of a commercial center. This Land use variation shows the need to integrate the preservation process with the planning and development process. As the focus has shifted from the city to the user, the goals and targets in this process have changed.

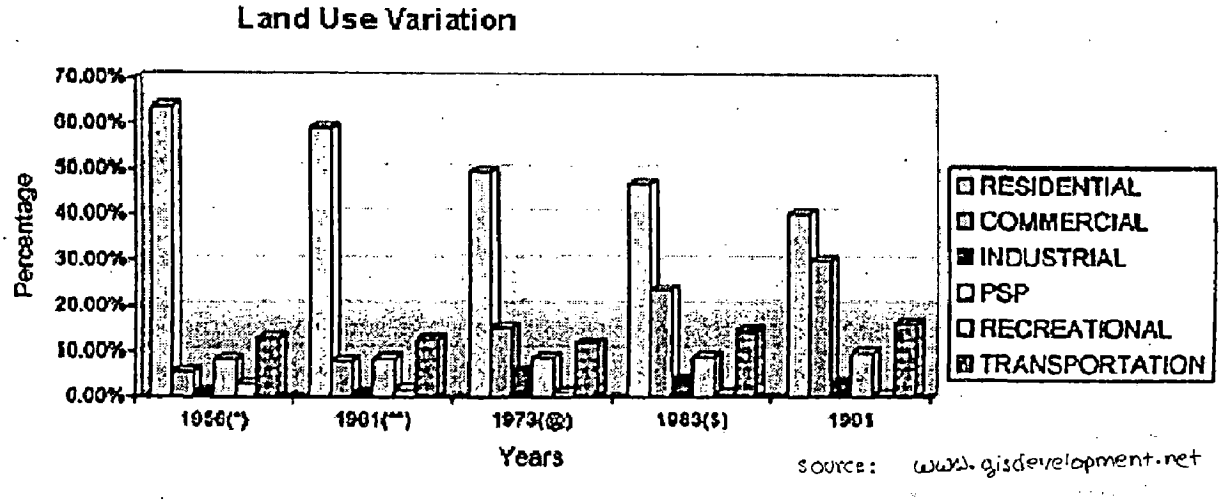
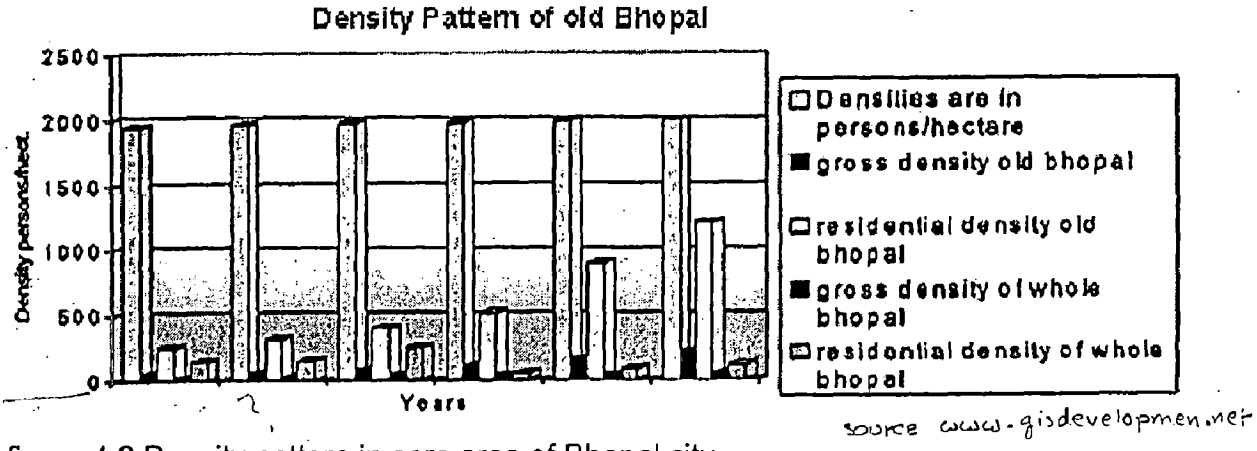


figure 4.1 Land use variation in core area of Bhopal city



source www-gisdevelopmen.net

figure 4.2 Density pattern in core area of Bhopal city

4.4 LINKAGES

Bhopal is located on the eastern fringe of the Malwa Plateau and enjoys an equable climate. Situated on the main railway network, it is well connected with Delhi, Bombay, Pune, Hyderabad, Madras, Bangalore and Kerala. Another broad-gauge line connects Bhopal with Indore, Ahmedabad, Kandla and other Industrial and trading centers in western India. National Highway No. 12 connecting Jabalpur to Jaipur passes through Bhopal , while many district headquarters of M.P. are connected with Bhopal by state highway. Bhopal is on the air map of India with daily flights to Delhi and Bombay and other metropolitan cities.

4.5 PLANNING OF THE CITY

The present structure of the city is radio centric with a barrier of large upper lake in the west of the city. The structure of the city is identifiable in terms of self contained sub cities. These sub cities are Parent city; BHEL, BHEL Service Township, Capital Town Ship, and Bairaghar. The 2005 development plan of Bhopal envisage continuation of sub city structure theme and proposes two additional sub cities around Misrod towards Mandeep and Nevri

The proposed sub cities have been envisaged in nexus to present rail road transport corridor which will provide mass transport corridor interlinked with over all city road network.

Physically the city has hilly terrain having an altitude ranging fromfron550 to 600 m from mean sea level. From the climate point of view it is modest with temperature ranging from 50 degree Fahrenheit to 104 degree Fahrenheit and rainfall varying from 50" to 60" annually. Most of the rainfall is in the monsoons. Westerly and south westerly, with average velocities ranging from 4kmph to 9kmph, are more prominent at the macro level. However the direction and wind velocities are more affected by numerous hills and valleys at the micro level and therefore play a very important role in the orientation of buildings. Geologically it has red soil mixed with boulders, on hillocks and slopes, and black cotton soil on other places at depth varying from 1 to 2.5 meters.

CLIMATIC DATA BHOPAL

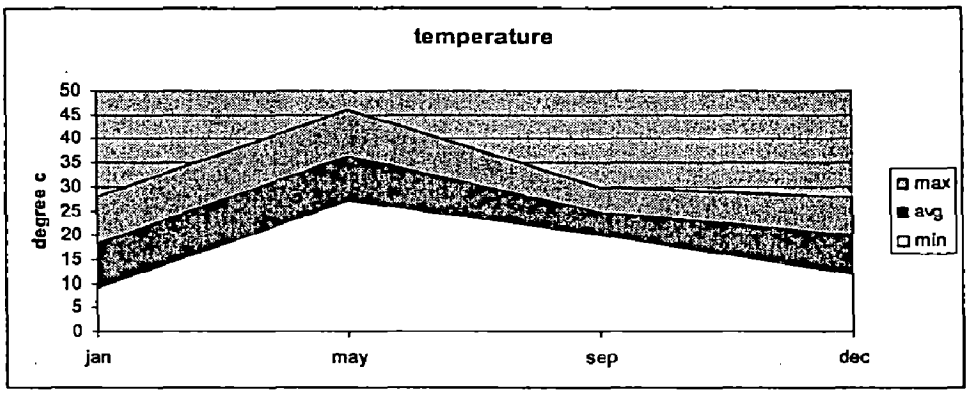


figure 4.3 Temperature

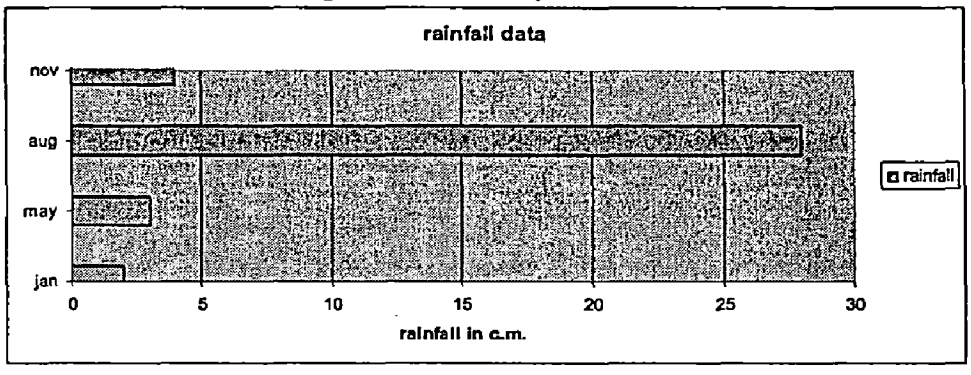


figure 4.4 Rainfall data

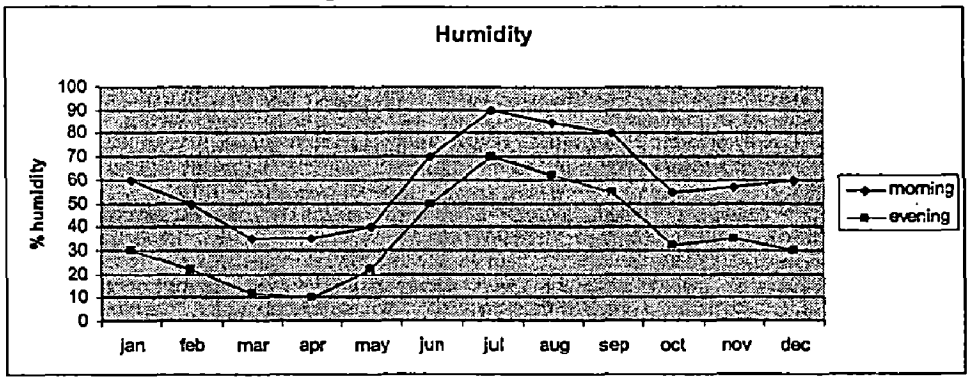


figure 4.5 Relative humidity

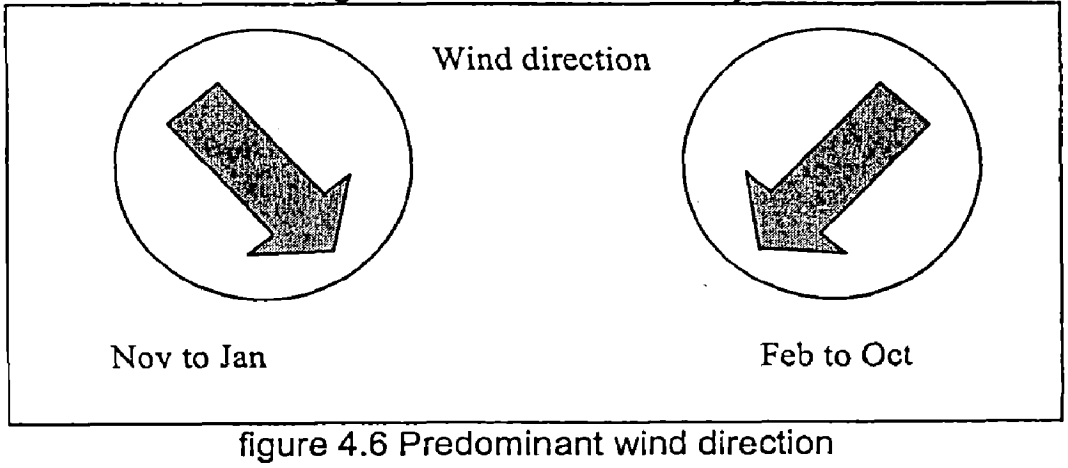


figure 4.6 Predominant wind direction

4.6 DEMOGRAPHIC AND SOCIO-ECONOMIC SITUATION OF BHOPAL CITY

Bhopal: Bhopal was a part of Sehore district in 1971. The total area of the Sehore district was 9,015 sq. km. Its population was 10.8 lakh, the density of population being 120 persons per sq.km. The literacy rate of the district was 29.7 per cent which was substantially higher than the state's average of 22.0 per cent. A little more than 40 per cent of the total population of the district was urban. The scheduled castes constituted 15.4 per cent of the district's population while scheduled tribes formed 4.6 per cent of its population. The literacy rates of the two scheduled groups were 9.0 per cent and 4.8 per cent respectively.

Bhopal district carved out of Sehore district in 1981, at that time it had an area of only 2772 sq. km. But the population of the district is about 9 lakh. It is now a predominantly urban district with more than 75 per cent of population living in the urban areas. Being the state capital functionally it is a service city.

The census report indicates that the city has experienced rapid demographic growth. The main reason for this is rapid in-migration on account of two reasons:

1. Up gradation of city as capital of Madhya Pradesh. in 1956
2. Commissioning of BHEL factory in 1958.

According to the census report the population of Bhopal was only 77 thousands and that was confined within city walls in 1901. now its population has grown over 14.33 lakhs which was a 2001 figure the major portion of the population is scattered mainly in three townships Bhopal(city and T.T. nagar) bairaghar and BHEL township. In 1971 census Bhopal was most urbanized city of Madhya Pradesh having urban content of 68.6% of states total urban population the city, as a matter of fact, has suffered many stresses and strains in population as compared to the other cities of the state this can be seen from the table.

The table clearly indicates that from 1901-1921 cities population decreased from 77 thousands to 45 thousands due to severe plague epidemic. Afterwards it increased comparatively at a faster rate than other major cities of the states

TABLE 4.1 POPULATION GROWTH OF MAJOR CITIES OF M.P.

	Population in lakh				% variation in decade			
year	bhopal	indore	gwalior	Jabalpur	bhopal	indore	gwalior	jabalpur
1901	0.77	0.98	1.39	0.97	-	-	-	-
1911	0.56	0.54	0.84	1.01	-21.03	-44.64	-39.07	-11.44
1921	0.45	1.05	1.14	1.09	-19.97	+44.52	+34.6	+8.09
1931	0.61	1.43	1.27	1.24	+35.36	+35.33	+11.67	+14.38
1941	0.75	2.04	1.82	1.78	+23.25	+42.92	+43.75	+43.38
1951	1.02	3.1	2.42	2.57	+36.03	+52.38	+32.38	+44.11
1961	2.23	3.95	3.01	3.67	+117.87	+27.05	+24.43	+42.81
1971	3.85	5.73	4.06	5.35	+72.63	+37.66	+26.13	+45.31

www.censusofindia.net

In 1956 when Bhopal was made a capitol of M.P. and in 1958 when the BHEL was located for the matter of policy its population increased from one lakh to two lakhs an increase of nearly 118% within a period of five years Due to these two factors, which further gave the impetus to the growth of many subsidiary industries and occupation. Because of urbanization process the city has witnessed growth largely by migration.

Physical growth of the city is much dependent on the topology of the area and barrier of the lakes physically the city has beautiful surroundings with hilly terrain. Initially the core area the walled city was self sufficient in its needs but because in latter half of twentieth century the whole country physical configuration was undergone a rapid change of urbanization and industrialization. Almost overnight, the core area had to function as the center for a whole lot of new spatial developments, with the increase in population at a tremendous rate the walled city had to assume the function of a commercial center. The city is growing owing to the

need of housing so it is important to review the housing shortage of the Bhopal and also economic standards.

Cities socio-economic survey indicates that 52 % of the total population migrated to Bhopal from various places for distinct reasons The influx of this population migration caused a chaotic housing shortage in the city , which could not be whipped out even after the large scale construction of housing units by the government . in today's scenario most of the physical growth of the city is because of the private builders making large colonies in the fringe areas of the cities at a massive scale according to the estimates contained in the Bhopal development plan 2005 the present housing shortages is estimated to about 1.2 lakh units which will increase to 4.5 lakh units in 2005,

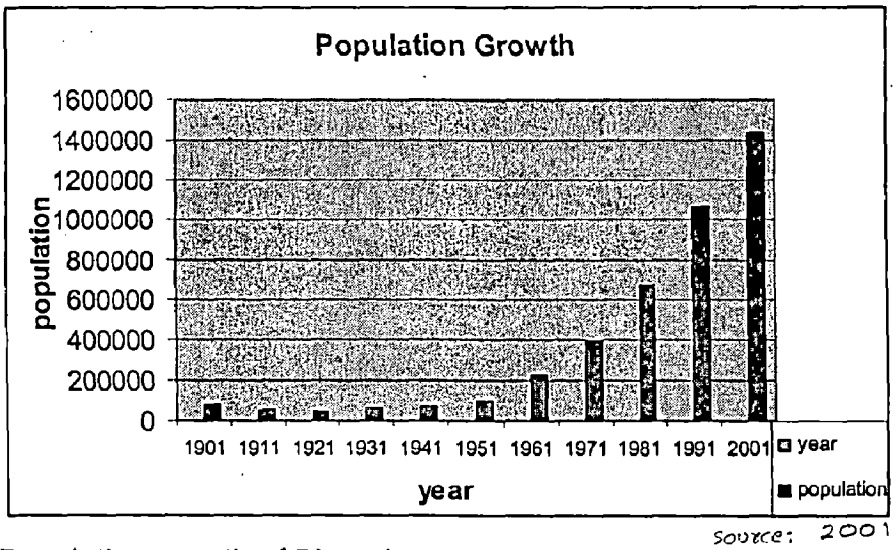
Bhopal is among the cities showing highest growth in the last century in the country but this massive growth has also given the cities some undesired consequences. The city has witnessed great in-migration of workers of all class after 1956. on present day there is large shortage of housing in the city for the citizens who worked in various government services which came up after the Bhopal was formed capital of Madhya Pradesh. Similarly the problems of slums have also come up because of squatting of urban land by in-migrant labor which came for large scale construction work that started soon after Bhopal was declared as capital. As a result of these, the growth of the city has deformed and resulted in the formation of slums in many pockets of the city. Through the passage of time the city has attained economic development and as a result rapid urbanization. This has also developed problems in the city like urban sprawl and dilapidation of agricultural land by population and pollution

4.7 DEMOGRAPHIC PROFILE OF BHOPAL

1. Population of Bhopal

According to the 2001 Census of India, the population of Bhopal (UA) has been worked out 14.54 lakh as against 10.63 lakh in 1991 census. This shows decennial growth of 34.91% of population during 1991-2001. The Corresponding percentage

at All-India level has been worked out at 21.34%. The total population of Bhopal is 2.40 % of the Madhya Pradesh Population.



source: 2001 census

figure 4.7 Population growth of Bhopal

2. Area

The total area Bhopal district is 2701.67 Sq. Kms. As per Population Census 1991, Bhopal district has 2 CD Blocks Phanda and Berasia. Berasia is a small town while Phanda block has Bhopal city which is second largest city of Madhya Pradesh Population wise Rural and urban composition of Bhopal district is given below:

TABLE 4.2 Urban and rural area of Bhopal

	Bhopald istrict	Phanda CD Block (Bhopal city)	Berasia (Berasia town)
Urban area	298.89 sq.k.m.	284.9 sq.k.m.	13.99 sq.k.m.
Rural area	2402.76 sq.k.m.	997.78 sq.k.m.	1404.98 sq.k.m.

source: 2001 census paper 2 provisional population totals

The following graph compares the urban and rural area of Phanda CD Block

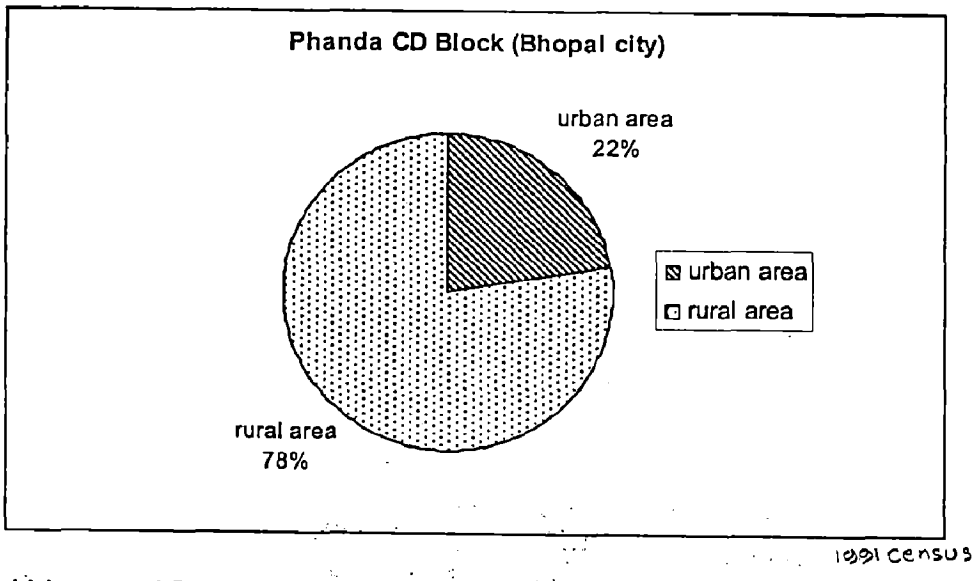


figure 4.8 Urban and Rural area of Bhopal

The Bhopal district has 80.53 % population living in urban areas and rest 19.47 % population in rural areas (Bhopal municipal area 284.9 sq km Berasia municipal corporation area 13.99 sq km total area of Bhopal district Berasia rural area 1404.98 sqkm Bhopal rural area 997.78 sq km.)

Graph shows the proportion of urban and rural population of phanda CD block

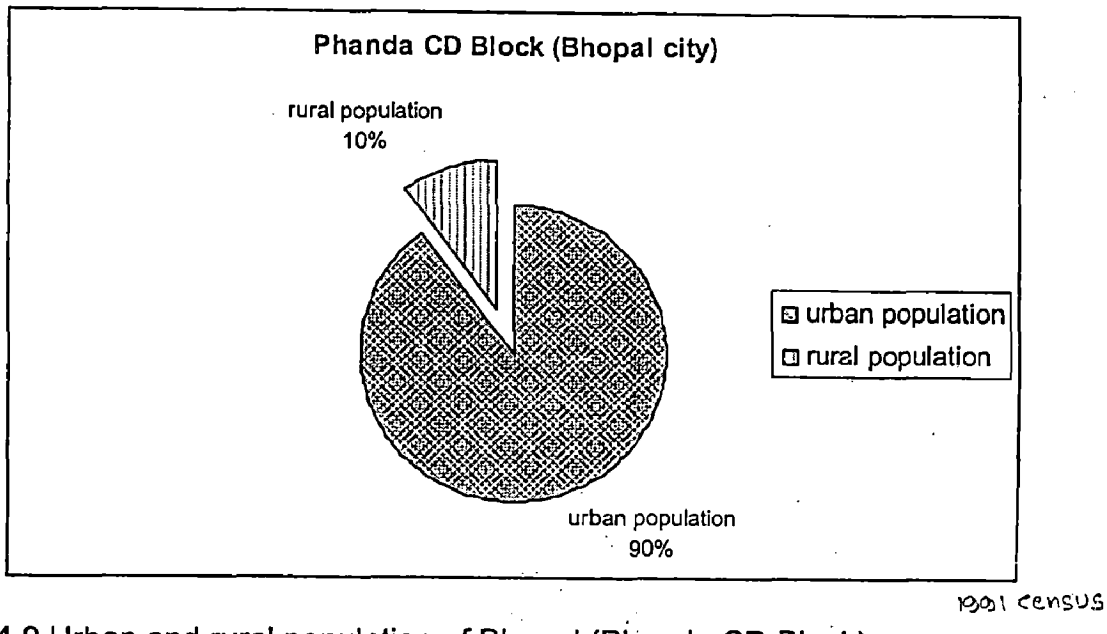


figure 4.9 Urban and rural population of Bhopal (Phanda CD Block)

3. Annual Average Growth Rate of Population in Delhi

Following chart depicts the annual average growth rate of Bhopal in Last century

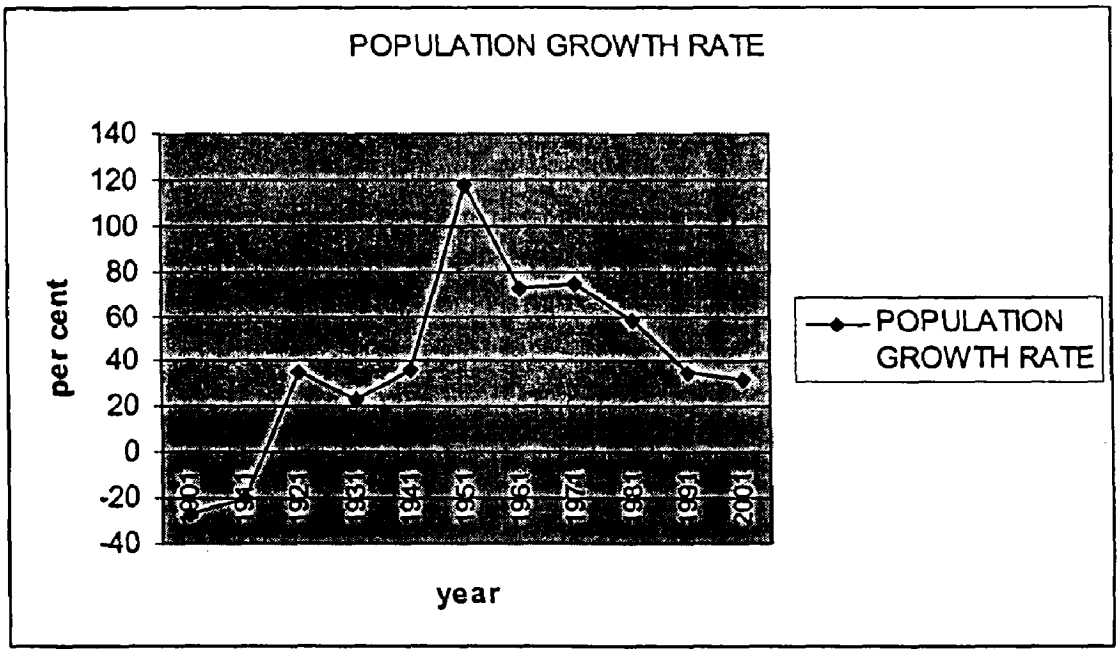


figure 4.10 Population growth rate of Bhopal

The graph shows very high population growth rate between 1951 and 1961 after which the growth rate has come down to normal levels and has achieved a uniform growth rate of 35 % in decade 1991-200. the reason for very high growth rate in decade of 50's was 1) Up gradation of city as capital of Madhya Pradesh. in 1956 and 2) Commissioning of BHEL factory in 1958.

4. Sex ratio

Sex Ratio is a very important demographic indicator to study socio-economic characteristics of population. The sex ratio(Number of females per 1000 males) of Bhopal (UA) is 898 in 2001. The corresponding figure of sex ratio at All-India is 933.

TABLE 4.3 Bhopal population characteristic (municipal corporation and out growths)

	total population	male	female	Sex ratio
Bhopal (UA)	1454830	766602	688228	898
Bhopal	1433875	755685	678190	897

	total population	male	female	Sex ratio
Damkheda	10233	5332	4901	919
Banjari	4066	2136	1930	904
Nayapura	3492	1803	1689	937
Akbarpur	2416	1260	1156	917
Bairagharchichali	748	386	362	938

(UA) Urban Agglomeration Source: 2001 census paper 2 provisional population totals

7. Density of population

Density of population is one of the important indicators to study population concentration and it is defined as number of persons living in per sq. kilometer. According to Census 2001 The population density of the Bhopal planning area as per 2001 Census is as high as 4797 persons per sq. km particularly in the CBD area. Spatial distribution of population density of Bhopal city, ward wise has been studied. It has been observed that the density is ranging from a meager less than 50 persons/ha in the peripheral areas to as high as 1000 persons per ha in the core of the city. There is tremendous pressure on the existing land in the core areas of city

8. Family size

As per 1991 Census, the average family size was 5.06 persons. The highest number of families i.e. 50% is in the category of 3-5 persons and the lowest 9% in the category of 9 & more persons. The family size in urban areas is 4.99 persons in comparison with rural family size of 5.90 persons. Details are in
table 3.7. Data relating to family size as per Population Census 2001 is yet to be released by the RGI.

9. Average family size

As per 2001 census the average family size has increased to 5.15 in urban area and 5.74 in rural area of Bhopal District

TABLE 4.4 AVERAGE FAMILY SIZE OF BHOPAL AND ITS OUTGROWTH

	Total population	Average family size
Bhopal District	1836784	5.27
Bhopal (UA)	1454830	5.15
Damkheda	10233	4.26
Banjari	4066	4.34
Nayapura	3492	5.14
Akbarpur	2416	4.80
Bairagharchichali	748	5.62

Source: 2001 census paper 2 provisional population totals

10. Literacy

Literacy is also a very important demographic characteristic, which is worked out during the course of Population Census. According to Population Census, a person is considered literate if he or she can read and write with understanding any language. The following statement gives literacy rates in 2001 census

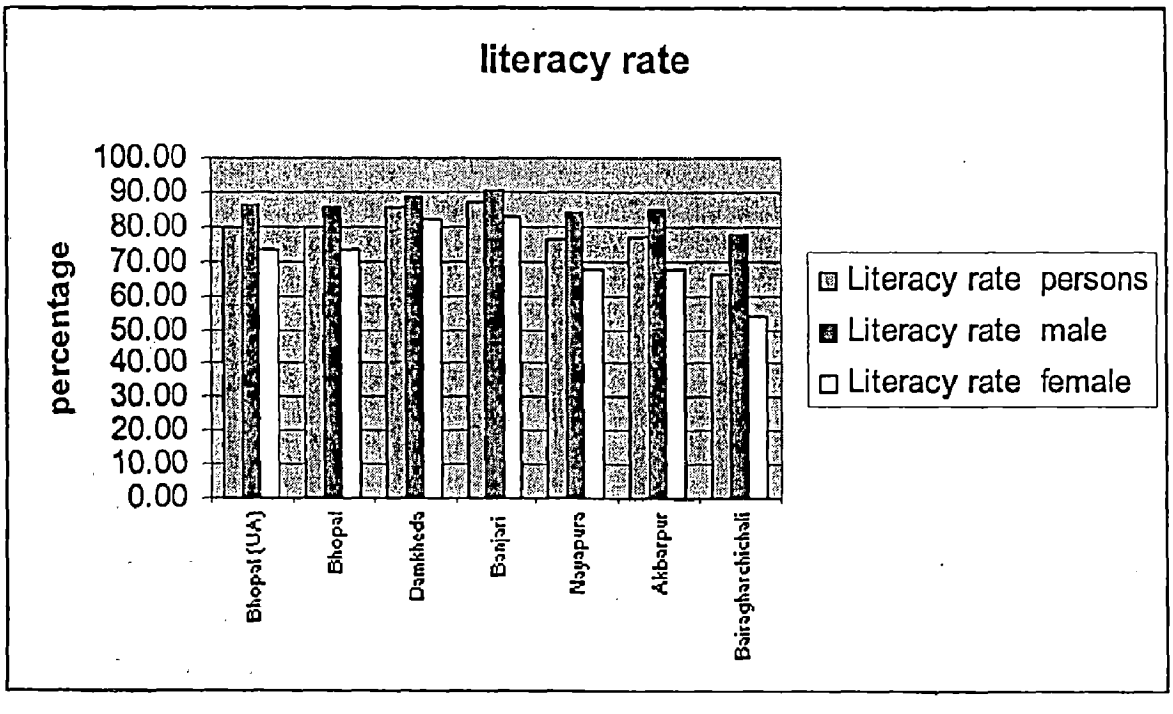


FIG 4.11 Literacy rate in Bhopal and its out growth

TABLE 4.5 LITERACY RATE IN BHOPAL AND ITS OUT GROWTH

	Persons	Male	female
Bhopal (UA)	80.16	85.98	73.64
Bhopal	80.12	85.95	73.59
Damkheda	85.75	88.82	82.26
Banjari	86.90	90.52	82.91
Nayapura	76.53	84.43	67.95
Akbarpur	76.63	85.20	67.48
Bairagharchichali	65.85	77.60	53.82

(UA) Urban Agglomeration Source: 2001 census paper 2 provisional population totals

Literacy in Bhopal (UA) is substantially higher 80.16% than the average literacy rate in Madhya Pradesh which is 52.83% according to 2001 census of India

11. Age composition

The Age distribution of the population of the State at the end of 1999-2000 was as under: (as percentage of total population)

TABLE 4.6 AGE COMPOSITION OF M.P. POPULATION

Below 5 years	Between 0-14 years	Between 15-59 years	+ 60 years	Remarks
12.5	38.6	53.4	7.9	Information in respect of other years (1995-96 to 1998-99) was not available.

Source M.P. Housing & environment dept website

12. Trend of urbanisation in Bhopal

Bhopal: Bhopal was a part of Sehore district in 1971. The total area of the Sehore

district was 9,015 sq. km. Its population was 10.8 lakh, the density of population being 120 persons per sq.km. The literacy rate of the district was 29.7 per cent which was substantially higher than the state's average of 22.0 per cent. A little more than 40 per cent of the total population of the district was urban. The scheduled castes constituted 15.4 per cent of the district's population while scheduled tribes formed 4.6 per cent of its population. The literacy rates of the two scheduled groups were 9.0 per cent and 4.8 per cent respectively. Bhopal district carved out of Sehore district in 1981, at that time it had an area of only 2772 sq. km. But the population of the district is about 9 lakh. It is now a predominantly urban district with more than 75 per cent of population living in the urban areas. Being the state capital functionally it is a service city. According to 2001 census Bhopal has almost 90% urban population.

13. Vital rates

The life expectancy (1991-95) in the Madhya Pradesh is 54.7 years for males and 54.6 years for females, as against 59.7 years and 60.9 years respectively for India as a whole.

The demographic scenario of the Madhya Pradesh is still characterized by a very high birth rate, a significantly high death rate, as well as infant mortality rate.

As of 2000, the State achieved a Crude Birth Rate (CBR) of only 30.6 (against the targeted 21) per thousand populations, Crude Death Rate (CDR) of 11.2 (against 9) per thousand population and infant mortality rate (IMR) of 97 (against 60) per thousand live births.

TABLE 4.7 TARGETS FOR VITAL RATES OF DEMOGRAPHY FOR M.P.

Sl. No.	Indicators	Targets upto year 2000	Achievements during			
			1995	1996	1997	1998
1.	CBR	21	33	32.4	31.9	30.6
2.	CDR	9	11.1	11.1	11.0	11.2
3.	IMR	60	99	97	94	97
4.	CPR	60 per cent	49.3	50.6	47.71	47.2

Source M.P. Housing & Environment dept.

The population projections for the Bhopal Planning Area up to the year 2021 were made on the basis of different standard statistical procedures such as Arithmetic, Geometric and Incremental increase methods. The projections obtained from geometric method were

adopted for the study to calculate the additional requirements of land for the year 2011 and 2021. The projected population is presented in **Table** from this table one can notice that the population of Bhopal city is likely to be about 24.50 lakh.

TABLE 4.8 POPULATION PROJECTIONS: BHOPAL CITY

	2001Census		
Year	2001	2011	2021
Population (projected)	1433875	2080901 (35.76%)	2707278 (30.10%)
Population (desirable)	1433875	1892715 (32%)	2460530(30%)

Source: Bhopal region perspective plan 2021 NCHSE Bhopal

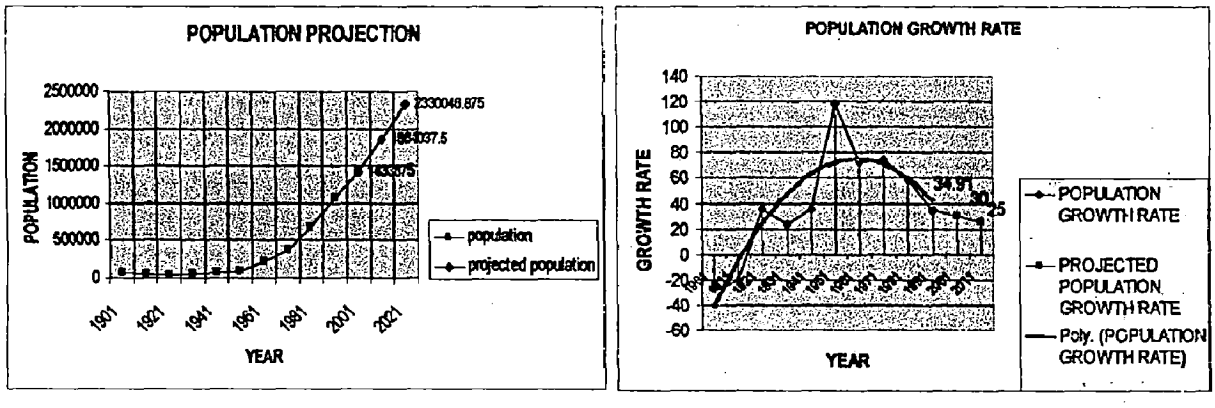


figure 4.12 Population projection and growth rate projection

14. Urban infrastructure

a) Water supply

Bhopal as adequate water supply at present, but the water resources in the region have limitation. The existing water supply is from the Upper Lake and Kolar Reservoirs. The Upper Lake is sensitive from the environmental point of view because it is silting fast and needs dredging. Besides, restoration of the Bhoj "wetlands" in the catchment areas is fast becoming essential. In future, water supply

can be procured from proper exploitation of the Bhopal catchment. Bhopal is partially served by a sewerage system but needs to have a more comprehensive system of waste disposal.

The BMC is supplying nearly 170 Ltr. of water per person everyday where as the required is worked out @ 180 lts per capita per day.

According to the need Different methods have been adopted for supplying water. In 38 Sq. Kms. of rural areas water is supplied through the Cistern method. In slum areas water is supplied through 23 water tankers and 38 stationary trolleys.

TABLE 4.9 SOURCES OF WATER IN BHOPAL CITY AND THERE CAPACITY

Source of Water	Amount of Water
Kolar	28 MGD
Upper lake	23 MGD
Tube wells	05 MGD

Bhopal Municipal Corporation

b) Sewerage and drainage

There is no a single city in India which is wholly sewered. Bhopal is no exception , the present habitated areas of the city are partially served by sewer system . some of the new development which has come up through private sector investment has there own community septic tank

The natural drainage of the city is provided by three main streams, which are joind by small nallahs and rivulets. The city areas of north eastern zone , drains into river Halali, Areas in south eastern zone by Kaliasot River. Both rivers ultimately drains into Betwa, Halali reservoirnear vidisha and Kaliasoth near Bhojpur on south western side the , the drainage is provided by small nallahs which drain into Kolar river which ultimately joins river Narmada

c) Solid waste

Presently the Bhopal City has limited financial, technical and human resources for solid waste management in the city. With the present infrastructure, corporation is able to collect only about 96 tonnes of garbage per day as against generation of 131 tonne/day. It is estimated that solid waste generation may increase to 165 tonnes per day by the year 2000 presently there is no compost plant existing in the city and the solid waste is dumped in the out skirts of the city and is used for land fill.

d) Electricity

In Madhya Pradesh is generated in the state in various thermal power stations like one that are in Sarni and Amarkanta etc and one hydro power station Virsinghpur Hydro power station. The power source for the Bhopal city is from hydel grid. In power stations electricity is generated at 11kv which is up-stepped to 440kv for transmission to the major cities. When the power reaches the city it is again down stepped in following stages in substations

440kv ⟶ 220kv ⟶ 132kv ⟶ 33kv ⟶ 11kv

from 11kv the power is down-stepped by the transformers at local level. The power is distributed among use zones the breakup of which is industrial 30, Commercial 20%, residential 40%, and misc. 10%. The power supply for Bhopal city is just enough to meet its normal days demand.

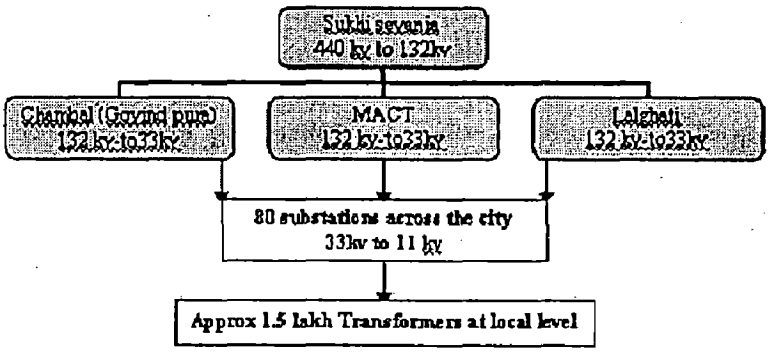


figure 4.13 Electricity distribution flowchart of Bhopal city

For the future needs of powers supply following 7 substation of 132 kv are proposed : Ayodhya Nagar , Gandhinagar Khajurisadak, Nabibagh, Sukhi sevania, Misrod, Anand Nagar, Kolar Road [5]

e) Transportation

Bhopal is the capital of the Madhya Pradesh and is centrally located. It occupies strategic location on national transportation network which include road , rail and

airways linking. National highway no 12. pass through the city and carry heavy vehicular traffic, regional as well as local. The state highway linking Indore and Sagar with Bhopal. There are other regional roads viz. Raisen road, Berasia Road, Kolar road and Chiklod road which carry regional and local traffic

Bhopal has two railway stations Bhopal city station and Habibgunj railway station the city lies on the main rail corridor and gas excellent Rail linkages with rest of the sountry.

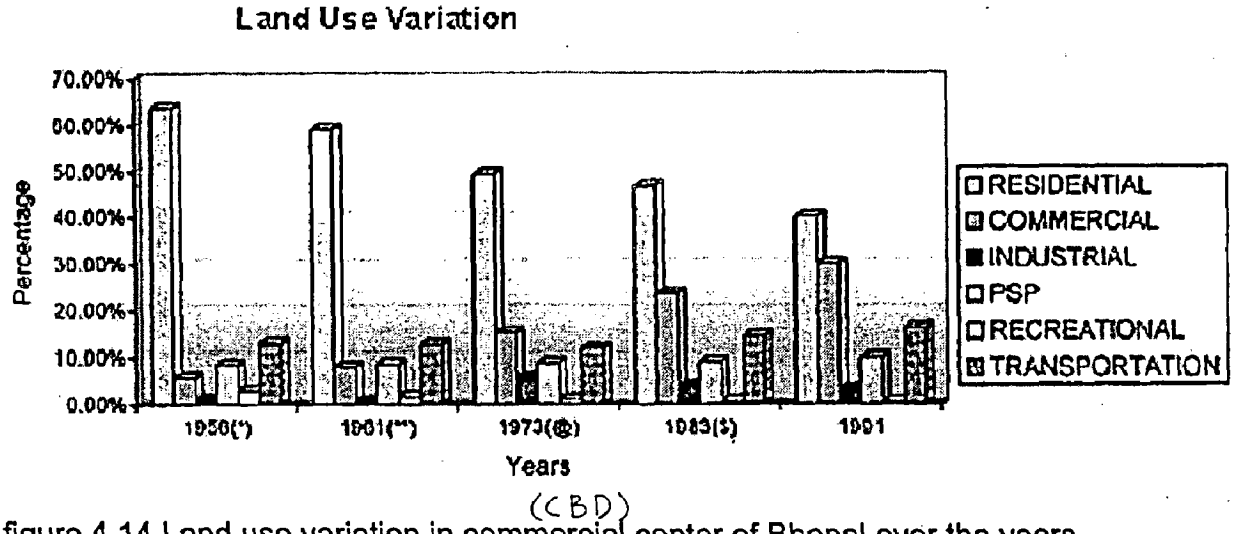
Bhopal has airport in Bairaghar and is connected to major metropolitan cities of India through airways linking

15. Urban settlement and sprawl analysis

Historic Cities are increasingly being seen as 'cultural landscapes' emerging out of the Human-Environment interaction, and not solely as collections of isolated physical entities. Bhopal is no exception to that.

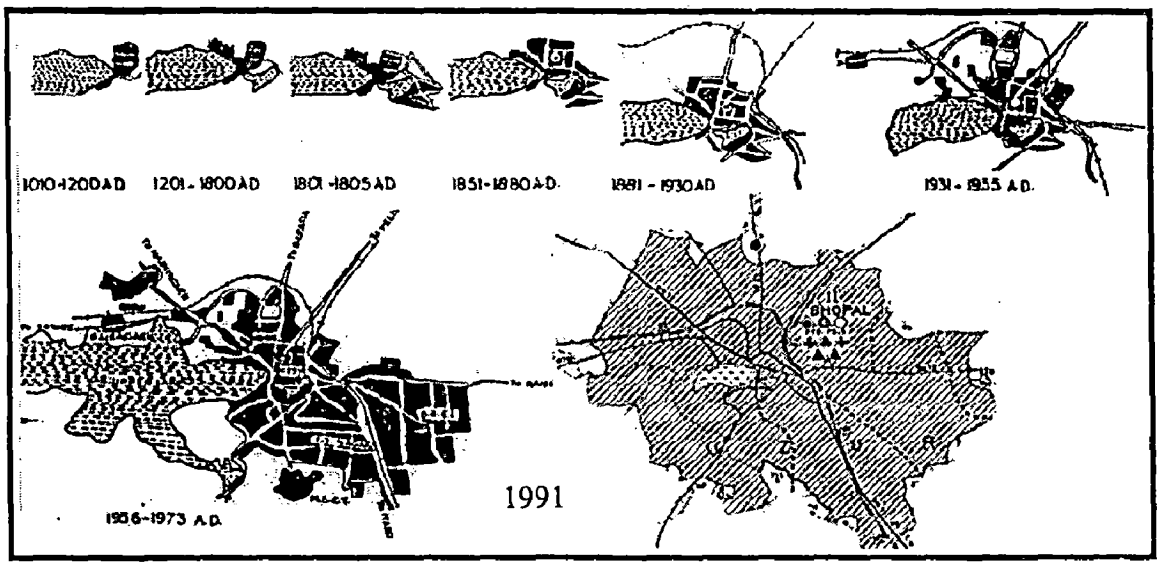
- In the case of Bhopal, the character of the city is defined by forms ranging from concrete physical forms to the more abstract cultural values that people may associate with a place.
- The walled city of Bhopal was self contained unit governing a very small principality.
- The basic regional functions taking place in spaces were related to administration.
- This function of administration still continues but with a wide change of scale.

Except for a few units not much industrial activity could settle in Bhopal. After becoming capital of state physical configuration of Bhopal had undergone a rapid change of urbanization and industrialization. Almost overnight, the core area had to function as the center for a whole lot of new spatial developments, with the increase in population at a tremendous rate the walled city had to assume the function of a The following figure clearly indicates the shift of center of gravity of the physical development of the Bhopal city to be shifting south ward in the direction of Mandideep the industrial township in neighboring district Raisen. The aspect that is the cause of concern is that this is a fertile area having intensive agricultural.



(CBD)

figure 4.14 Land use variation in commercial center of Bhopal over the years.



Source:'Planning Indian City' by M.N. Buch & 1991 district census handbook of Bhopal city

figure 4.15 Morphology of Bhopal city

OBSERVATION AND PROBLEM OVERVIEW

5.1 GENERAL

Field study is important source information on ground reality of the research area in this study two methods are applied for collection of quantitative and qualitative information of the socio-economic conditions and condition of physical infrastructure of the peri urban area.

5.2 FIELD OBSERVATIONS

figure 5.1 Farm house situated in middle of agricultural farm land in Ratibad village. the elite class of city construct farm houses in the immidiate rural area

figure 5.2 Character of a village housing cluster in peri urban area of Bhopal city. This type of cluster are scattered in the hinterland

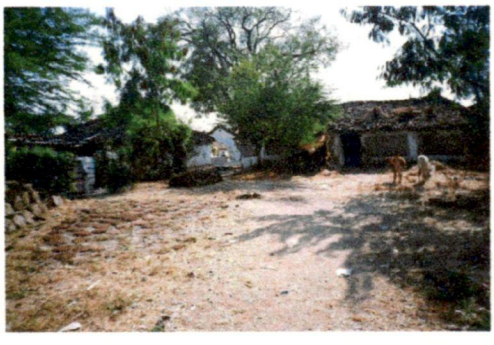


figure 5.3 The open space in front of village residence is used for household activities in the day time most of the activities of villagers are outside of the house

figure 5.4 The figure shows the condition of soak pit latrine of a village residence the important

thing to notice is that the location of the facility is out side and away from the house. How ever the presence of soke pit latrine itself highlights the increased awareness towards the hygiene in the village community.

figure 5.5 This figure highlights the ill design and maintenance of open drainage. The agricultural area are heavy users of the water for the purpose of irrigation The isolated residences in the rural area are generally located abutting the field.

figure 5.6 Large agricultural holdings with rich cropping area are divided into smaller land holdings and are sold as farm houses this is a sign of degrading rural area on the periphery of cities

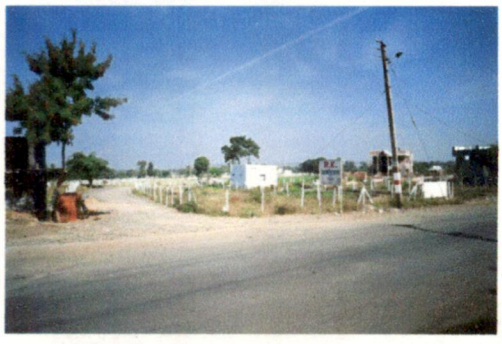
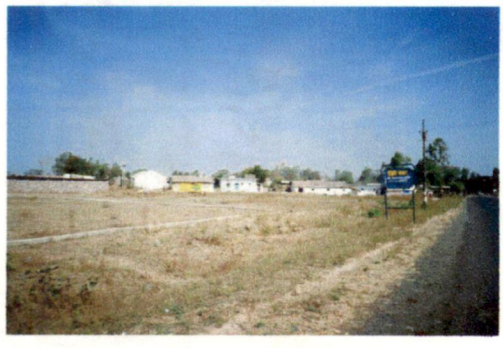


figure 5.7 Large scale construction work being carried in Neelbad village by builders and colonizers.

figure 5.8 Open space adjacent to highway are particularly susceptible the fast



development. This particular photograph shows large land is acquired by a colonizer for the purpose of building housing colony this area is about 5 k.m . from the urban boundary of Bhopal.

figure. 5.9 High density high rise development on Kolar road Bhopal shows the pace of Urbanization. All the development on this road has occured in last 10-15 years and has achieved very high residential density. The sad part is that the quality of life is increasingly going down because of lack of infrastructure

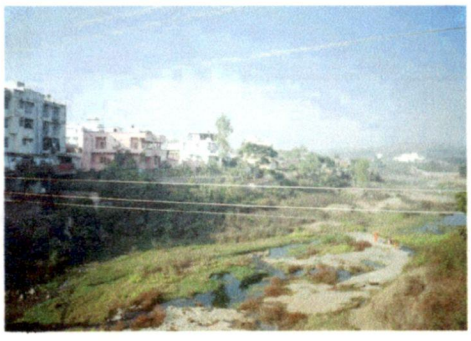


figure 5.10 Kalia sot river is the physical barrier to city growth, development seen across the river is the out growth (Dam Kheda) of Bhopal . this is case of leapfrog development on the fringe of large city where the pressure of development forces the breaking of physical barrier to city growth

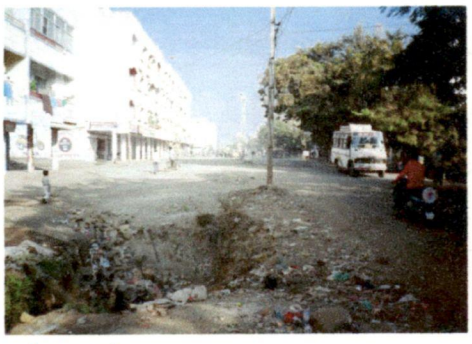


figure 5.11 Picture shows poor infrastructure facility on Kolar road the village Damkheda which used to be here has completely vanished and high density high rise development has come up. The area has poor road infrastructure, solid waste collection and disposal is not adequate.

figure 5.12 Residential development engulfing a rich agricultural land besides the Bilkisgunj road. an agricultural area can sustain itself only if it is

in considerable size and has infrastructure for irrigation and connectivity

figure 5.13 Dilapidated house at a prime location of former village which is fast changing its character in wake of urbanization, the house is in bad shape will soon be replaced by the force of land economics

figure 5.14 Village house holds facing the dilemma of being estranged in their own area because of rapidly changing character of surrounding area. farming activities and associated non farming activities in the are fast depleting. In the end the villagers have to give up their living and life style and migrate to other place

figure 5.15 A barbed Agricultural field in Ratibad village this particular piece of property is subjected to system of land management where the land is sold by the agriculturist but he still practices agriculture on it by giving rent to the new owner

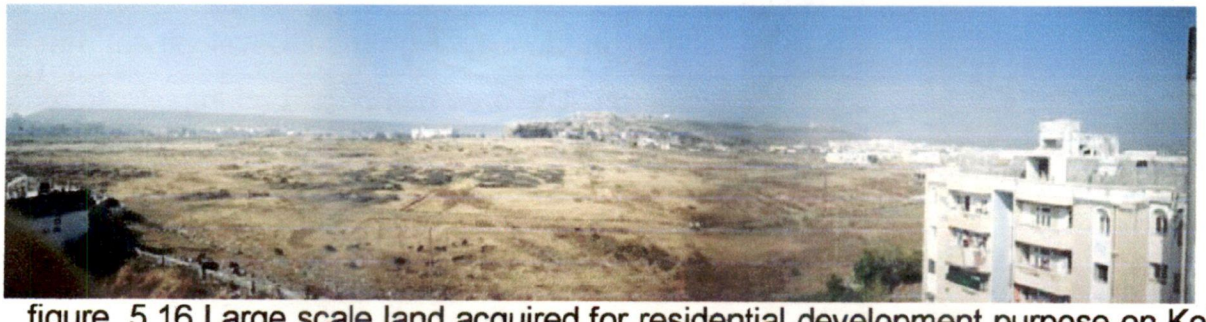


figure. 5.16 Large scale land acquired for residential development purpose on Kolar road. In lack of proper guidelines the ecologically sensitive areas are made available to the colonizers for development

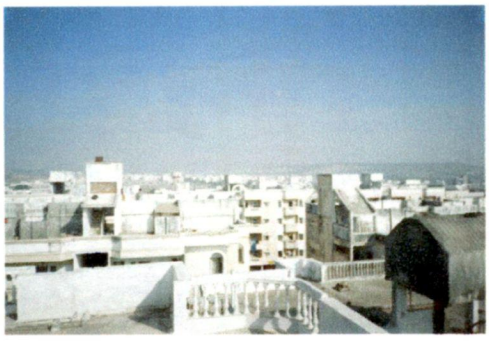


figure 5.17 Development in the out skirts of city beyond the limits of development authority.

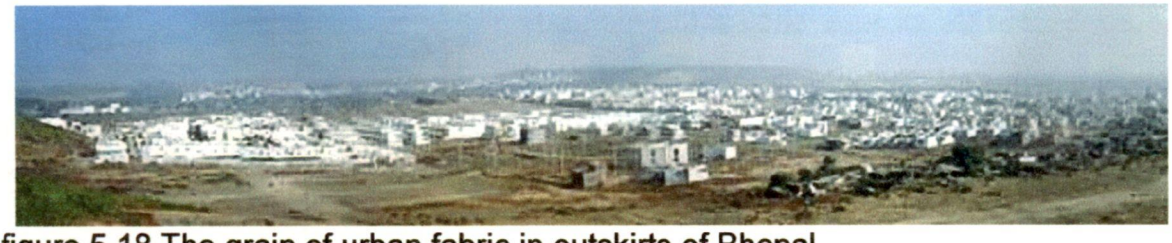


figure 5.18 The grain of urban fabric in outskirts of Bhopal

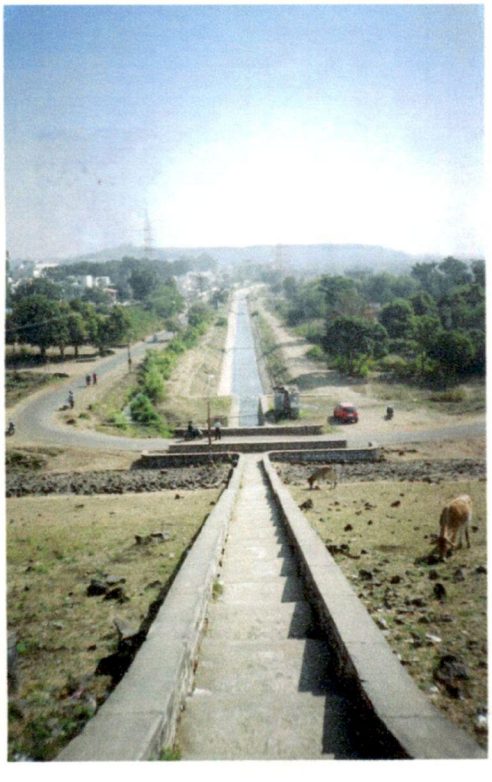


figure 5.19Canal from Kalia sot dam feeds the agricultural area in the south east of Bhopal city but the leap frog development on the Kolar road and fast growing ribbon development on the Hoshangabad is damaging the hinterland which was served by this canal

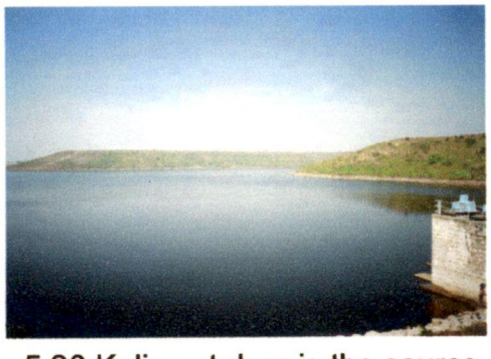


figure 5.20 Kalia sot dam is the source of canal

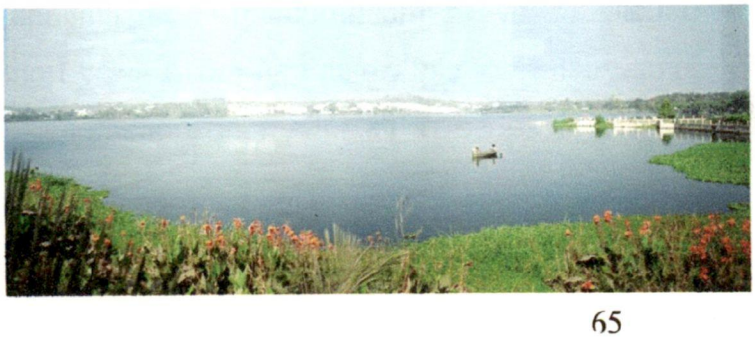


figure 5.21 Shahpura lake in Bhopal is major recreational area near the out growth of

Bhopal and is one of the reasons because of which development has attracted

figure 5.22 this development is high density high rise in nature on the fringe of out skirts where the nearer are developed as low density this particular example of the greed of builders results in inefficiency of planning associated with disturbing the center of gravity of the core and city

figure 5.23 This picture shows the degrading condition of rural area. Because of changing occupation there is significant rural urban migration. The elderly who could not migrate suffer.

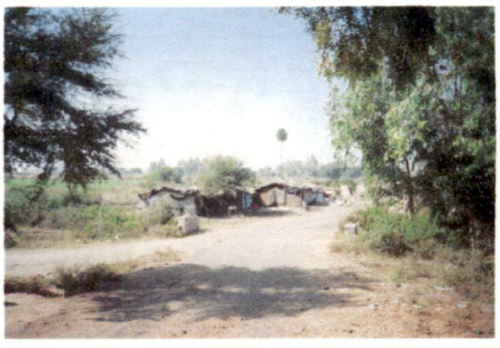


figure 5.24 Competing land uses on the periphery of Bhopal

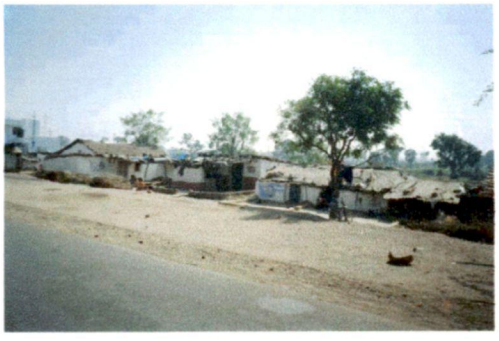
figure 5.25 Rich agricultural land surrounded by high density development

figure 5.26 The development of fringe starts usually by mushrooming institutional infrastructure of city which can move away from the city because of its inheritant character like

hotels and educational institutions

figure 5.27 this picture reminds us of the industrial housing the worst thing is that the land it occupies was purely agricultural. The kind of development which has occurred has left no soft landscape for percolation of water, this has increased runoff rate of rain water

figure.5.28 ,5.29 these pictures are showing the degradation of old village of Bag



Mugalia and development of same settlement on another site near the city this is a classical example of degradation due to change in occupational character

figure 2.30 A good example of softening the edge of urban settlement. Such fringe can provide recreational area to the urban population here the development is on the water front but it could be a garden , vegetation or plantation.

DATABASE PREPARATION AND GIS ANALYSIS

6.1 GIS

GIS data consist of two elements, namely spatial and non- spatial. The first one gives the information about the feature's geometric orientation, shape, size and relative position with respect to other features and second qualifies information about various attributes like area, length, population, etc.

6.2 MAPS USED FOR GIS

Detailed maps of the study area are created using Arc/ Info software which involves

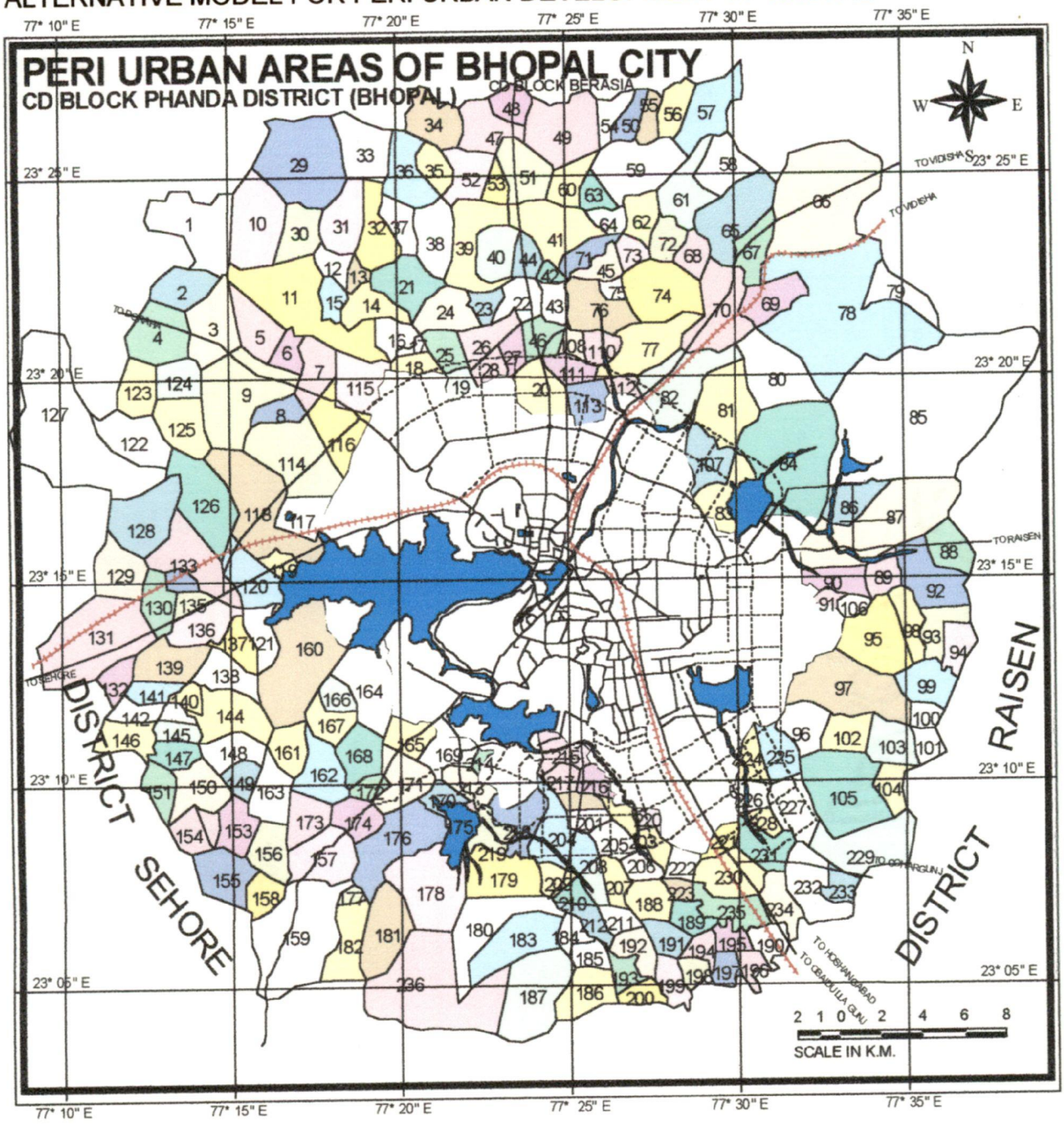
- Digitization of scanned maps
- On-screen digitization
- Projection and transformation of digitized maps into real world coordinates

Detailed maps are crucial to this study because they show the physical aspects of the urbanizing environment of the villages. The topo-sheet maps from the Survey of India (1976) at the scales 1:50,000 and 1:25,000 are used. For integration of census data for villages around Bhopal city the CD block map of Phanda Tehsil Huzur was used from the district census hand book of Bhopal 1991 census. The maps of urban area of Bhopal are derived from the municipal maps of Bhopal showing the ward boundaries. The existing and proposed road network and location of water bodies in Bhopal planning area is taken from the 2005 master plan of Bhopal. The location of rivers streams and canal is taken from the survey of India: district planning series – 'Bhopal' map at scale 1:2,50,000. Geographic Information System (GIS) is used to analyze the census data spatially.

6.3 PREPARATION OF ATTRIBUTE DATABASE

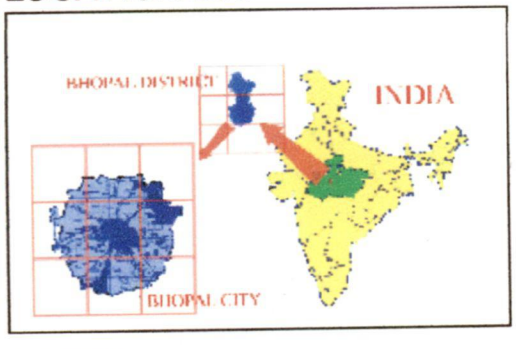
Attribute database is prepared from the district census handbook of Bhopal for 1991 census and 2001 census. This is used in Arc View GIS software for the analysis

ALTERNATIVE MODEL FOR PERI URBAN DEVELOPMENT OF BHOPAL



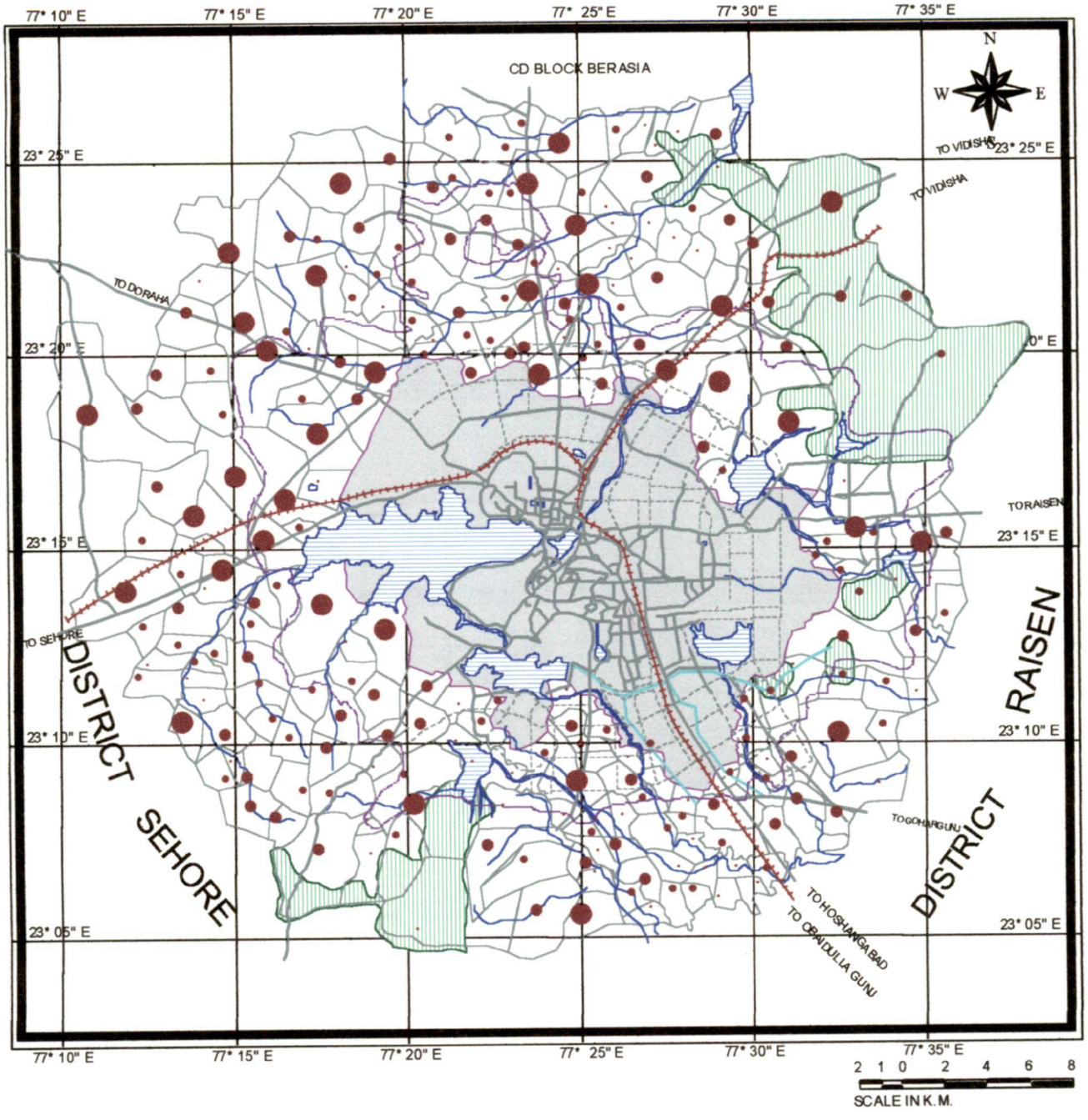
MAP 1: Villages surrounding Bhopal City in CD Block Phanda (list of village names is given in Annexure) Phanda CD Block has 236 Villages and 1 Municipal Corporation containing 66 wards.

LOCATION MAP



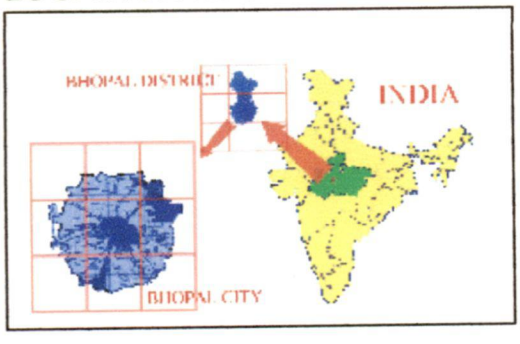
DATA SOURCES
CENSUS OF INDIA 1991, 2001
MAP SOURCE:
DISTRICT CENSUS HANDBOOK 1991
BHOPAL DEVELOPMENT PLAN 2005
SOI TOPOSHEETS 1:50,000 SCALE
MUNICIPAL CORPORATION WARD MAP

ALTERNATIVE MODEL FOR PERI URBAN DEVELOPMENT OF BHOPAL



MAP 2: Village population according to 1991 Census of India

LOCATION MAP



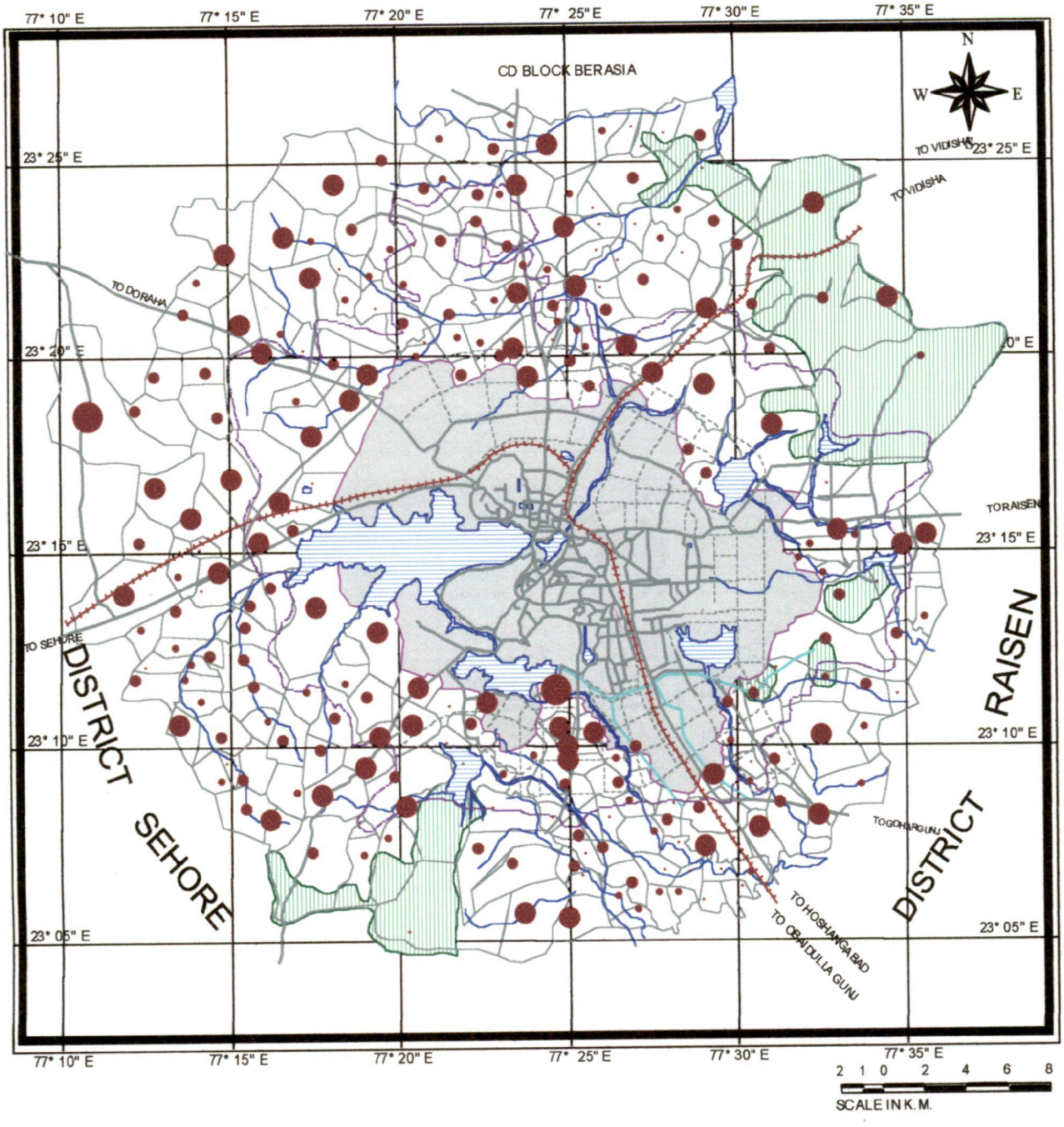
DATA SOURCES
CENSUS OF INDIA 1991, 2001
MAP SOURCE:
DISTRICT CENSUS HANDBOOK 1991
BHOPAL DEVELOPMENT PLAN 2005
SOI TOPOSHEETS 1:50,000 SCALE
MUNICIPAL CORPORATION WARD MAP

LEGEND

Village population
- Pop < 200
- 200 - 500
- 500 - 1000
- 1000 - 5000
- Pop > 5000

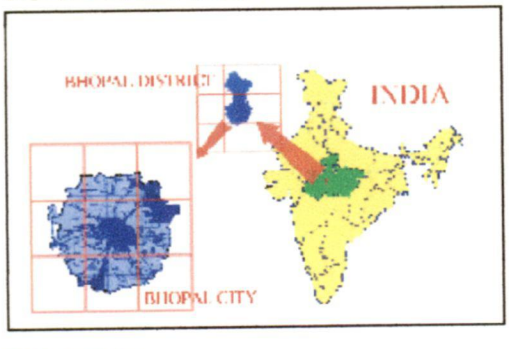
Proposed roads (2005)
BDA limit
Roads
Rail network
CanalCanal.shp
Rivers and streems
Lakes & reservoirs
Municipal area
Municipal / Urban area limit
Village
Reserved forest

ALTERNATIVE MODEL FOR PERI URBAN DEVELOPMENT OF BHOPAL



MAP 3: Village population according to 2001 Census of India

LOCATION MAP



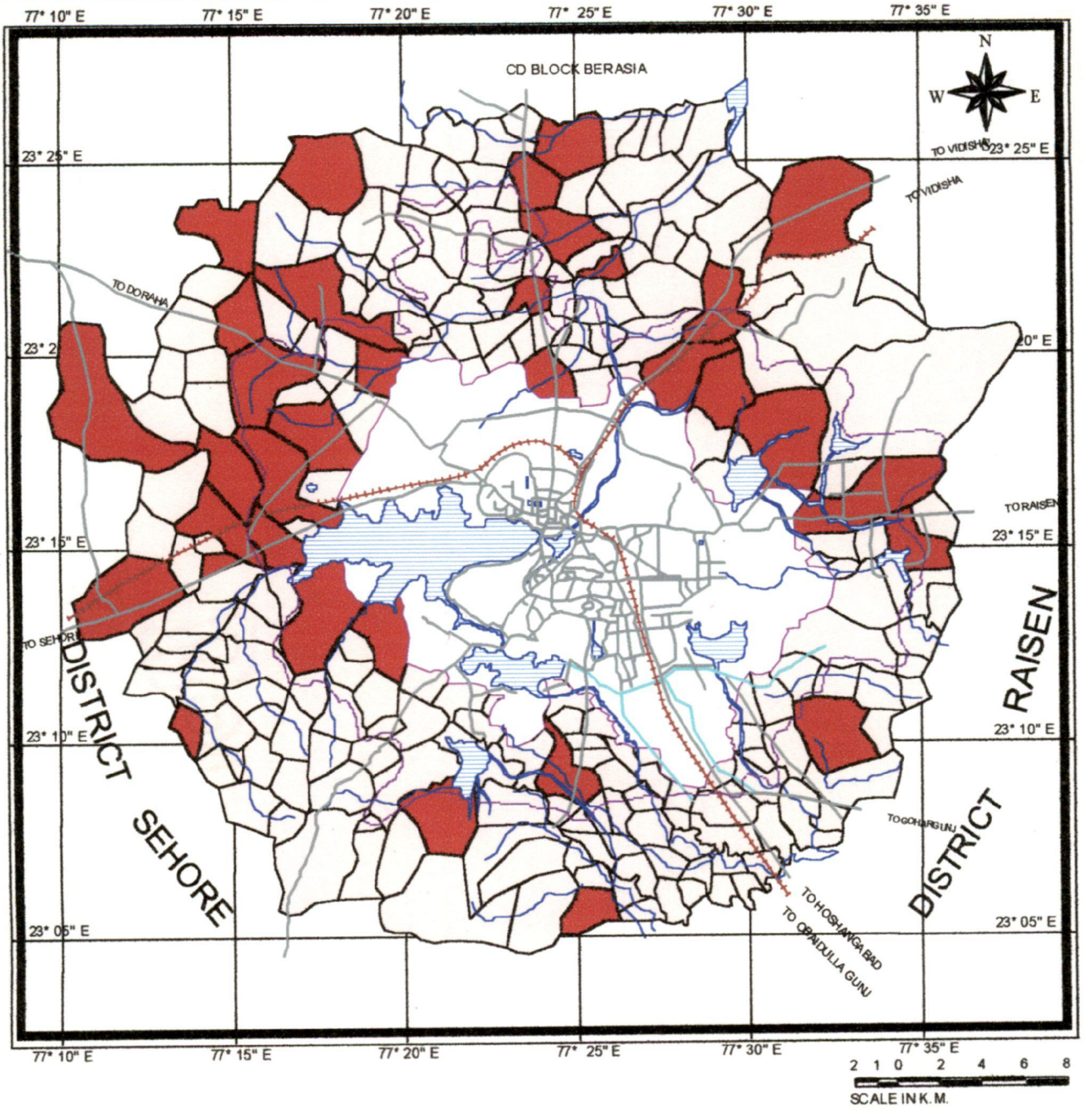
DATA SOURCES
CENSUS OF INDIA 1991, 2001
MAP SOURCE:
DISTRICT CENSUS HANDBOOK 1991
BHOPAL DEVELOPMENT PLAN 2005
SOI TOPOSHEETS 1:50,000 SCALE
MUNICIPAL CORPORATION WARD MAP

LEGEND

Village population
- Pop < 200
- 200 - 500
- 500 - 1000
- 1000 - 5000
- Pop > 5000

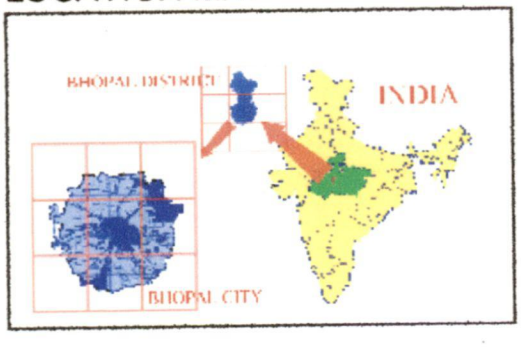
- Proposed roads (2005)
- BDA limit
- Roads
- Rail network
- Canal
- Rivers and streems
- Lakes & reservoirs
- Municipal area
- Municipal / Urban area limit
- Village
- Reserved forest

ALTERNATIVE MODEL FOR PERI URBAN DEVELOPMENT OF BHOPAL



MAP 4: Village population according to 1991 Census of India

LOCATION MAP



DATA SOURCES
CENSUS OF INDIA 1991, 2001
MAP SOURCE:
DISTRICT CENSUS HANDBOOK 1991
BHOPAL DEVELOPMENT PLAN 2005
SOI TOPOSHEETS 1:50,000 SCALE
MUNICIPAL CORPORATION WARD MAP

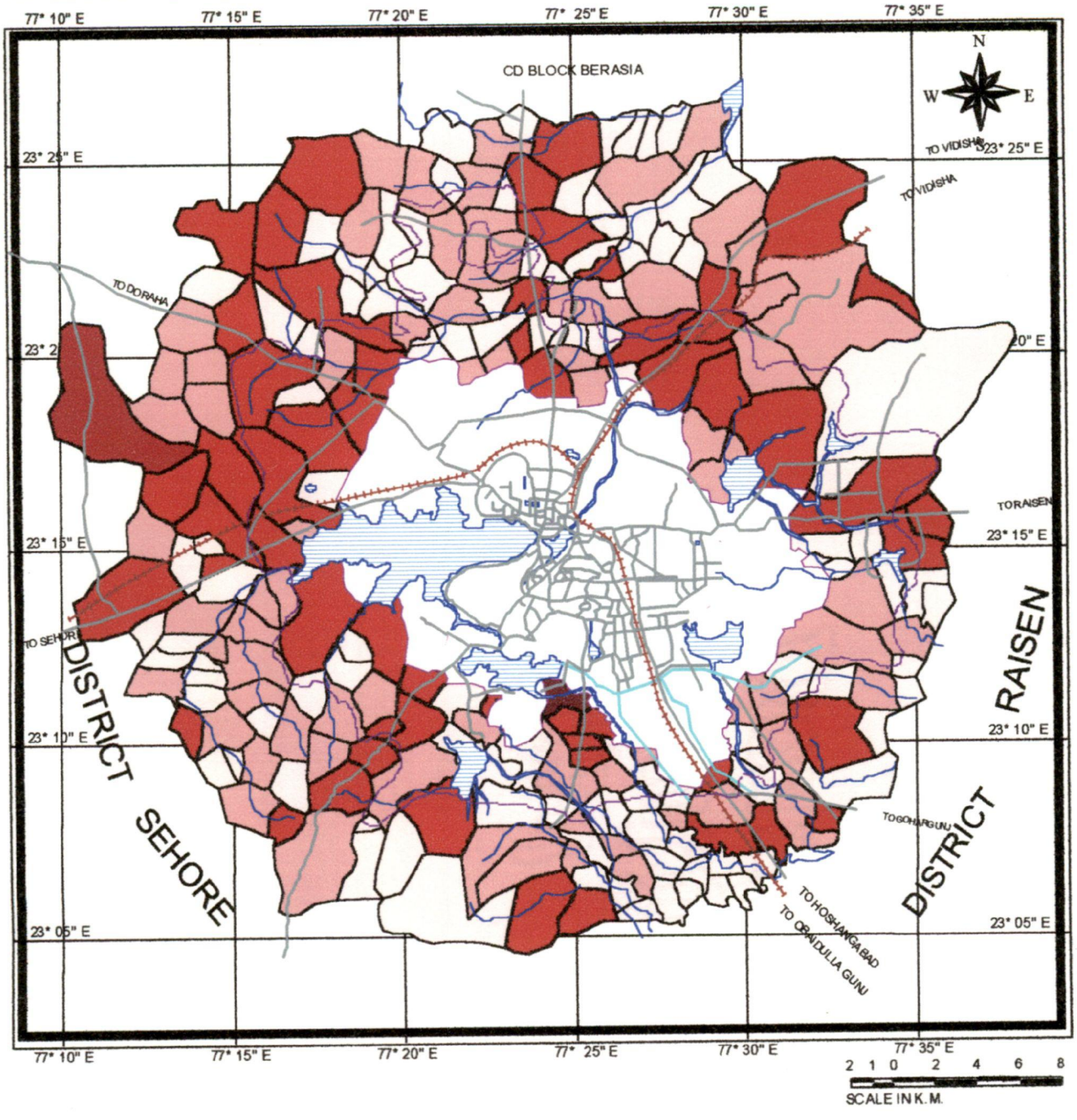
LEGEND

- BDA limit
- Roads
- Rail network
- Rivers and streems
- Canal
- Lakes & reservoirs
- Municipal area
- Municipal / Urban area limit

Village population 1991

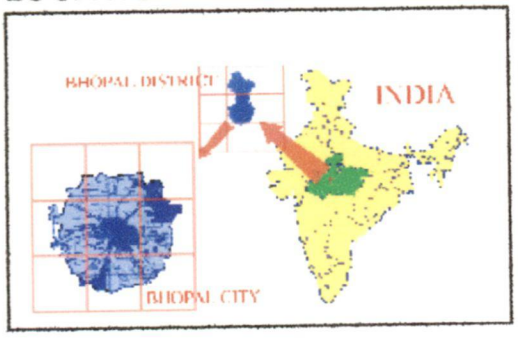
- 0 - 500
- 500 - 1000
- 1000 - 5000

ALTERNATIVE MODEL FOR PERI URBAN DEVELOPMENT OF BHOPAL



MAP 5: Village population according to 2001 Census of India

LOCATION MAP



DATA SOURCES
CENSUS OF INDIA 1991, 2001
MAP SOURCE:
DISTRICT CENSUS HANDBOOK 1991
BHOPAL DEVELOPMENT PLAN 2005
SOI TOPOSHEETS 1:50,000 SCALE
MUNICIPAL CORPORATION WARD MAP

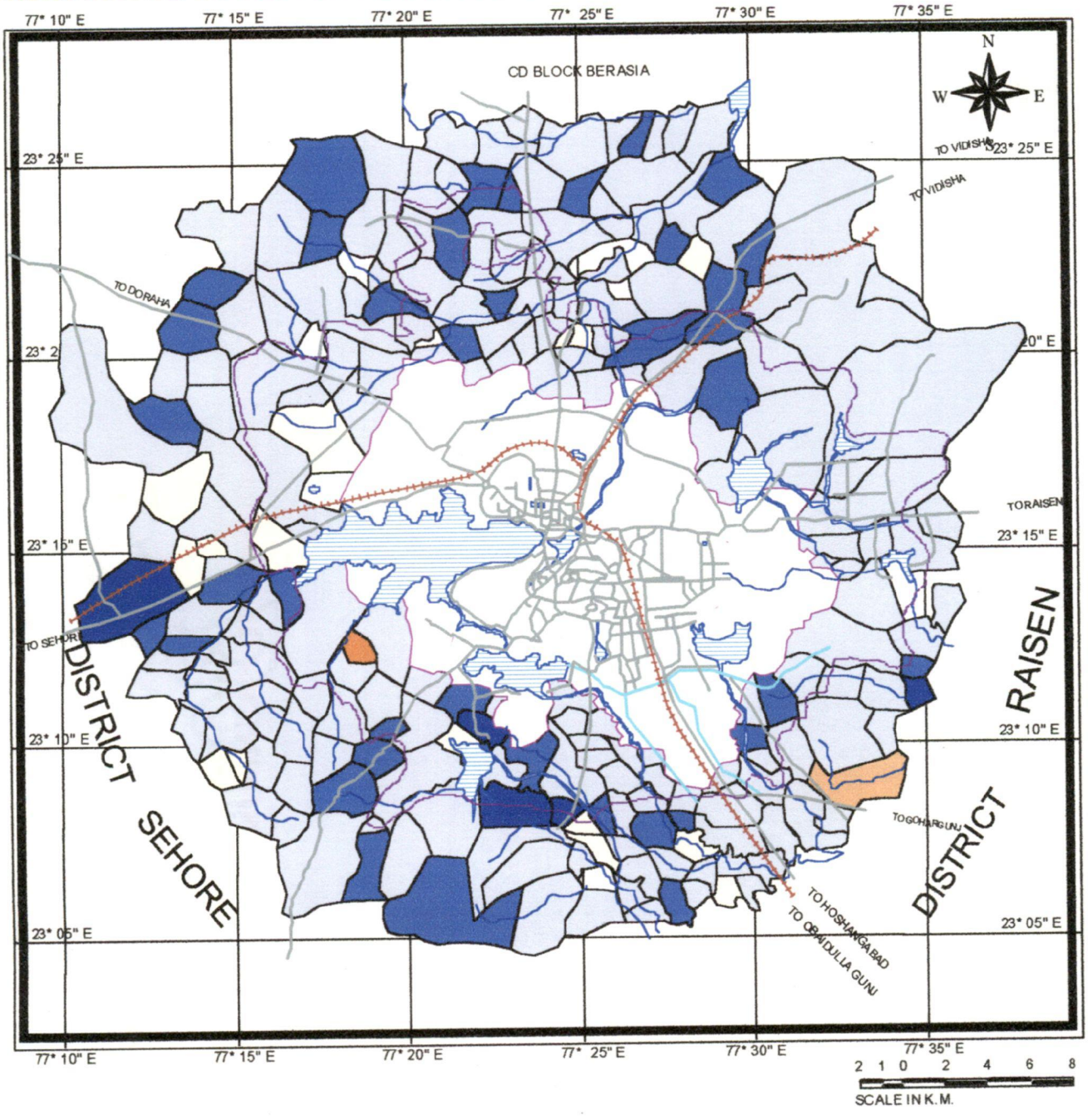
LEGEND

- BDA limit
- Roads
- Rail network
- Rivers and streems
- Canal
- Lakes & reservoirs
- Municipal area
- Municipal / Urban area limit

Village population 2001

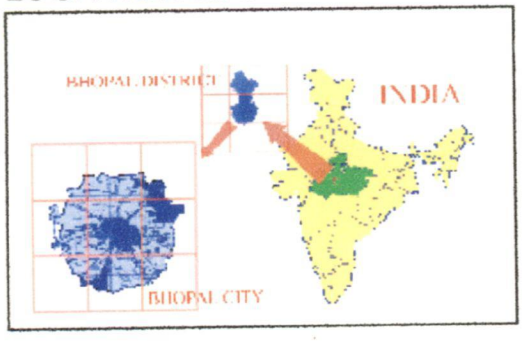
- 0 - 500
- 500 - 1000
- 1000 - 5000
- 5000 - 10000

ALTERNATIVE MODEL FOR PERI URBAN DEVELOPMENT OF BHOPAL



MAP 6: Sex ratio (no of females per ' 000 male population) 1991 Census of India

LOCATION MAP



DATA SOURCES
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MAP SOURCE:
DISTRICT CENSUS HANDBOOK 1991
BHOPAL DEVELOPMENT PLAN 2005
SOI TOPOSHEETS 1:50,000 SCALE
MUNICIPAL CORPORATION WARD MAP

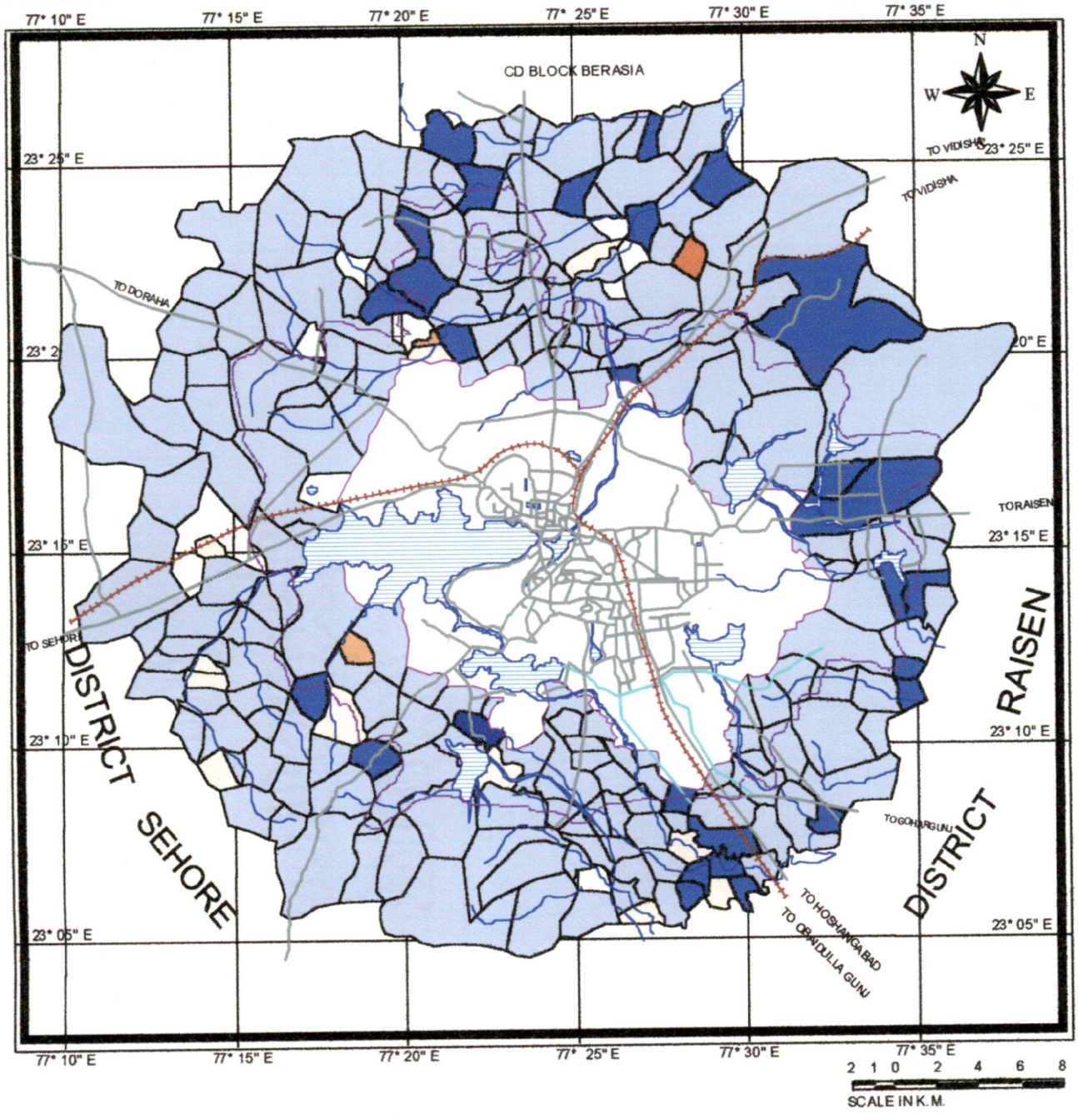
LEGEND

- BDA limit
- Roads
- Rail network
- Rivers and streems
- Canal
- Lakes & reservoirs
- Municipal area
- Municipal / Urban area limit

Sex ratio 1991 (no of female per male)

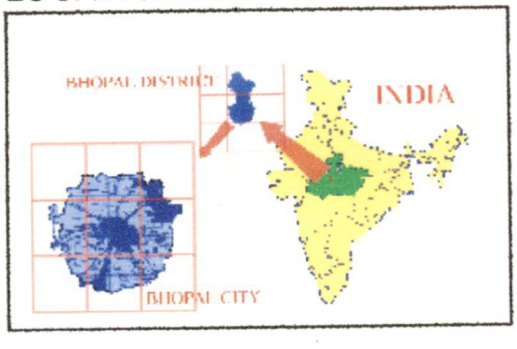
- 0 - 0.5
- 0.5 - 0.8
- 0.8 - 0.99
- 1 - 1.2
- 1.2 - 1.5
- 1.5 - 2

ALTERNATIVE MODEL FOR PERI URBAN DEVELOPMENT OF BHOPAL



MAP 7: Sex ratio (no of females per ' 000 male population) 2001 Census of India

LOCATION MAP



DATA SOURCES
CENSUS OF INDIA 1991, 2001
MAP SOURCE:
DISTRICT CENSUS HANDBOOK 1991
BHOPAL DEVELOPMENT PLAN 2005
SOI TOPOSHEETS 1:50,000 SCALE
MUNICIPAL CORPORATION WARD MAP

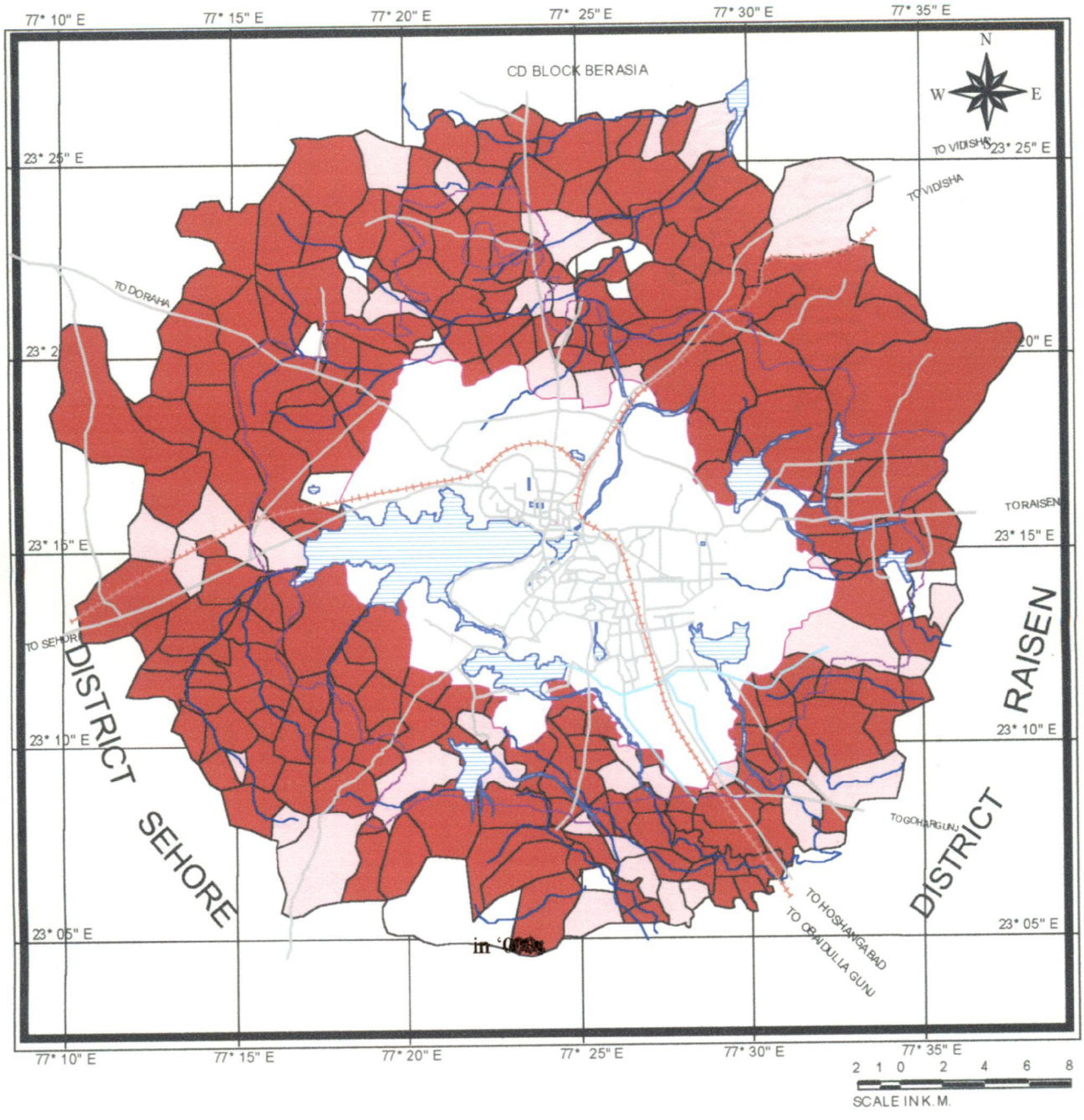
LEGEND

- BDA limit
- Roads
- Rail network
- Rivers and streems
- Canal
- Lakes & reservoirs
- Municipal area
- Municipal / Urban area limit

Sex ratio 2001(no of female per male)

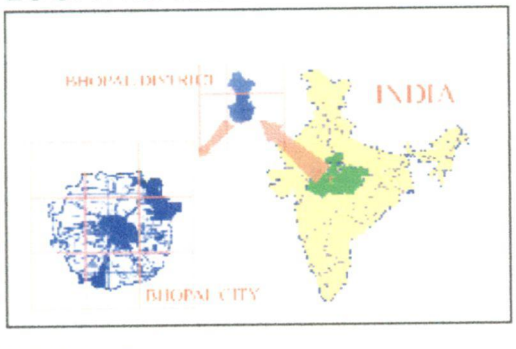
- 0 - 0.5
- 0.5 - 0.8
- 0.8 - 0.99
- 1 - 1.2
- 1.2 - 1.5
- 1.5 - 2

ALTERNATIVE MODEL FOR PERI URBAN DEVELOPMENT OF BHOPAL



MAP 9: Ratio of male working population to total male population in 1991 Census of India

LOCATION MAP



LEGEND

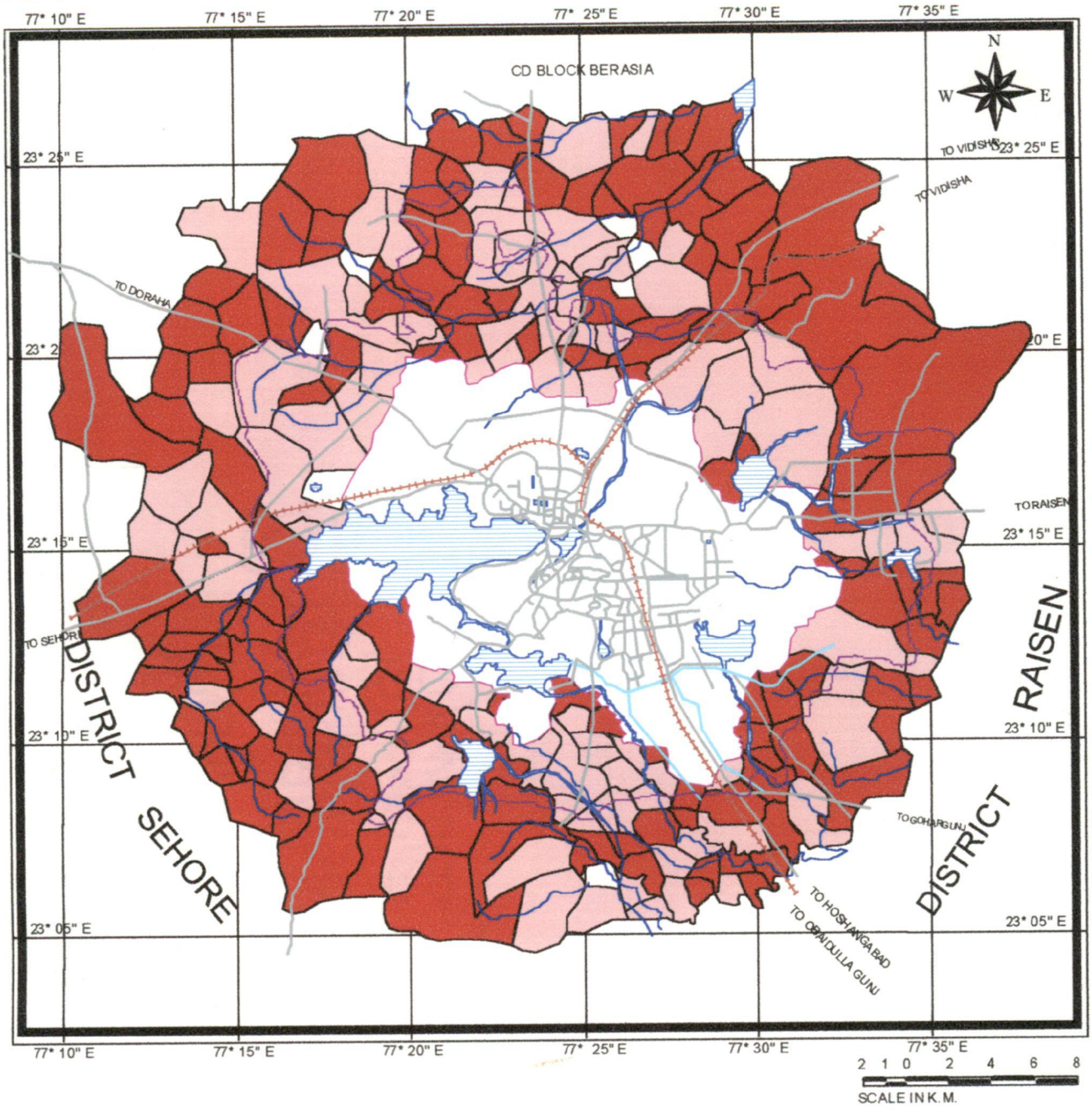
- BDA limit
- Roads
- Rail network
- Rivers and streems
- Canal
- Lakes & reservoirs
- Municipal area
- Municipal / Urban area limit

Ratio male working population to total population 1991

- 0- 10 %
- 10- 25%
- 25- 50%
- 50- 75%

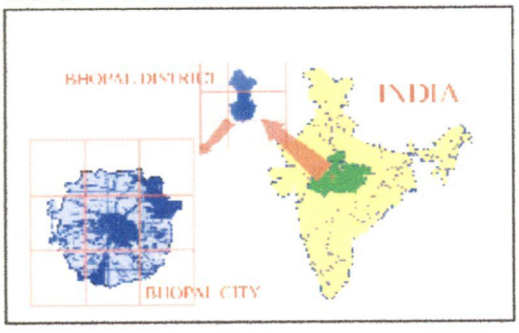
DATA SOURCES
CENSUS OF INDIA 1991, 2001
MAP SOURCE:
DISTRICT CENSUS HANDBOOK 1991
BHOPAL DEVELOPMENT PLAN 2005
SOI TOPOSHEETS 1:50,000 SCALE
MUNICIPAL CORPORATION WARD MAP

ALTERNATIVE MODEL FOR PERI URBAN DEVELOPMENT OF BHOPAL



MAP 9: Ratio of male working population to total male population in 2001 Census of India

LOCATION MAP



DATA SOURCES
CENSUS OF INDIA 1991, 2001
MAP SOURCE:
DISTRICT CENSUS HANDBOOK 1991
BHOPAL DEVELOPMENT PLAN 2005
SOI TOPOSHEETS 1:50,000 SCALE
MUNICIPAL CORPORATION WARD MAP

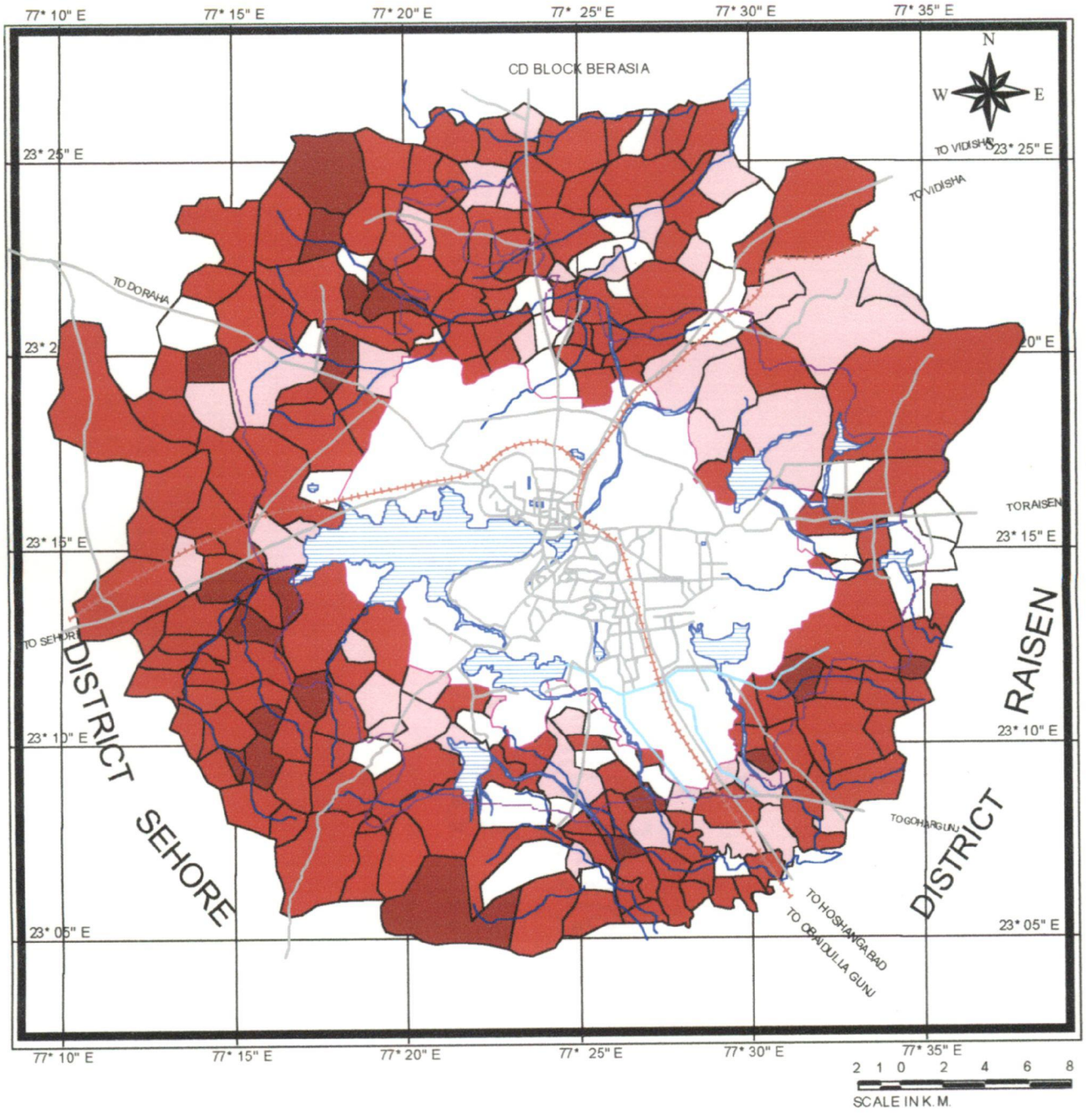
LEGEND

- BDA limit
- Roads
- Rail network
- Rivers and streems
- Canal
- Lakes & reservoirs
- Municipal area
- Municipal / Urban area limit

Ratio male working population to total population 2001

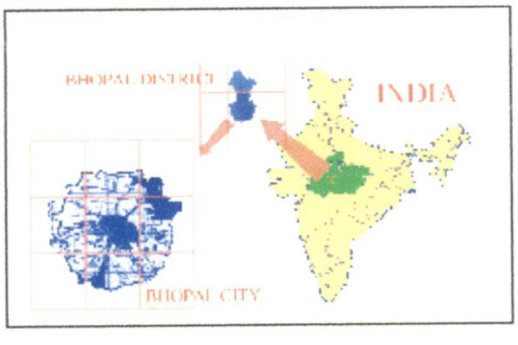
- 0- 10 %
- 10- 25%
- 25- 50%
- 50- 75%

ALTERNATIVE MODEL FOR PERI URBAN DEVELOPMENT OF BHOPAL



MAP10: Ratio of male cultivators to total male population in 1991 Census of India

LOCATION MAP



DATA SOURCES
CENSUS OF INDIA 1991, 2001
MAP SOURCE:
DISTRICT CENSUS HANDBOOK 1991
BHOPAL DEVELOPMENT PLAN 2005
SOI TOPOSHEETS 1:50,000 SCALE
MUNICIPAL CORPORATION WARD MAP

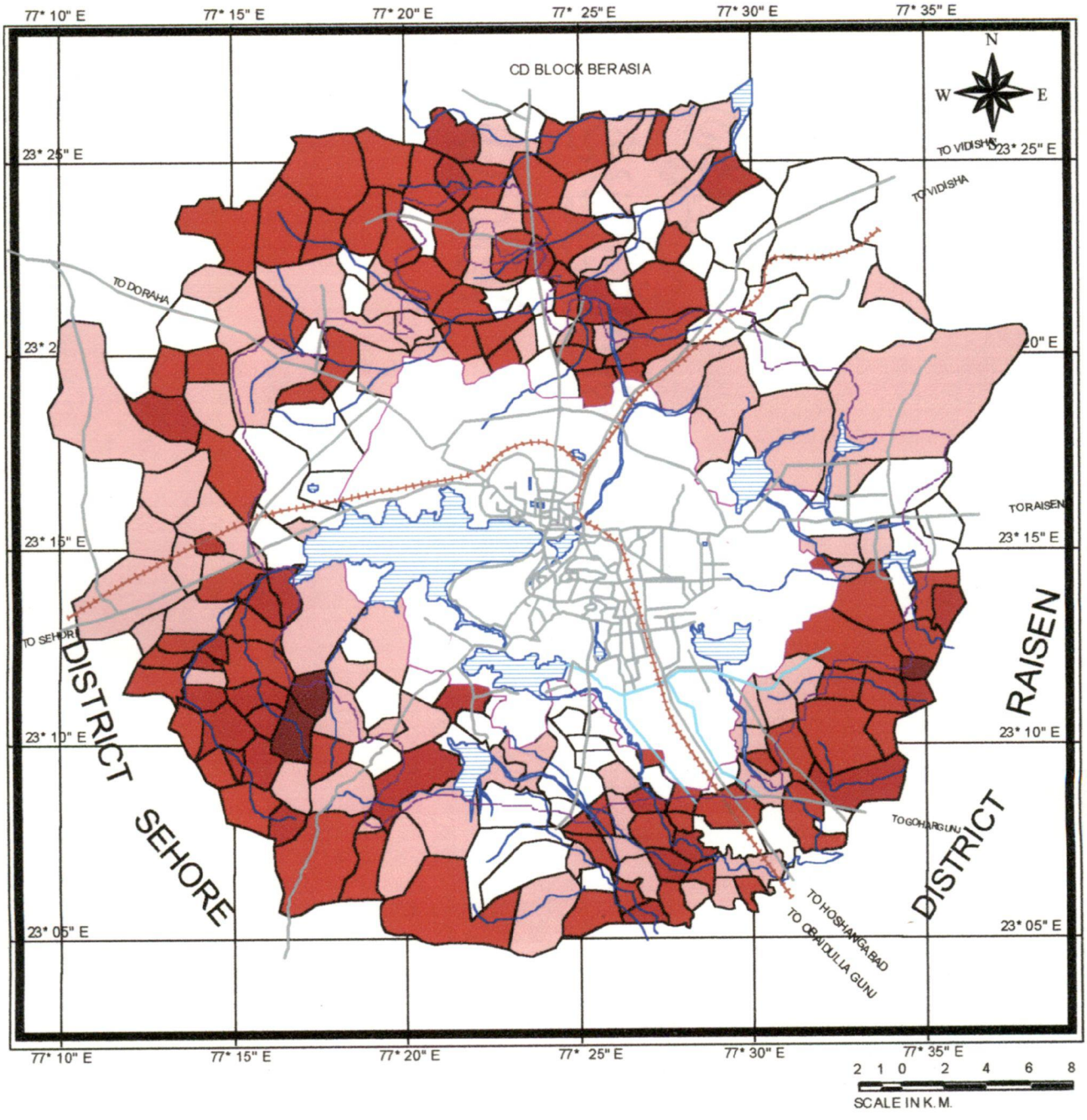
LEGEND

- BDA limit
- Roads
- Rail network
- Rivers and streems
- Canal
- Lakes & reservoirs
- Municipal area
- Municipal / Urban area limit

Ratio of male cultivators (IND CAT I) to total male worker 1991

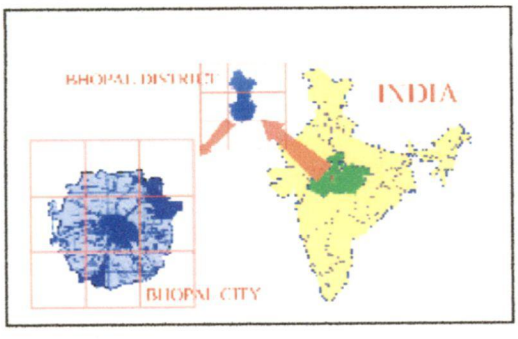
- 0- 20 %
- 20- 40%
- 40- 60%
- 60- 80%

ALTERNATIVE MODEL FOR PERI URBAN DEVELOPMENT OF BHOPAL



MAP11: Ratio of male cultivators to total male population in 2001 Census of India

LOCATION MAP



DATA SOURCES
CENSUS OF INDIA 1991, 2001
MAP SOURCE:
DISTRICT CENSUS HANDBOOK 1991
BHOPAL DEVELOPMENT PLAN 2005
SOI TOPOSHEETS 1:50,000 SCALE
MUNICIPAL CORPORATION WARD MAP

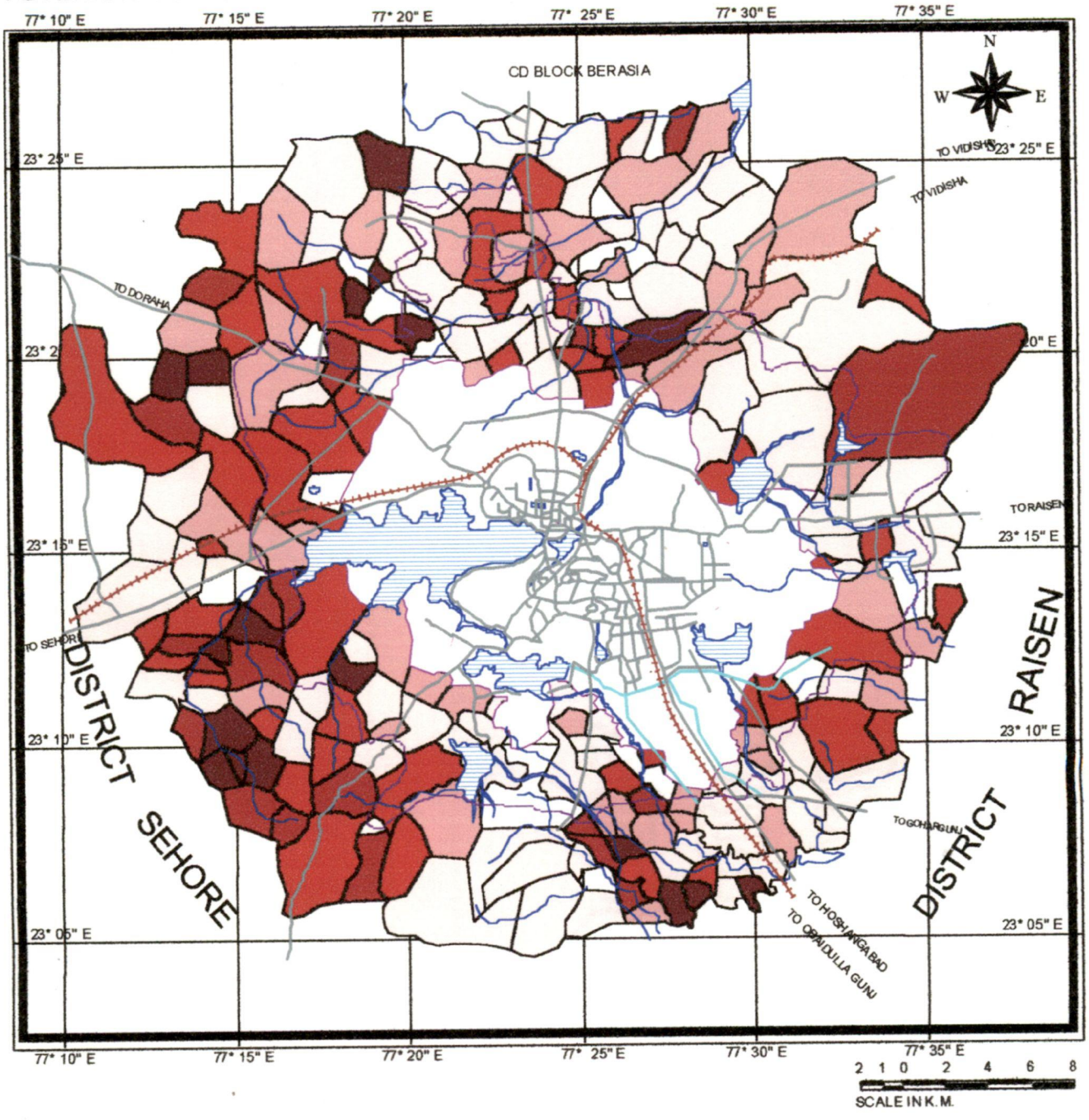
LEGEND

- BDA limit
- Roads
- Rail network
- Rivers and streems
- Canal
- Lakes & reservoirs
- Municipal area
- Municipal / Urban area limit

Ratio of male cultivators (IND CAT I) to total male worker 2001

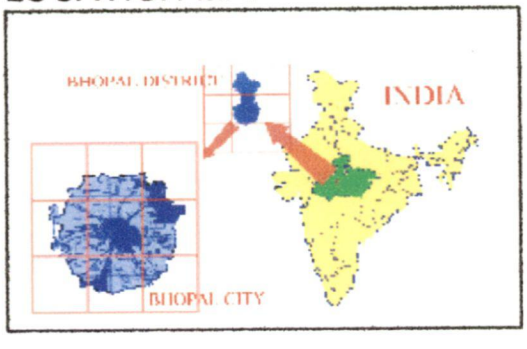
- 0- 20 %
- 20- 40%
- 40- 60%
- 60- 80%

ALTERNATIVE MODEL FOR PERI URBAN DEVELOPMENT OF BHOPAL



MAP12: Ratio of female cultivators to total female population in 1991 Census of India

LOCATION MAP



DATA SOURCES
CENSUS OF INDIA 1991, 2001
MAP SOURCE:
DISTRICT CENSUS HANDBOOK 1991
BHOPAL DEVELOPMENT PLAN 2005
SOI TOPOSHEETS 1:50,000 SCALE
MUNICIPAL CORPORATION WARD MAP

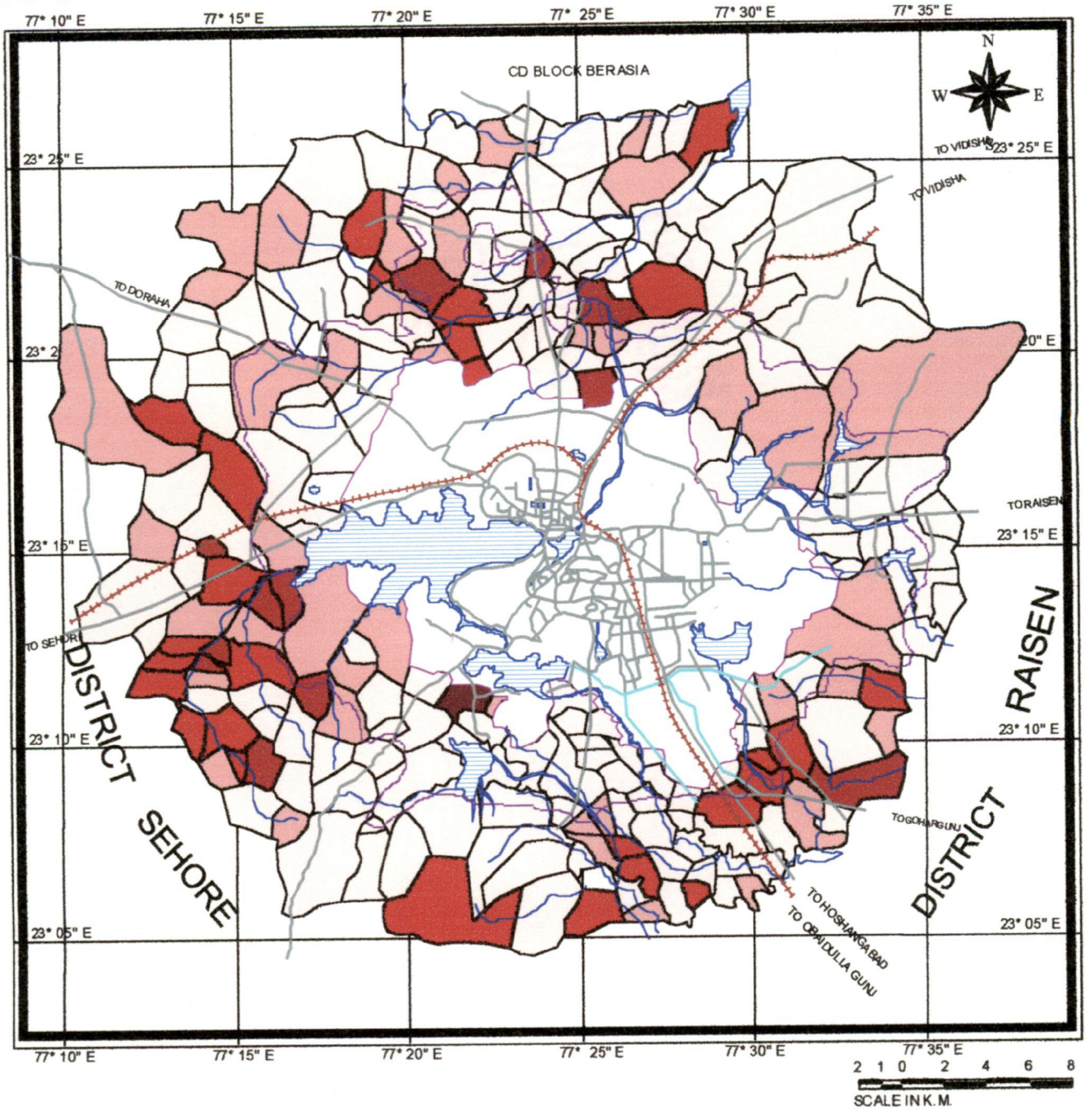
LEGEND

- BDA limit
- Roads
- Rail network
- Rivers and streems
- Canal
- Lakes & reservoirs
- Municipal area
- Municipal / Urban area limit

Ratio of female cultivators (IND CAT I) to total female worker 1991

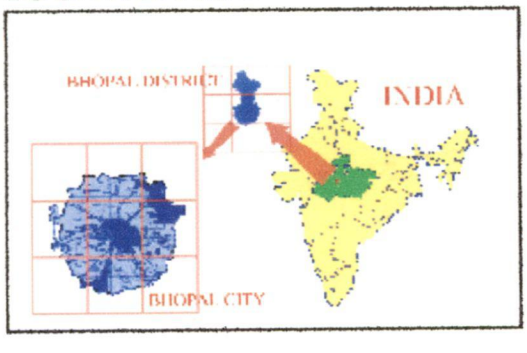
- 0- 20 %
- 20- 40%
- 40- 60%
- 60- 80%

ALTERNATIVE MODEL FOR PERI URBAN DEVELOPMENT OF BHOPAL



MAP13: Ratio of female cultivators to total female population in 2001 Census of India

LOCATION MAP



DATA SOURCES
CENSUS OF INDIA 1991, 2001
MAP SOURCE:
DISTRICT CENSUS HANDBOOK 1991
BHOPAL DEVELOPMENT PLAN 2005
SOI TOPOSHEETS 1:50,000 SCALE
MUNICIPAL CORPORATION WARD MAP

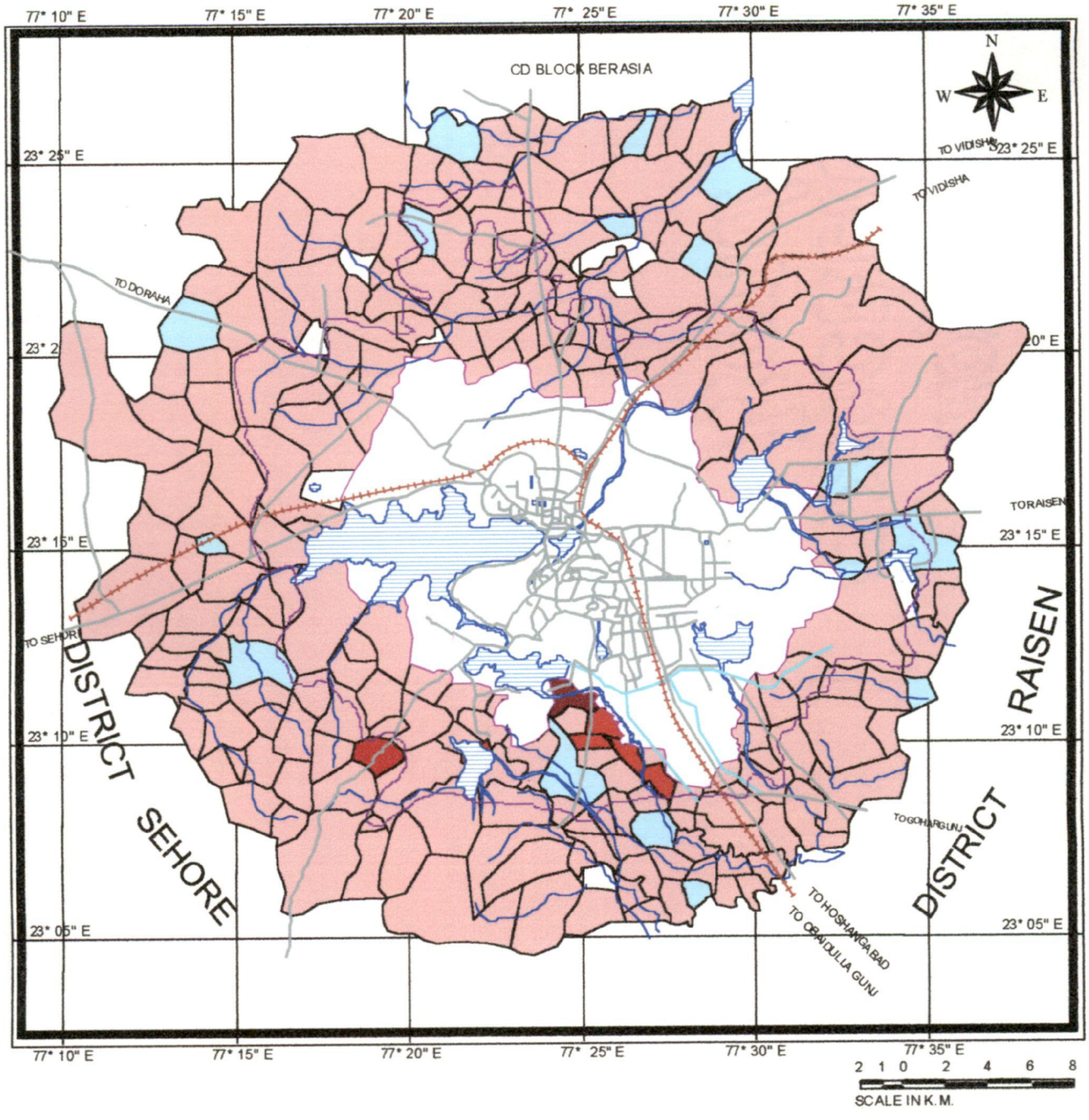
LEGEND

- BDA limit
- Roads
- Rail network
- Rivers and streems
- Canal
- Lakes & reservoirs
- Municipal area
- Municipal / Urban area limit

Ratio of female cultivators (IND CAT I to total female worker 2001

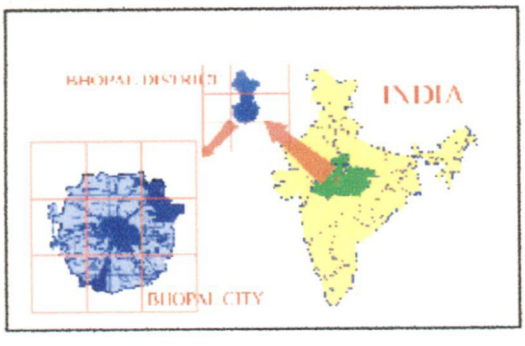
- 0- 20 %
- 20- 40%
- 40- 60%
- 60- 80%

ALTERNATIVE MODEL FOR PERI URBAN DEVELOPMENT OF BHOPAL



MAP14: Population growth from 1991 to 2001

LOCATION MAP



DATA SOURCES
CENSUS OF INDIA 1991, 2001
MAP SOURCE:
DISTRICT CENSUS HANDBOOK 1991
BHOPAL DEVELOPMENT PLAN 2005
SOI TOPOSHEETS 1:50,000 SCALE
MUNICIPAL CORPORATION WARD MAP

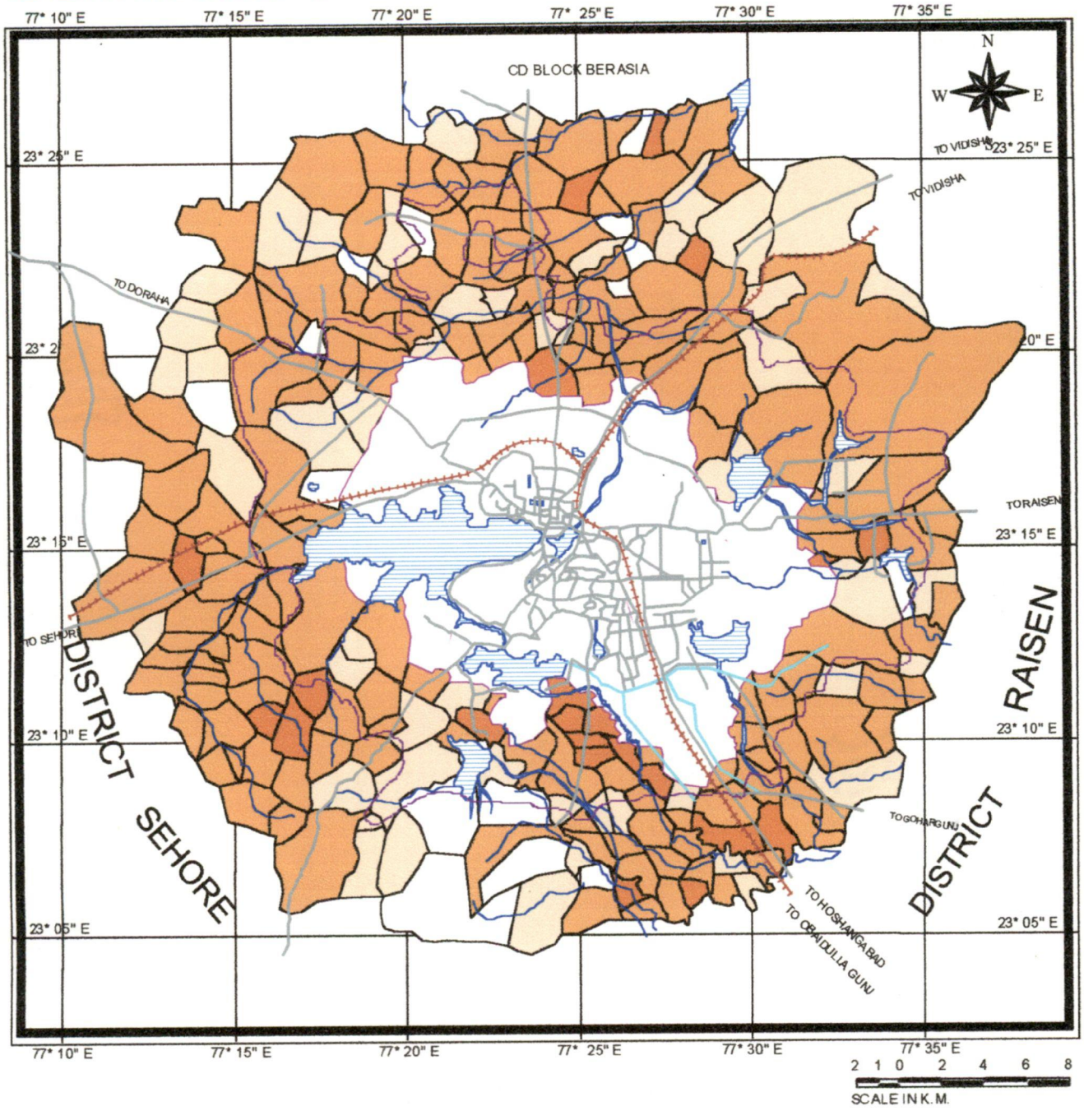
LEGEND

- BDA limit
- Roads
- Rail network
- Rivers and streems
- Canal
- Lakes & reservoirs
- Municipal area
- Municipal / Urban area limit

Populaiton growth from 1991 to 200

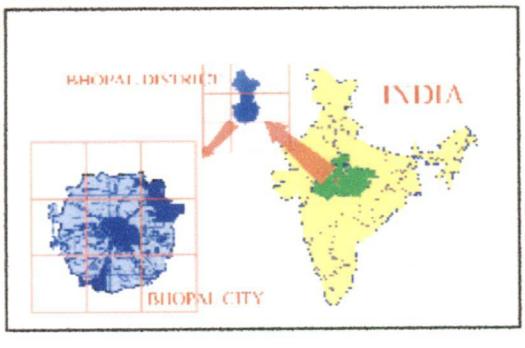
- Negative
- 1 - 10
- 10 - 50

ALTERNATIVE MODEL FOR PERI URBAN DEVELOPMENT OF BHOPAL



MAP15: Percentage of literate population 2001 Census of India

LOCATION MAP



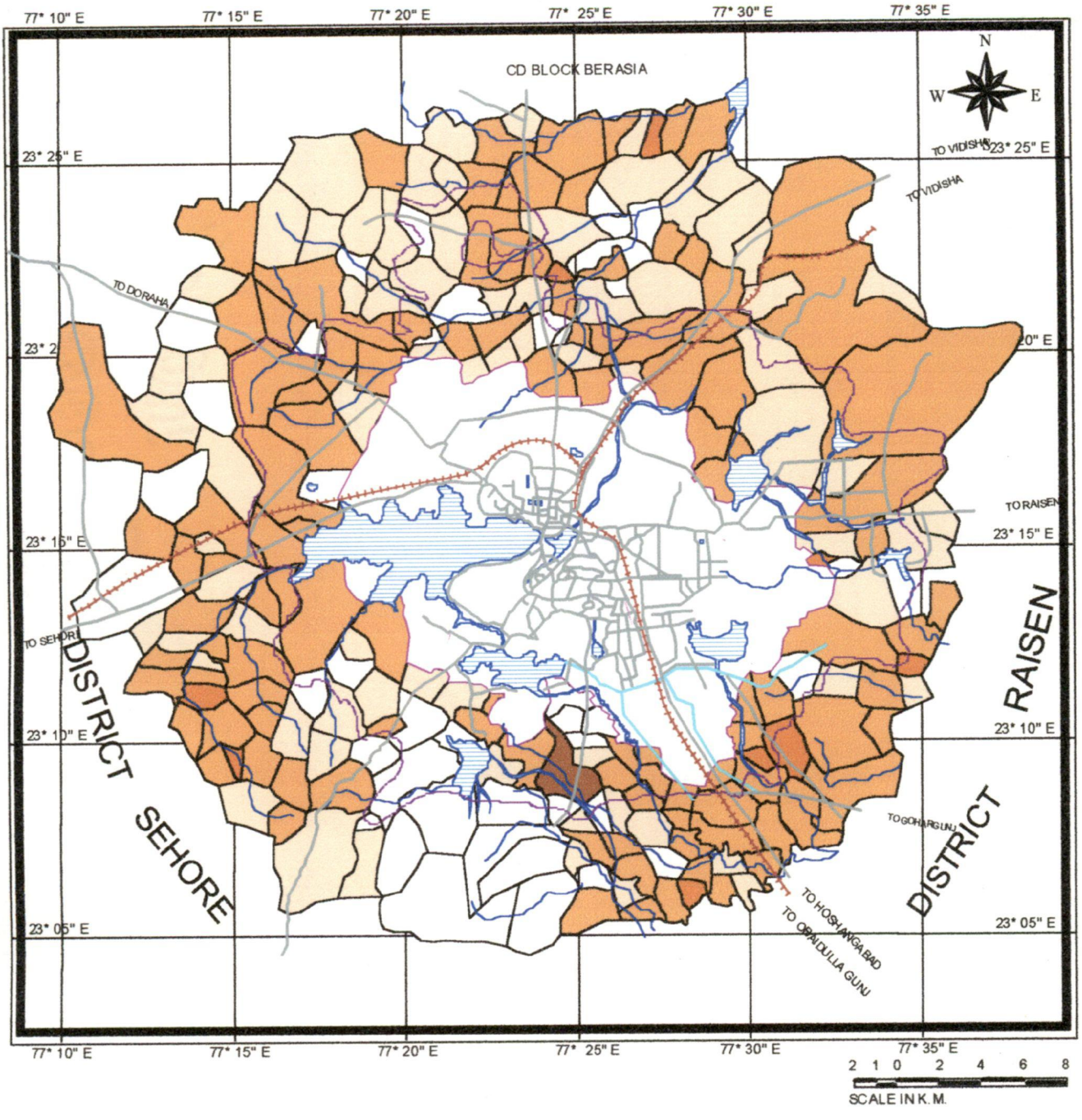
DATA SOURCES
CENSUS OF INDIA 1991, 2001
MAP SOURCE:
DISTRICT CENSUS HANDBOOK 1991
BHOPAL DEVELOPMENT PLAN 2005
SOI TOPOSHEETS 1:50,000 SCALE
MUNICIPAL CORPORATION WARD MAP

LEGEND

BDA limitBda boundary.shp
RoadsHighways.shp
Rail networkRailnetwork.shp
Rivers and streemsRiver stream.shp
CanalCanal.shp
Lakes & reservoirsWaterbody.shp
Municipal areaWards.shp
Municipal / Urban area limitWards.shp

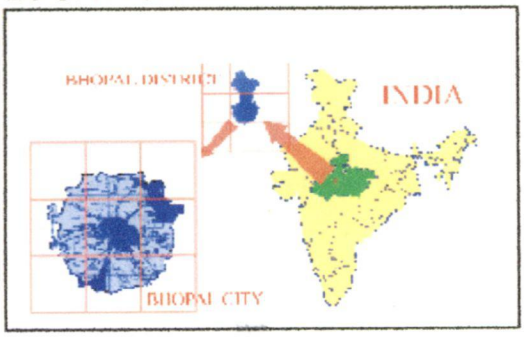
Percent of literate population 2001
LESS THAN 20 %
20%- 40%
40%- 60%
60%- 80%
80%-100%

ALTERNATIVE MODEL FOR PERI URBAN DEVELOPMENT OF BHOPAL



MAP16: Percentage of literate male population 1991 Census of India

LOCATION MAP



DATA SOURCES
CENSUS OF INDIA 1991, 2001
MAP SOURCE:
DISTRICT CENSUS HANDBOOK 1991
BHOPAL DEVELOPMENT PLAN 2005
SOI TOPOSHEETS 1:50,000 SCALE
MUNICIPAL CORPORATION WARD MAP

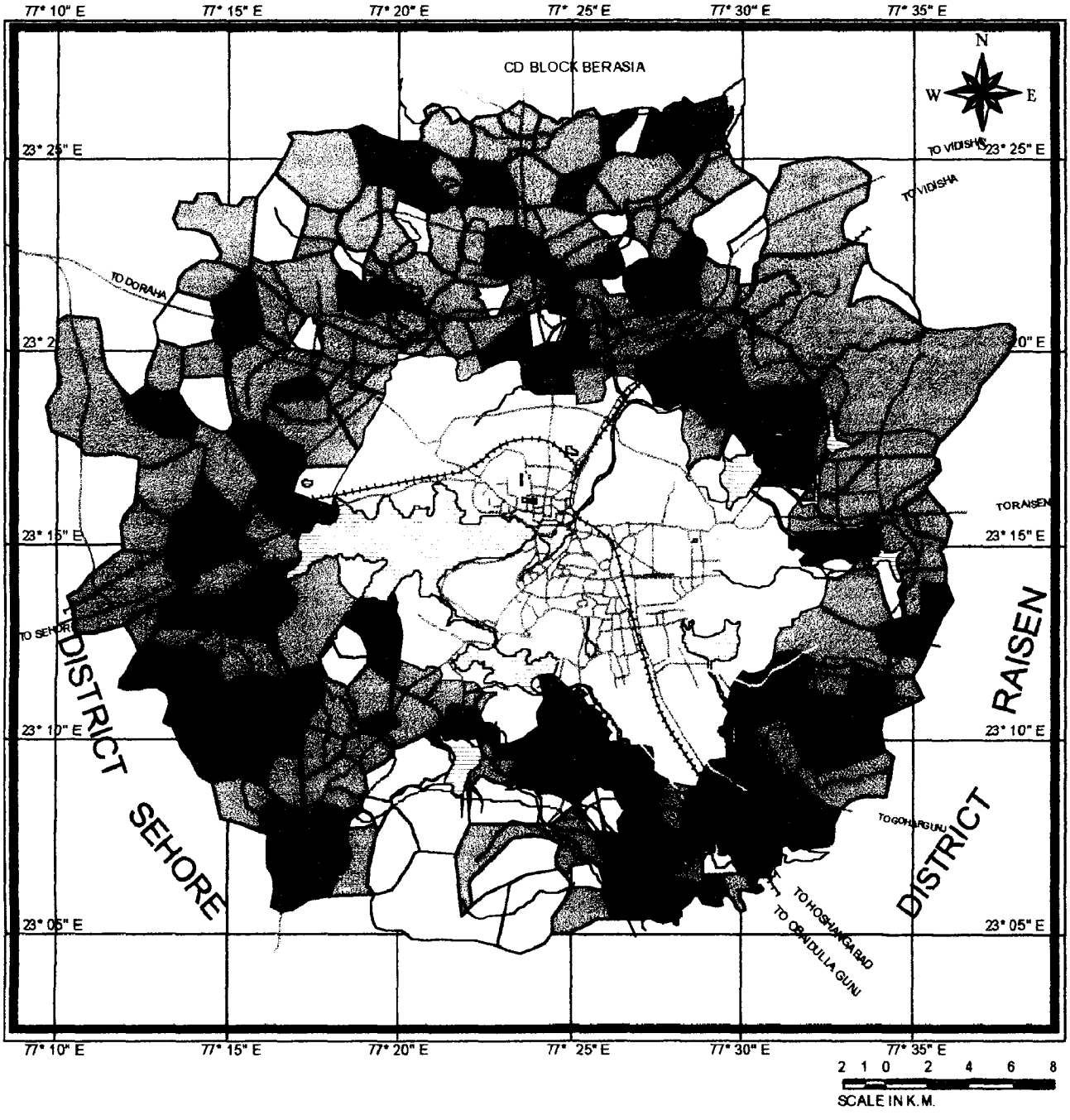
LEGEND

- BDA limitBda boundary.shp
- RoadsHighways.shp
- Rail networkRailnetwork.shp
- Rivers and streemsRiver stream.shp
- CanalCanal.shp
- Lakes & reservoirsWaterbody.shp
- Municipal areaWards.shp
- Municipal / Urban area limitWards.shp

Percent of literate male population 1991

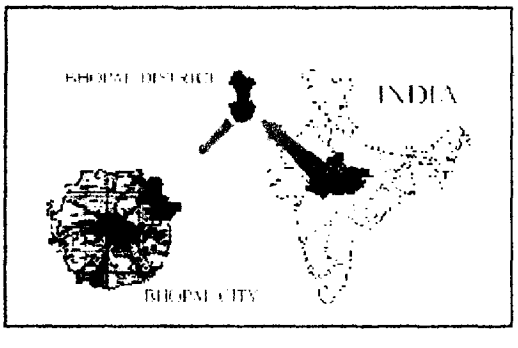
- LESS THAN 20 %
- 20%- 40%
- 40%- 60%
- 60%- 80%
- 80%-100%

ALTERNATIVE MODEL FOR PERI URBAN DEVELOPMENT OF BHOPAL



MAP17: Percentage of literate male population 2001 Census of India

LOCATION MAP



DATA SOURCES
CENSUS OF INDIA 1991, 2001
MAP SOURCE:
DISTRICT CENSUS HANDBOOK 1991
BHOPAL DEVELOPMENT PLAN 2005
SOI TOPOSHEETS 1:50,000 SCALE

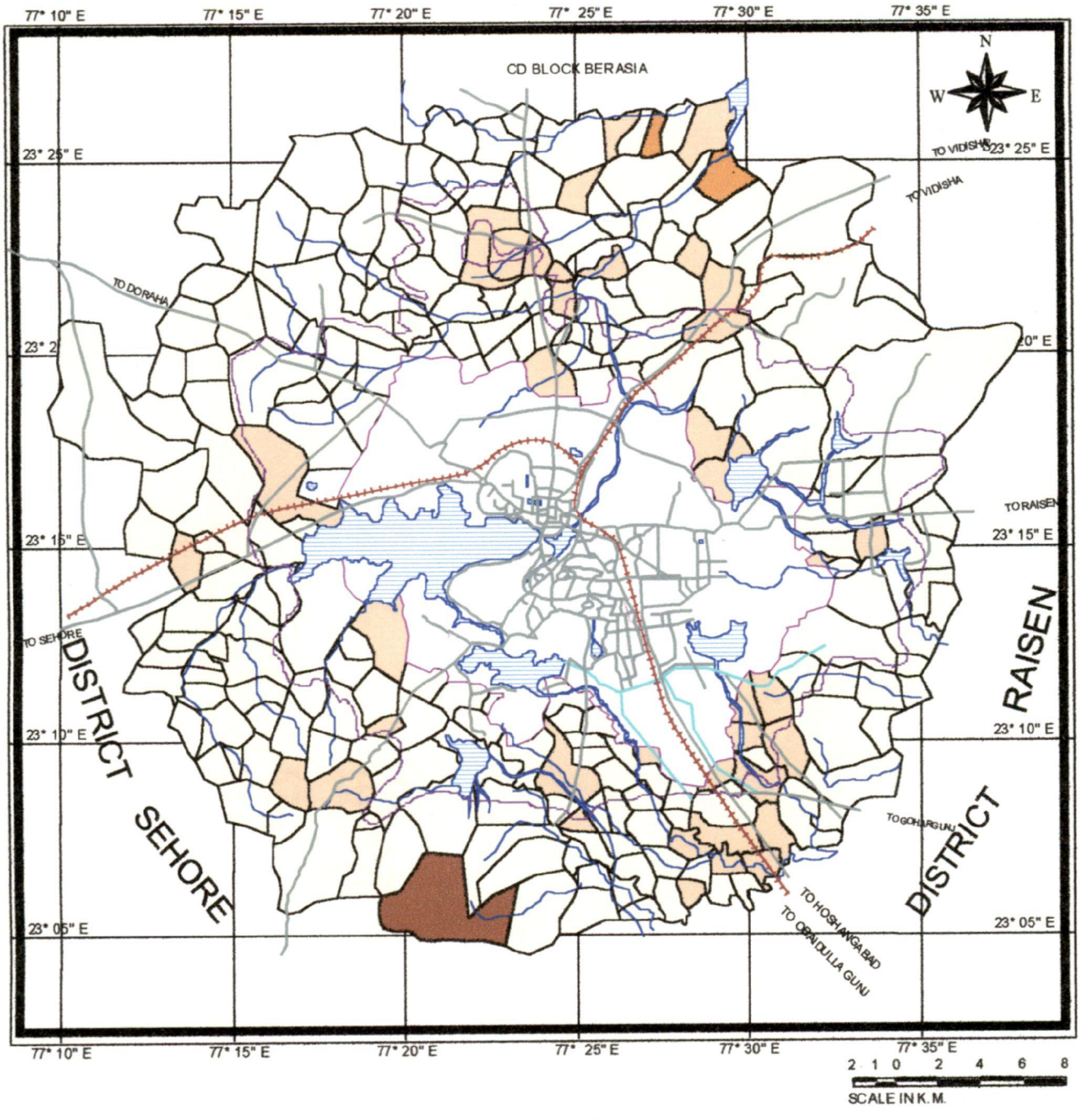
LEGEND

- BDA limitBda boundary.shp
- RoadsHighways.shp
- Rail networkRailnetwork.shp
- Rivers and streemsRiver stream.shp
- CanalCanal.shp
- Lakes & reservoirsWaterbody.shp
- Municipal areaWards.shp
- Municipal / Urban area limitWards.shp

Percent of literate male population 2001

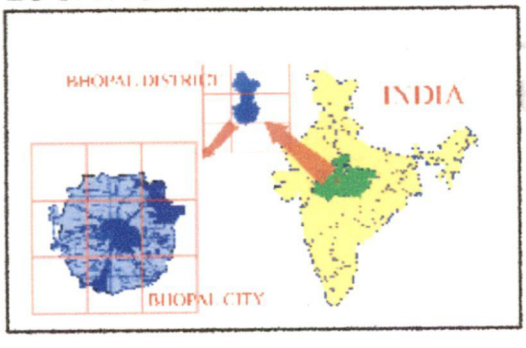
- LESS THAN 20 %
- 20%- 40%
- 40%- 60%
- 60%- 80%
- 80%-100%

ALTERNATIVE MODEL FOR PERI URBAN DEVELOPMENT OF BHOPAL



MAP18: Percentage of literate female population 1991 Census of India

LOCATION MAP



DATA SOURCES
CENSUS OF INDIA 1991, 2001
MAP SOURCE:
DISTRICT CENSUS HANDBOOK 1991
BHOPAL DEVELOPMENT PLAN 2005
SOI TOPOSHEETS 1:50,000 SCALE
MUNICIPAL CORPORATION WARD MAP

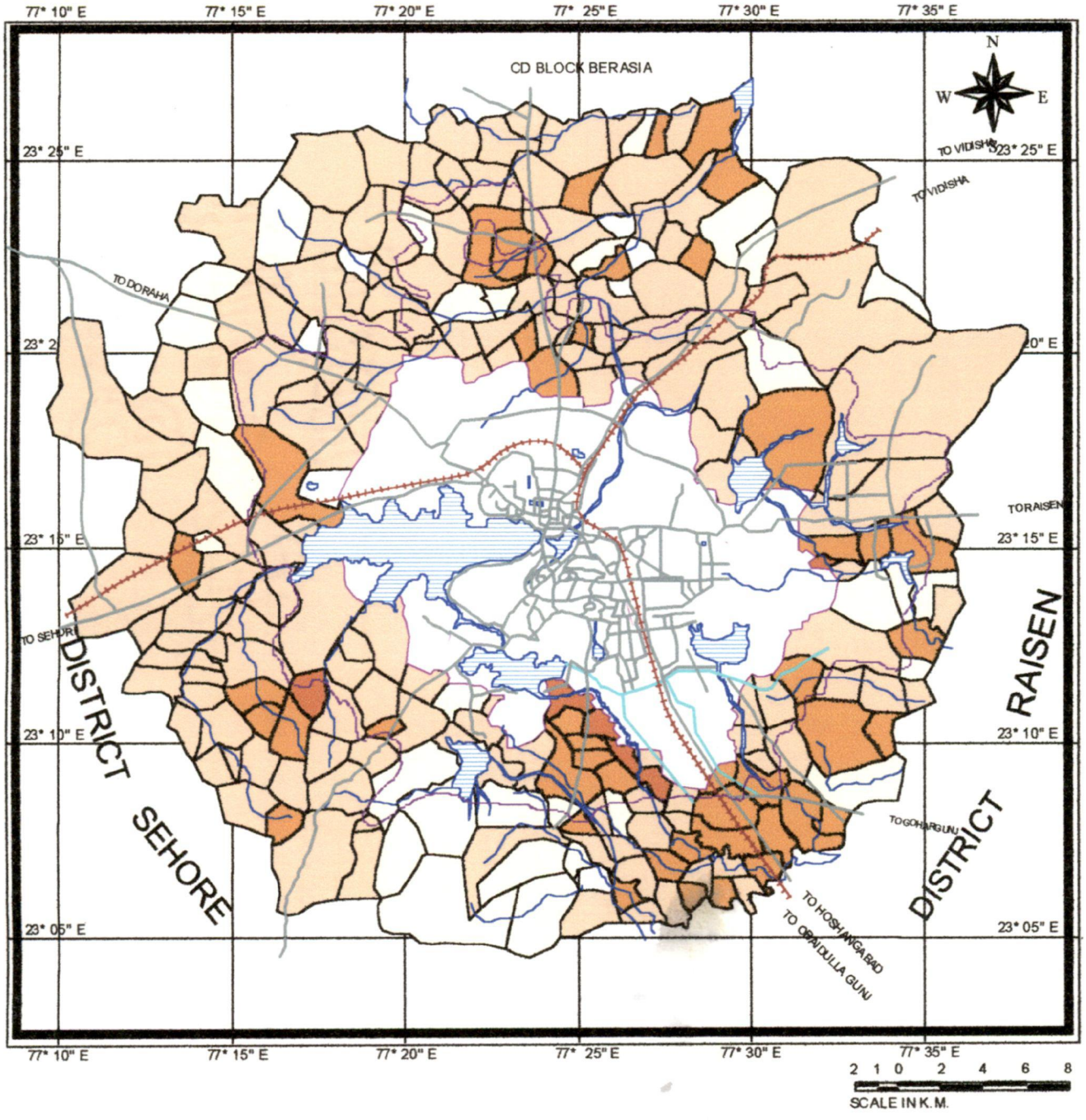
LEGEND

BDA limitBda boundary.shp
RoadsHighways.shp
Rail networkRailnetwork.shp
Rivers and streemsRiver stream.shp
CanalCanal.shp
Lakes & reservoirsWaterbody.shp
Municipal areaWards.shp
Municipal / Urban area limitWards.shp

Percent of literate female population 1991

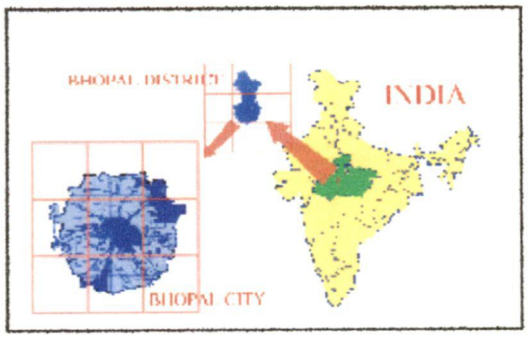
- LESS THAN 20 %
- 20%- 40%
- 40%- 60%
- 60%- 80%
- 80%-100%

ALTERNATIVE MODEL FOR PERI URBAN DEVELOPMENT OF BHOPAL



MAP19: Percentage of literate female population 2001 Census of India

LOCATION MAP



DATA SOURCES
CENSUS OF INDIA 1991, 2001
MAP SOURCE:
DISTRICT CENSUS HANDBOOK 1991
BHOPAL DEVELOPMENT PLAN 2005
SOI TOPOSHEETS 1:50,000 SCALE
MUNICIPAL CORPORATION WARD MAP

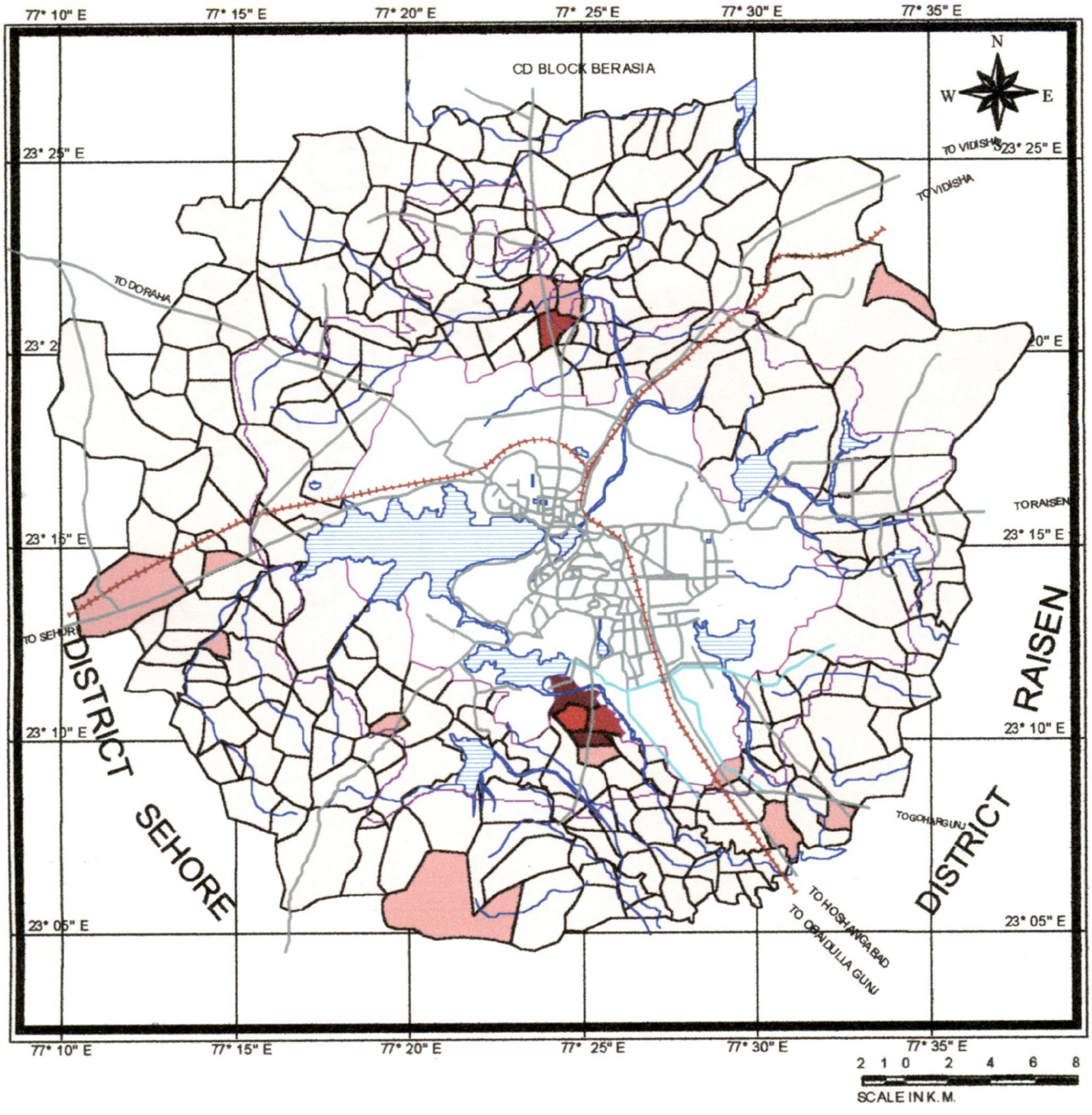
LEGEND

BDA limitBda boundary.shp
RoadsHighways.shp
Rail networkRailnetwork.shp
Rivers and streemsRiver stream.shp
CanalCanal.shp
Lakes & reservoirsWaterbody.shp
Municipal areaWards.shp
Municipal / Urban area limitWards.shp

Percent of literate female population 2001

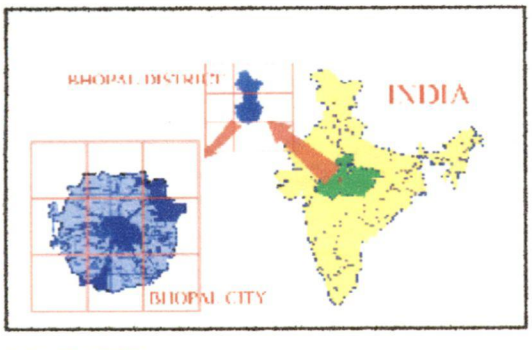
LESS THAN 20 %
20%- 40%
40%- 60%
60%- 80%
80%-100%

ALTERNATIVE MODEL FOR PERI URBAN DEVELOPMENT OF BHOPAL



MAP20: Per hectare population density of villages

LOCATION MAP



DATA SOURCES
CENSUS OF INDIA 1991, 2001
MAP SOURCE:
DISTRICT CENSUS HANDBOOK 1991
BHOPAL DEVELOPMENT PLAN 2005
SOI TOPOSHEETS 1:50,000 SCALE
MUNICIPAL CORPORATION WARD MAP

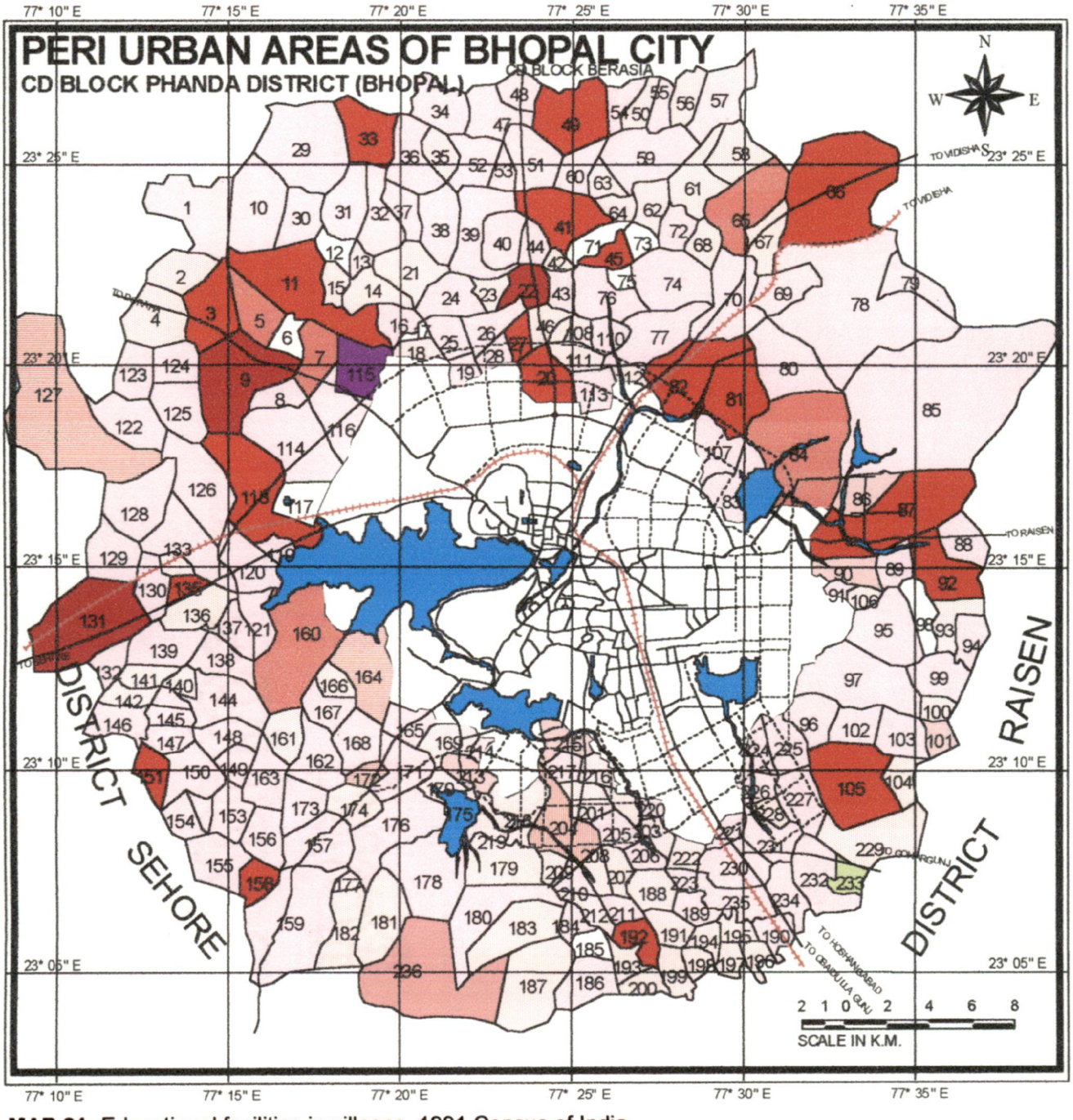
LEGEND

- BDA limit
- Roads
- Rail network
- Rivers and streems
- Canal
- Lakes & reservoirs
- Municipal area
- Municipal / Urban area limit

Per hectare population density 200

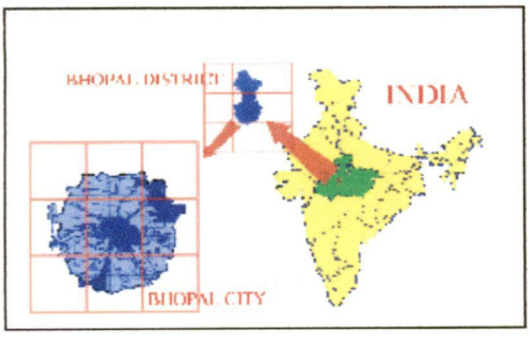
- < 5
- 5 - 10
- 10 - 15

ALTERNATIVE MODEL FOR PERI URBAN DEVELOPMENT OF BHOPAL



MAP 21: Educational facilities in villages 1991 Census of India

LOCATION MAP



DATA SOURCES
CENSUS OF INDIA 1991, 2001
MAP SOURCE:
DISTRICT CENSUS HANDBOOK 1991
BHOPAL DEVELOPMENT PLAN 2005
SOI TOPOSHEETS 1:50,000 SCALE

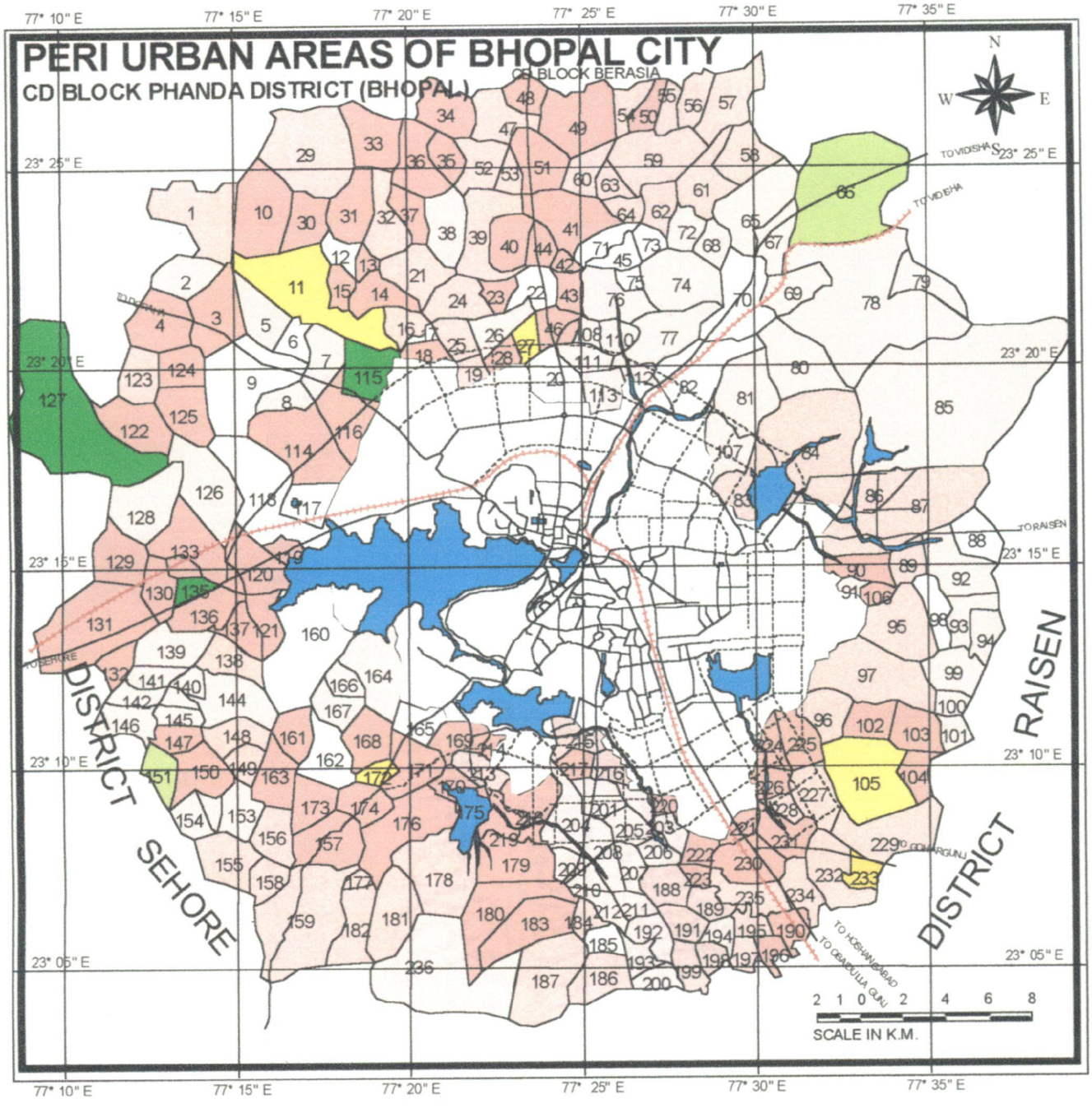
LEGEND

- Proposed highway.shp
- Highways.shp
- Railnetwork.shp
- Waterbody.shp
- Wards.shp

Bhopal_village.shp

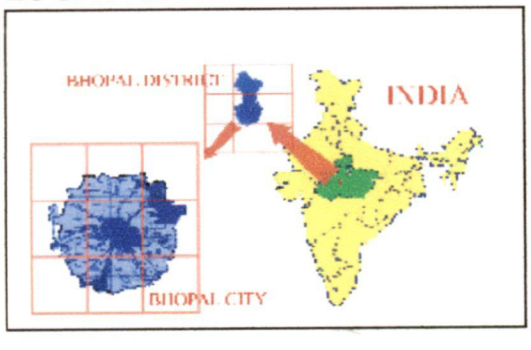
- NO EDUCATIONAL FACILITY
- PRIMARY SCHOOL
- MIDDLE SCHOOL
- HIGHER SEC. SCHOOL
- FACILITY WITHIN 5 K.M
- FACILITY 5-10-KM
- FACILITY MORETHAN 10 M\KM
- PRIMARY + OTHER
- MIDDLE + PUC
- MIDDLE + AC
- MIDDLE + OTHER
- MIDDLE + AC + OTHER

ALTERNATIVE MODEL FOR PERI URBAN DEVELOPMENT OF BHOPAL



MAP22: Health facilities in villages 1991 Census of India

LOCATION MAP



LEGEND

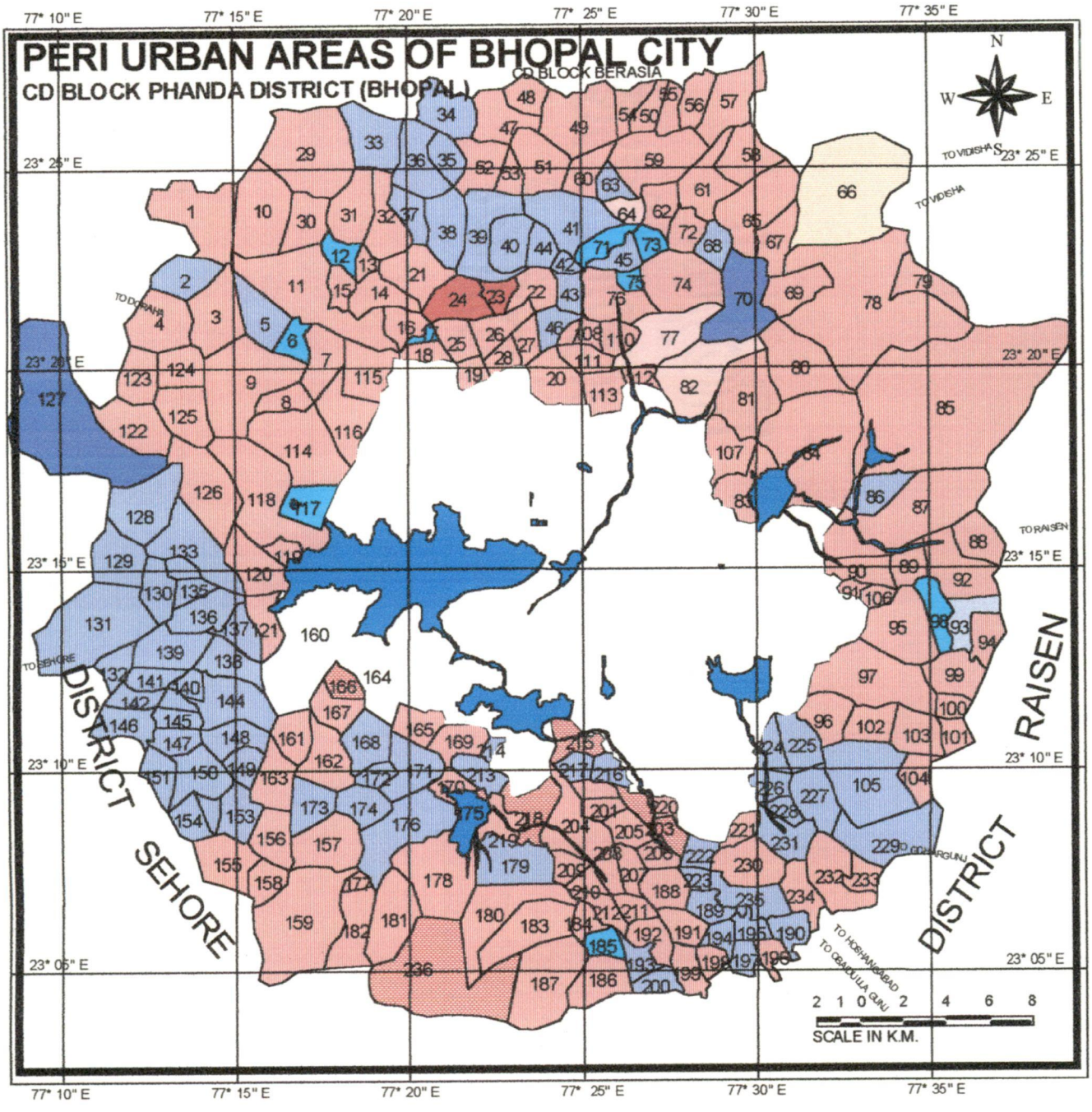
- Proposed highway.shp
- Highways.shp
- Railnetwork.shp
- Waterbody.shp
- Wards.shp

Bhopal_village.shp

- NO HEALTH FACILITY
- RP
- HC
- PHS
- D
- FACILITY WITHIN 5KM
- FACILITY AT 5-10 KM
- FACILITY AT MORE THAN 10KM
- PHC
- PHS+ RP
- D+ RP
- PHC +D

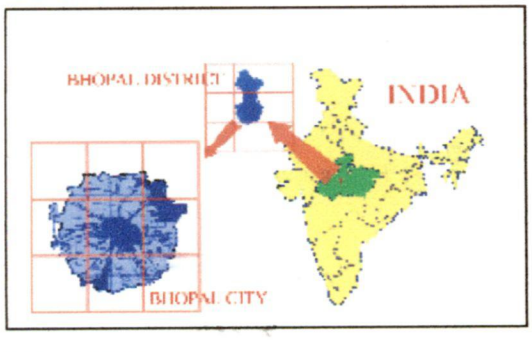
DATA SOURCES
CENSUS OF INDIA 1991, 2001
MAP SOURCE:
DISTRICT CENSUS HANDBOOK 1991
BHOPAL DEVELOPMENT PLAN 2005
SOI TOPOSHEETS 1:50,000 SCALE

ALTERNATIVE MODEL FOR PERI URBAN DEVELOPMENT OF BHOPAL



MAP23: Water supply facilities in villages 1991 Census of India

LOCATION MAP



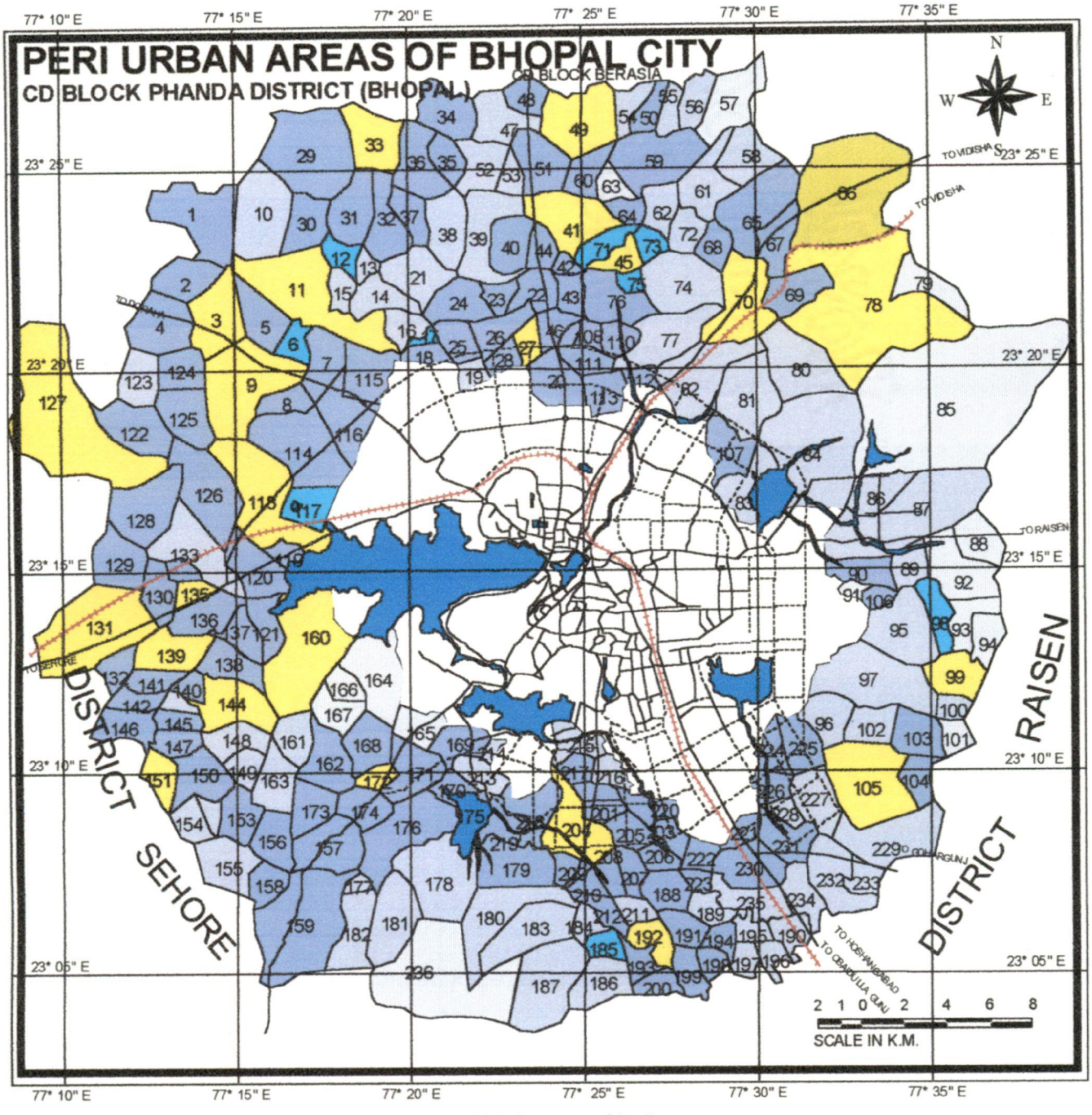
DATA SOURCES
CENSUS OF INDIA 1991, 2001
MAP SOURCE:
DISTRICT CENSUS HANDBOOK 1991
BHOPAL DEVELOPMENT PLAN 2005
SOI TOPOSHEETS 1:50,000 SCALE
MUNICIPAL CORPORATION WARD MAP

LEGEND

- Waterbody.shp
- Wards.shp

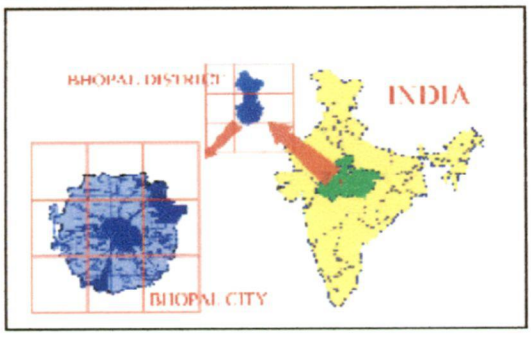
Bhopal_village.shp

- NO FACILITY
- WELL
- HAND PUMP
- WELL HAND PUMP
- WELL AND CANAL
- HAND PUMP AND CANAL
- TUBEWELL AND HAND PUMP
- WELL AND PUMP AND CANAL
- WELL HAND PUMP AND TUBEWELL



MAP24: Post and phone facilities in villages 1991 Census of India

LOCATION MAP



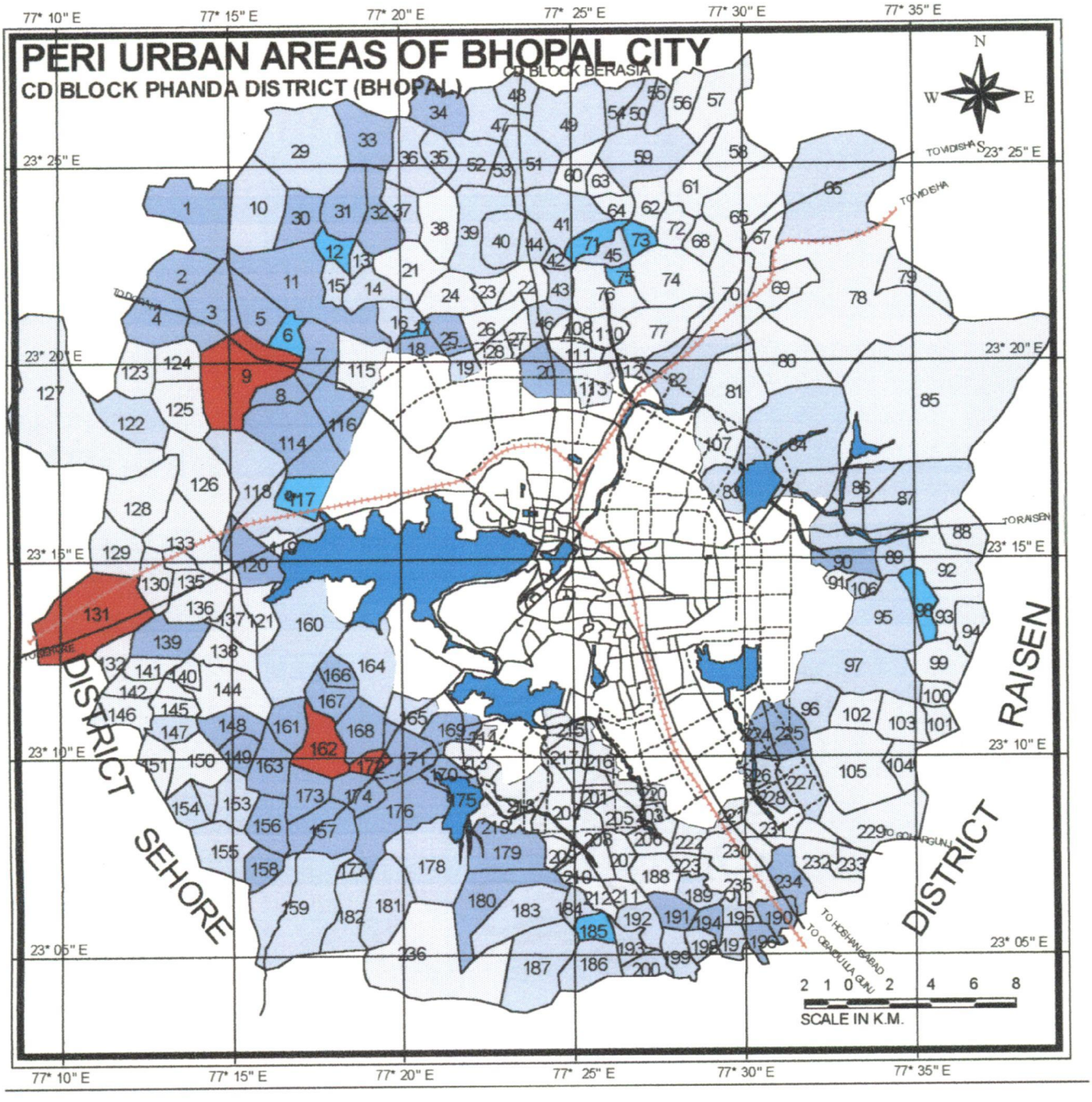
LEGEND

- Proposed highway.shp
- Highways.shp
- Railnetwork.shp
- Waterbody.shp
- Wards.shp

Bhopal_village.shp

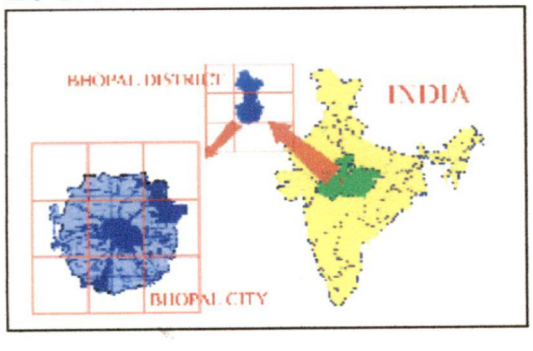
- NO FACILITY
- POST
- FACILITY WITHIN 5KM
- FACILITY FROM 5-10 KM
- FACILITY MORE THAN 10 KM
- POST AND PHONE

DATA SOURCES
CENSUS OF INDIA 1991, 2001
MAP SOURCE:
DISTRICT CENSUS HANDBOOK 1991
BHOPAL DEVELOPMENT PLAN 2005
SOI TOPOSHEETS 1:50,000 SCALE
MUNICIPAL CORPORATION WARD MAP



MAP 25: Weekly market facilities in villages 1991 Census of India

LOCATION MAP



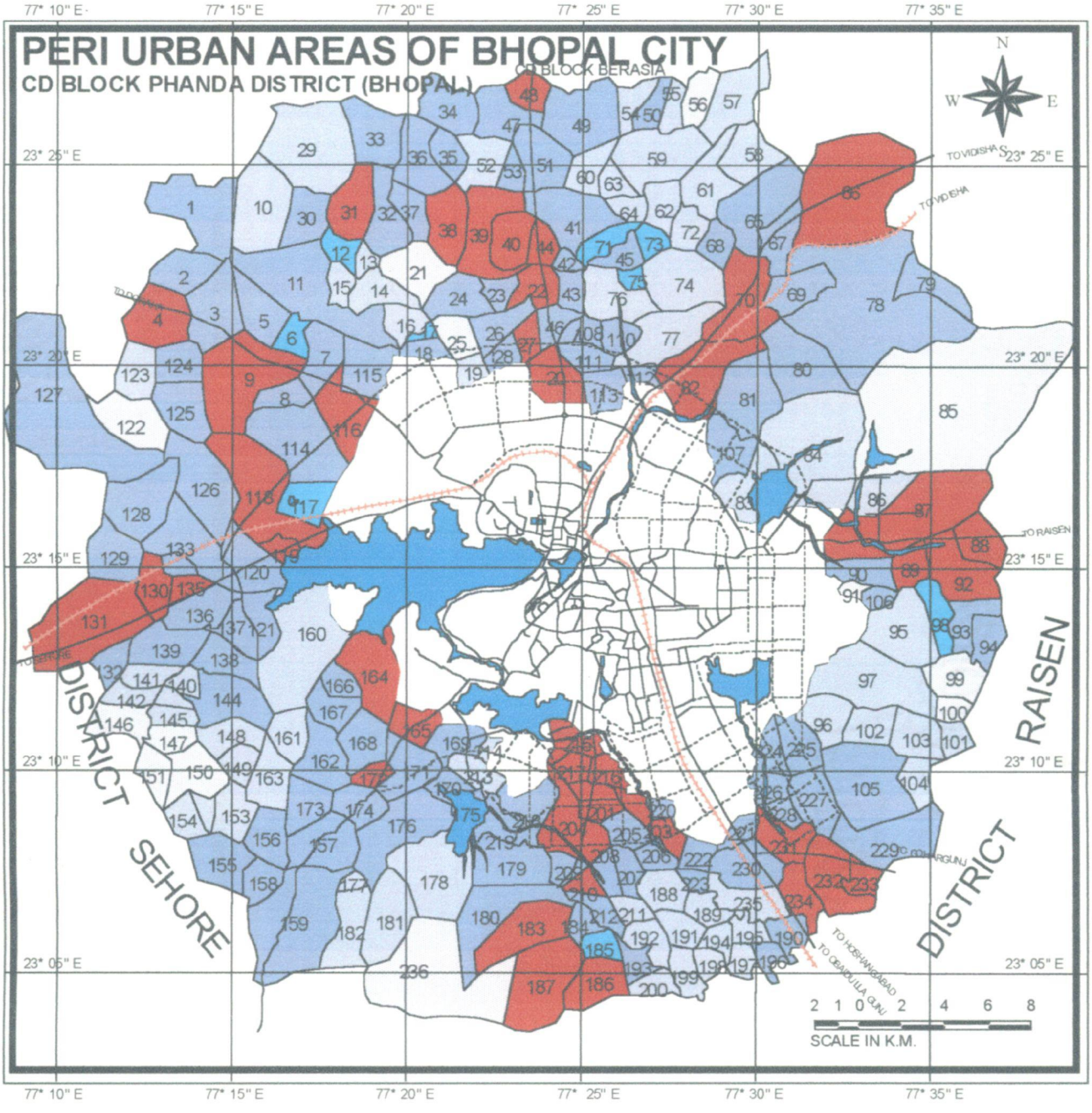
LEGEND

- Proposed highway.shp
- Highways.shp
- Railnetwork.shp
- Waterbody.shp
- Wards.shp

Bhopal_village.shp

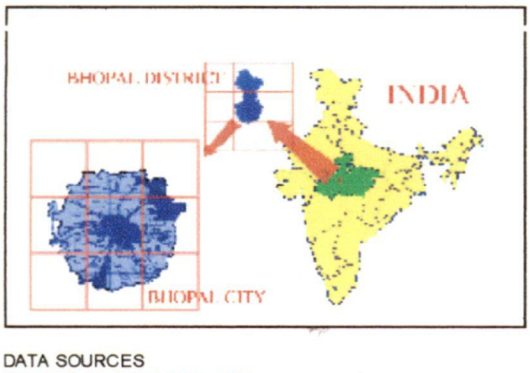
- N.A.
- MONDAY
- FRIDAY
- 0-5KM
- 5-10KM
- >10KM

DATA SOURCES
CENSUS OF INDIA 1991, 2001
MAP SOURCE:
DISTRICT CENSUS HANDBOOK 1991
BHOPAL DEVELOPMENT PLAN 2005
SOI TOPOSHEETS 1:50,000 SCALE
MUNICIPAL CORPORATION WARD MAP



MAP26: Communication (Bus stand) facilities in villages 1991 Census of India

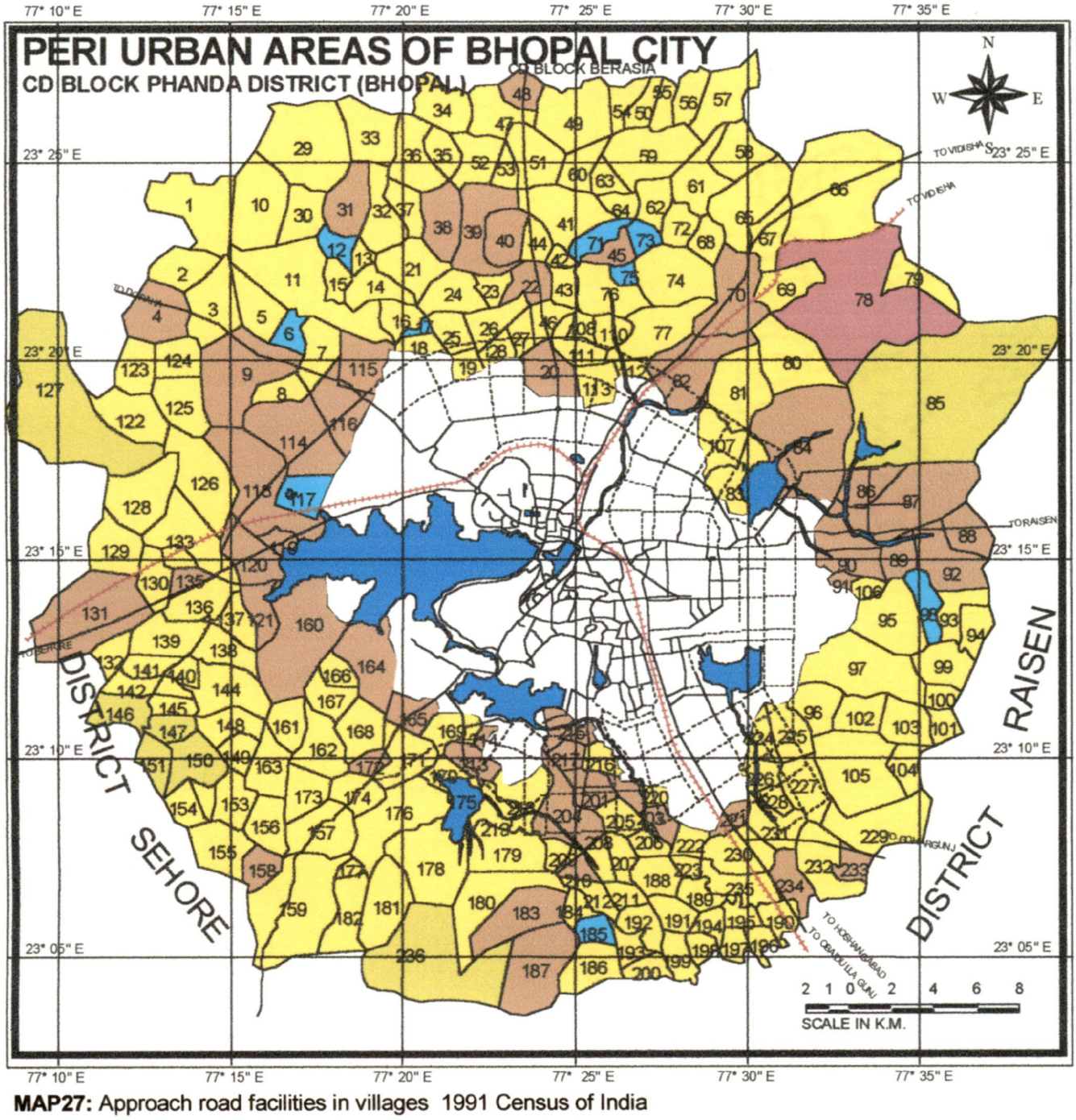
LOCATION MAP



LEGEND
- Proposed highway.shp
- Highways.shp
- Railnetwork.shp
- Waterbody.shp
- Wards.shp

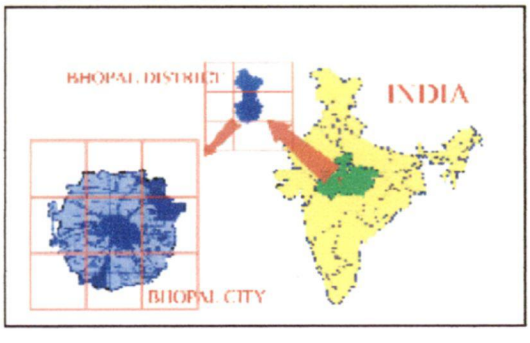
Bhopal_village.shp
- N.A.
- BUS STOP
- 0-5KM
- 5-10KM
- >10KM

DATA SOURCES
CENSUS OF INDIA 1991, 2001
MAP SOURCE:
DISTRICT CENSUS HANDBOOK 1991
BHOPAL DEVELOPMENT PLAN 2005
SOI TOPOSHEETS 1:50,000 SCALE
MUNICIPAL CORPORATION WARD MAP



MAP27: Approach road facilities in villages 1991 Census of India

LOCATION MAP



LEGEND

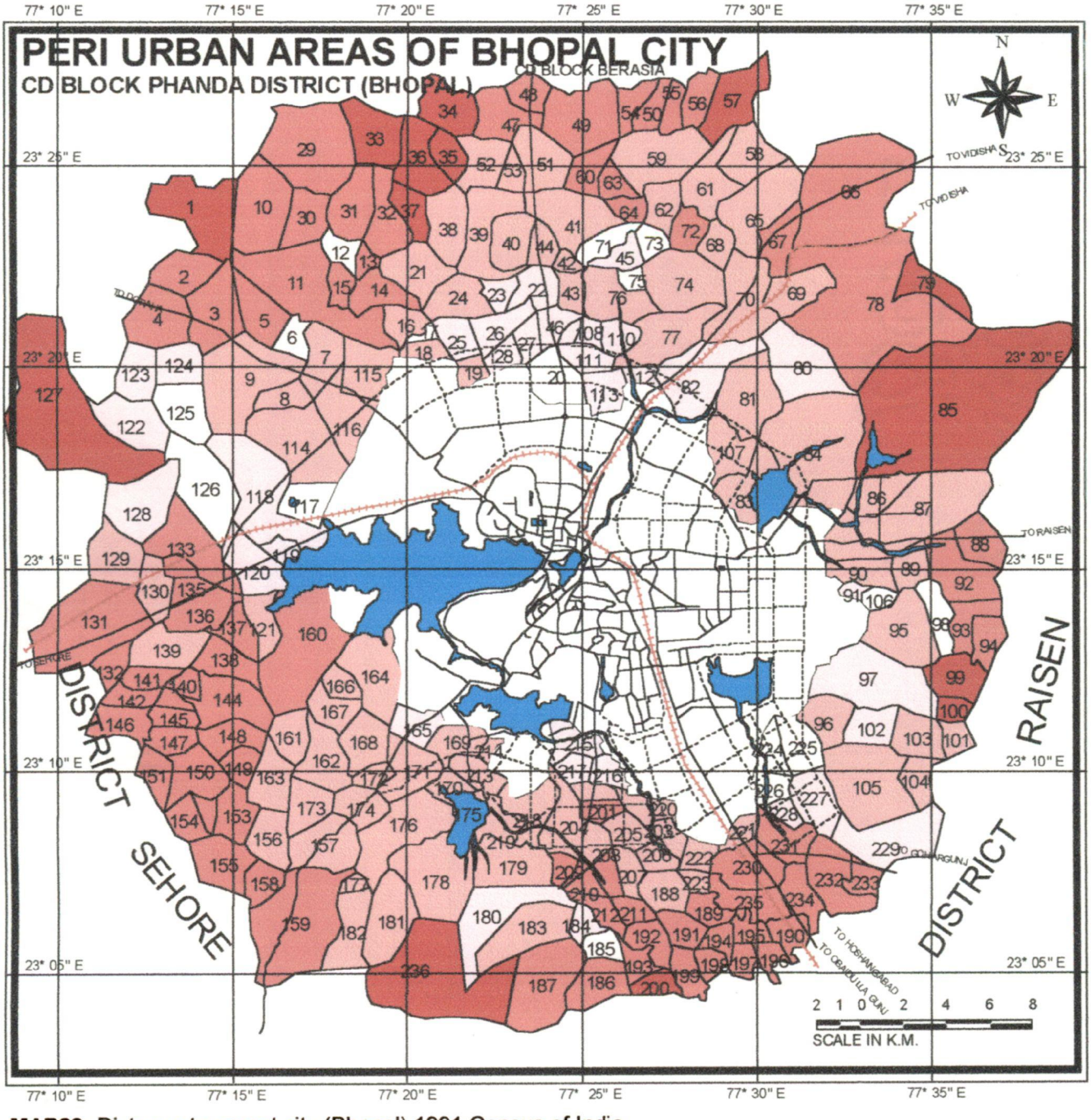
- Proposed highway.shp
- Highways.shp
- Railnetwork.shp
- Waterbody.shp
- Wards.shp

Bhopal_village.shp

- N.A.
- WITHIN 10 KM KUCHHA ROAD
- KUCHHA ROAD MORE THAN 10KM
- WITHIN 10KM PUCCA ROAD
- PUCCA ROAD MORE THAN 10KM

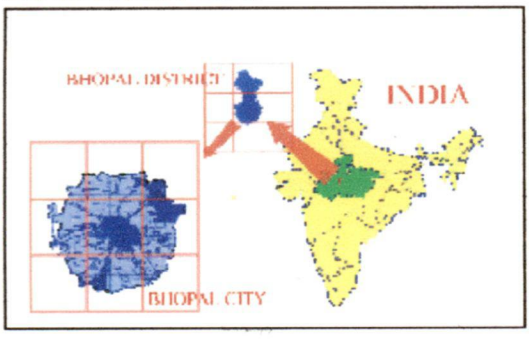
DATA SOURCES
CENSUS OF INDIA 1991, 2001
MAP SOURCE:
DISTRICT CENSUS HANDBOOK 1991
BHOPAL DEVELOPMENT PLAN 2005
SOI TOPOSHEETS 1:50,000 SCALE
MUNICIPAL CORPORATION WARD MAP

ALTERNATIVE MODEL FOR PERI URBAN DEVELOPMENT OF BHOPAL



MAP28: Distance to parent city (Bhopal) 1991 Census of India

LOCATION MAP



LEGEND

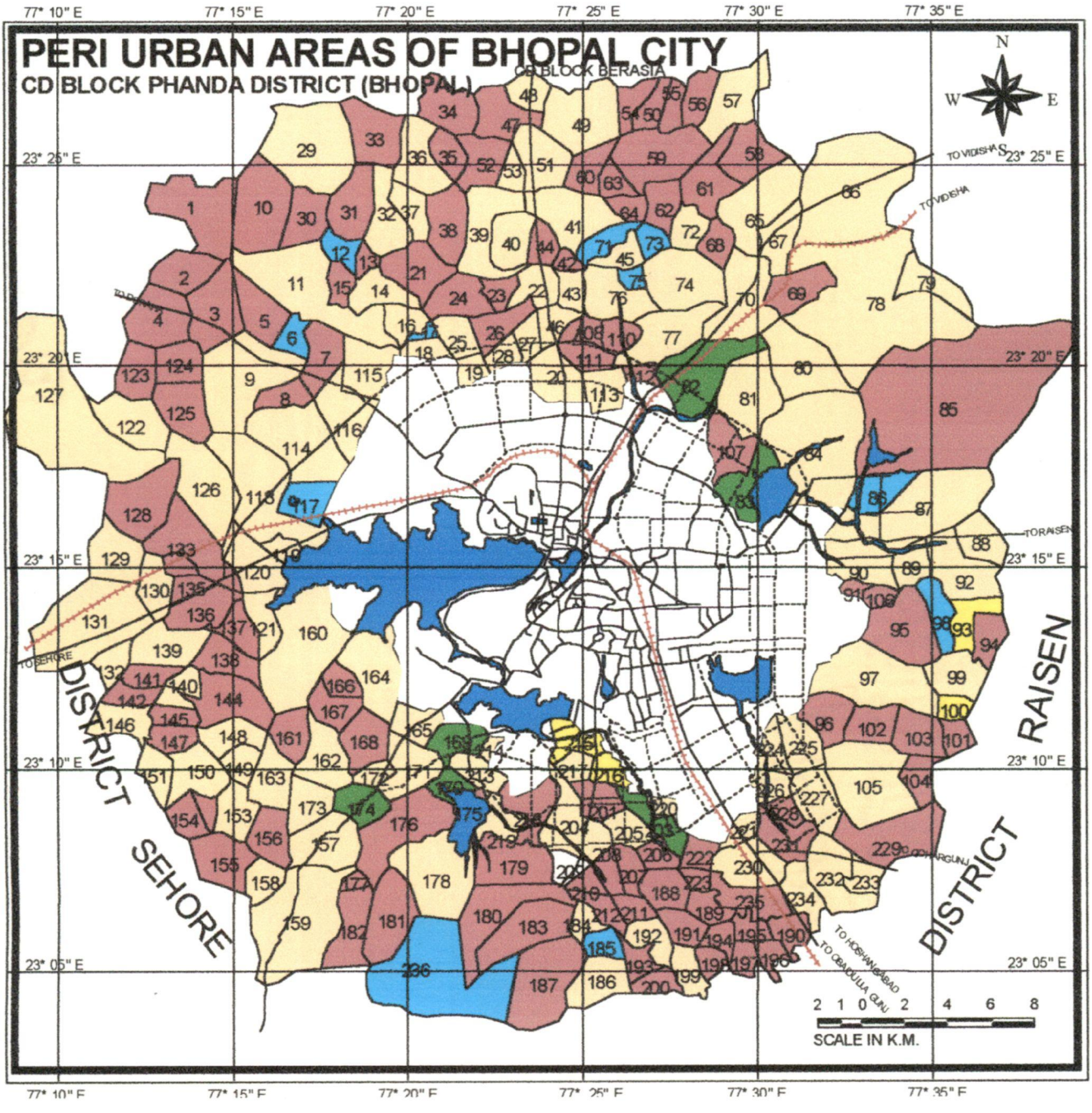
- Proposed highway.shp
- Highways.shp
- Railnetwork.shp
- Waterbody.shp
- Wards.shp

Bhopal_village.shp

- 0 - 5
- 5- 10
- 10 - 15
- 15 - 20
- 20 - 25
- 25 - 30

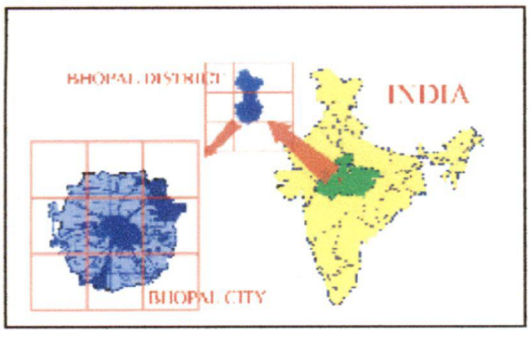
Distance to parent city in K.M.

DATA SOURCES
CENSUS OF INDIA 1991, 2001
MAP SOURCE:
DISTRICT CENSUS HANDBOOK 1991
BHOPAL DEVELOPMENT PLAN 2005
SOI TOPOSHEETS 1:50,000 SCALE
MUNICIPAL CORPORATION WARD MAP



MAP29: Power supply in villages 1991 Census of India

LOCATION MAP



DATA SOURCES
CENSUS OF INDIA 1991, 2001
MAP SOURCE:
DISTRICT CENSUS HANDBOOK 1991
BHOPAL DEVELOPMENT PLAN 2005
SOI TOPOSHEETS 1:50,000 SCALE
MUNICIPAL CORPORATION WARD MAP

LEGEND

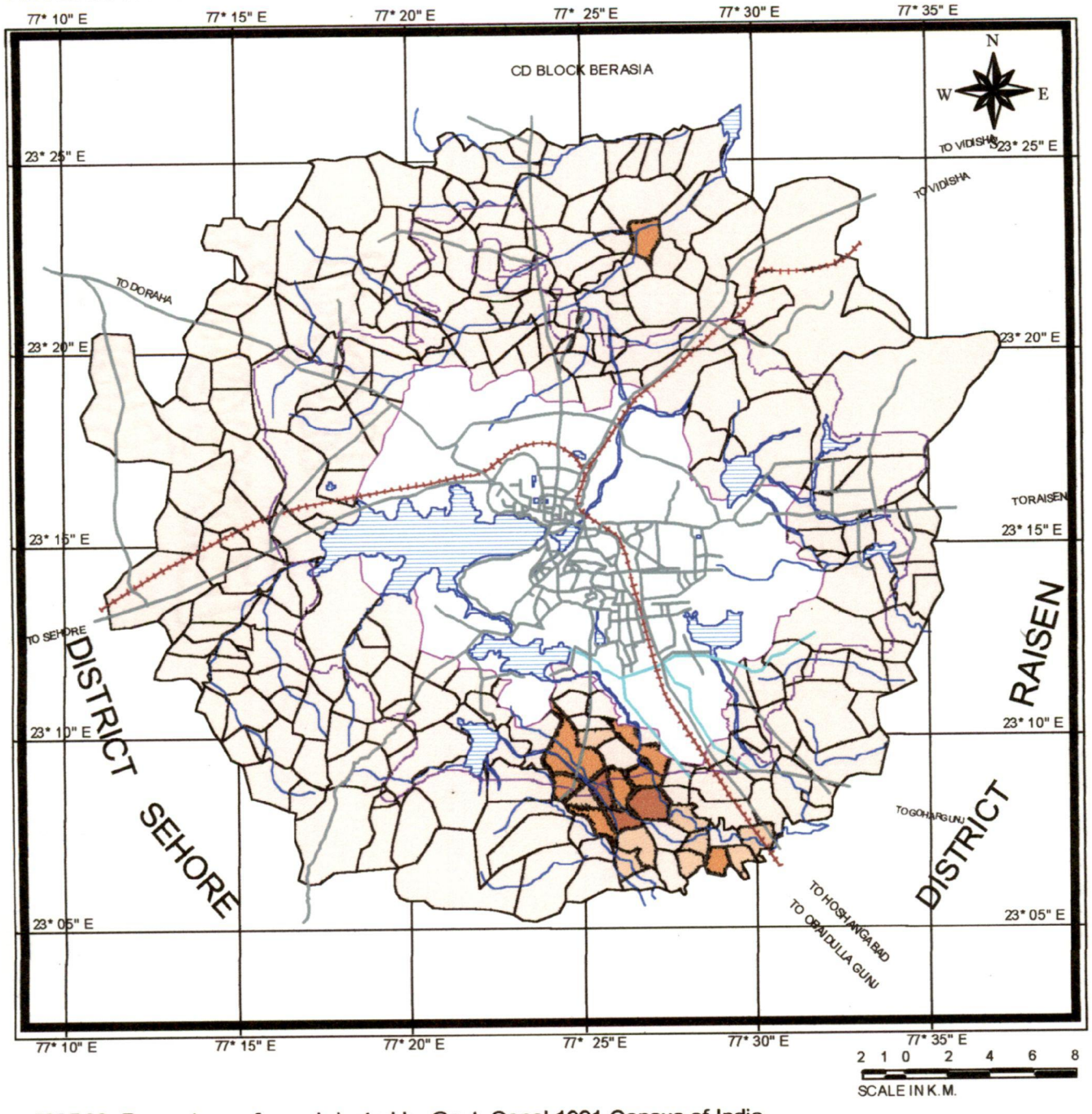
- Proposed highway.shp
- Highways.shp
- Railnetwork.shp
- Waterbody.shp
- Wards.shp

Bhopal_village.shp

- N.A.
- ED
- EAG
- EA
- ED EA

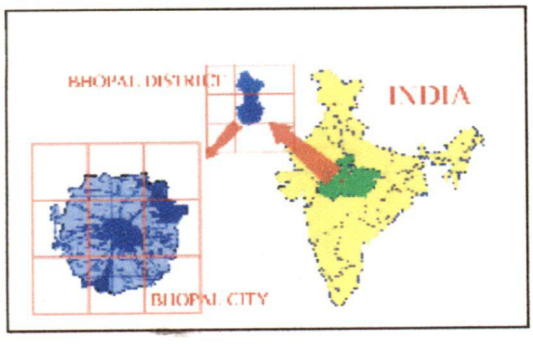
Note: *ED- Electricity for domestic purposes, * EAG– Electricity for agriculture *EO– Electricity for other purposes (commercial , industrial, etc.) *EA- Electricity for all purposes

ALTERNATIVE MODEL FOR PERI URBAN DEVELOPMENT OF BHOPAL



MAP30: Percentage of area irrigated by Govt. Canal 1991 Census of India

LOCATION MAP



DATA SOURCES
CENSUS OF INDIA 1991, 2001
MAP SOURCE:
DISTRICT CENSUS HANDBOOK 1991
BHOPAL DEVELOPMENT PLAN 2005
SOI TOPOSHEETS 1:50,000 SCALE
MUNICIPAL CORPORATION WARD MAP

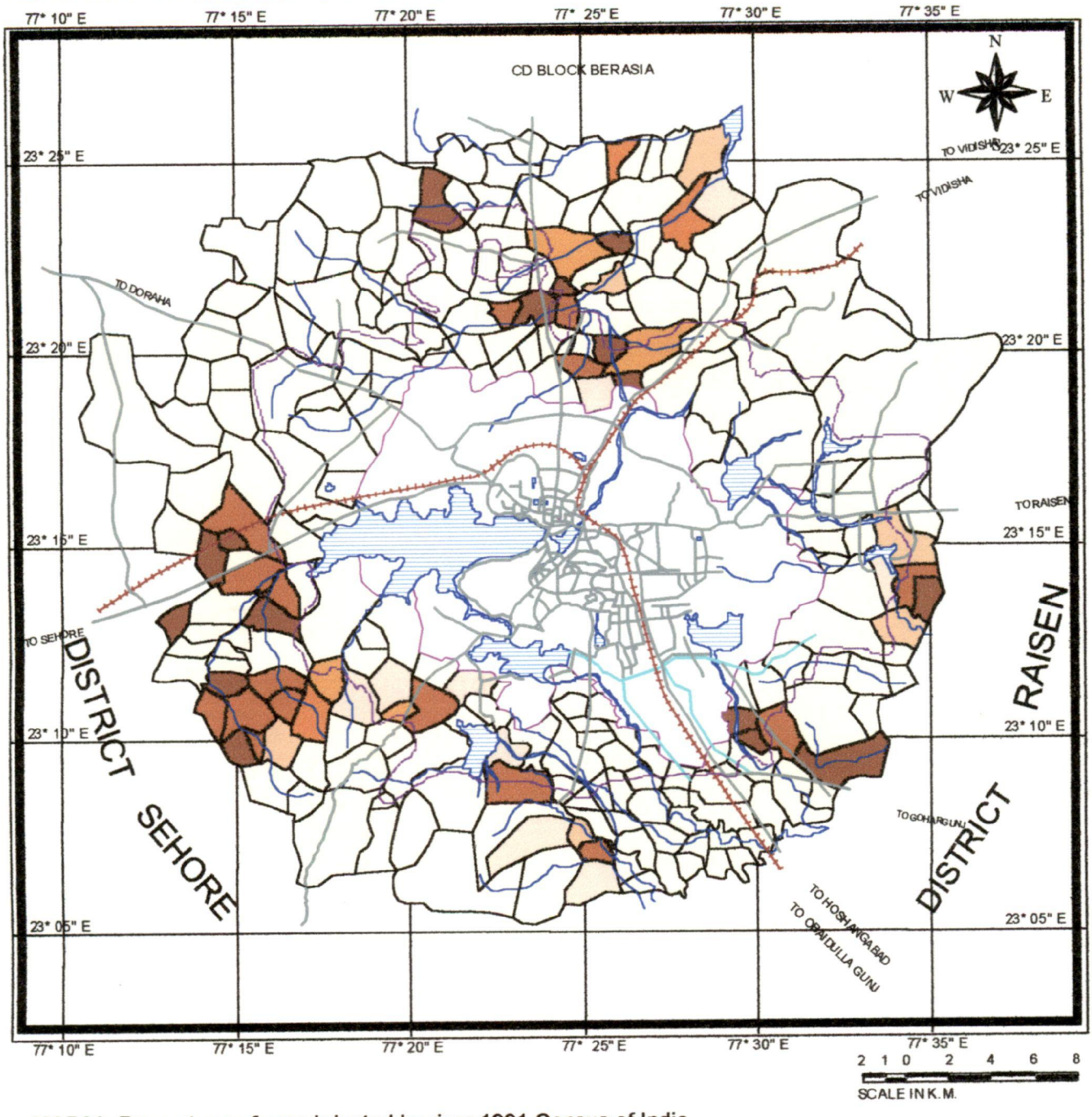
LEGEND

- BDA limit
- Roads
- Rail network
- Rivers and streems
- Canal
- Lakes & reservoirs
- Municipal area
- Municipal / Urban area limit

Area irrigated by govt. canal

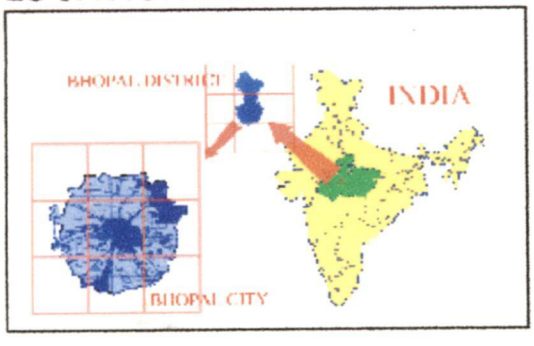
- LESS THAN 20 %
- 20%- 40%
- 40%- 60%
- 60%- 80%
- 80%-100%

ALTERNATIVE MODEL FOR PERI URBAN DEVELOPMENT OF BHOPAL



MAP31: Percentage of area irrigated by river 1991 Census of India

LOCATION MAP



DATA SOURCES
CENSUS OF INDIA 1991, 2001
MAP SOURCE:
DISTRICT CENSUS HANDBOOK 1991
BHOPAL DEVELOPMENT PLAN 2005
SOI TOPOSHEETS 1:50,000 SCALE
MUNICIPAL CORPORATION WARD MAP

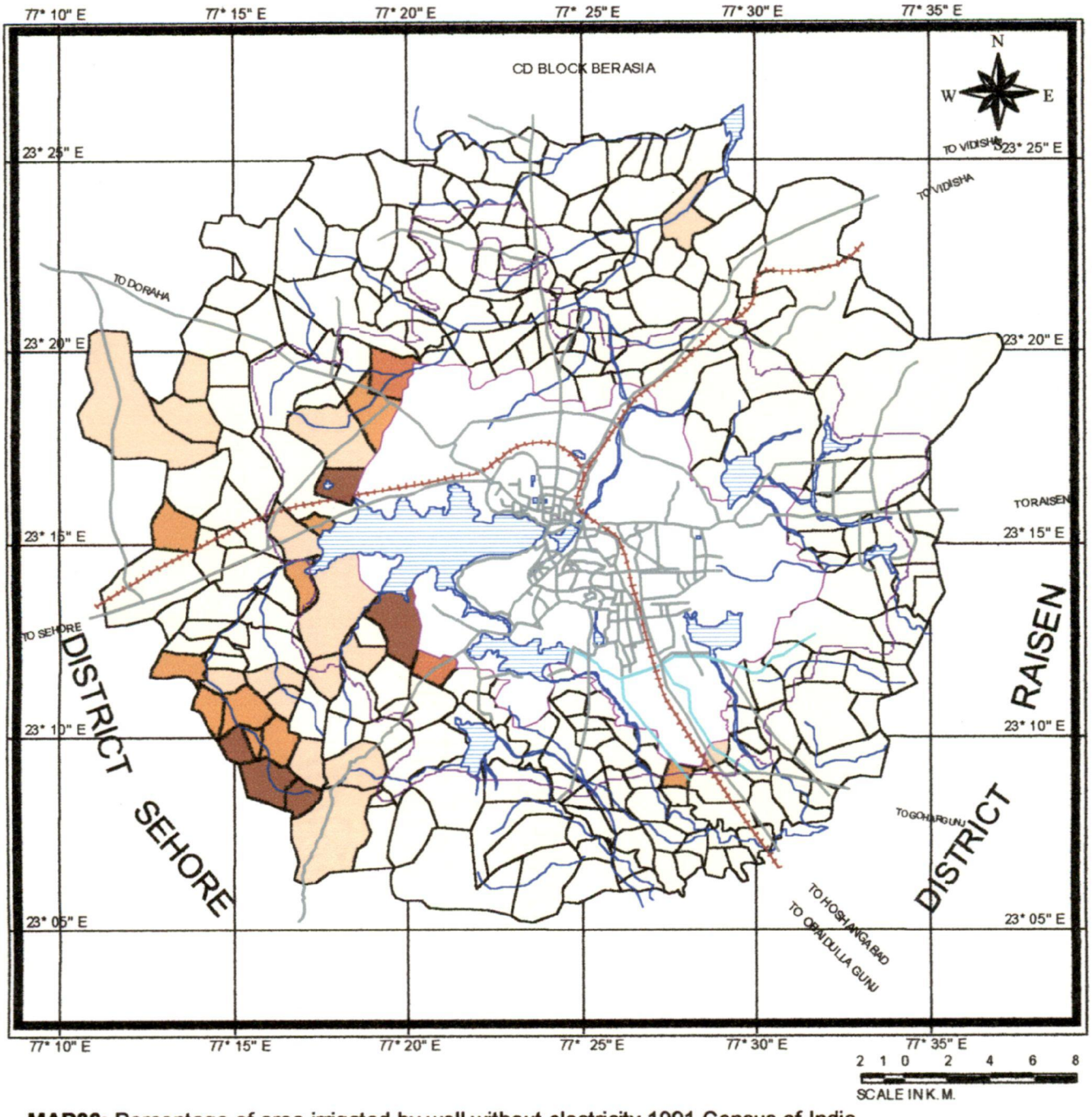
LEGEND

- BDA limit
- Roads
- Rail network
- Rivers and streems
- Canal
- Lakes & reservoirs
- Municipal area Wards.shp
- Municipal / Urban area limit

Area under river irrigation

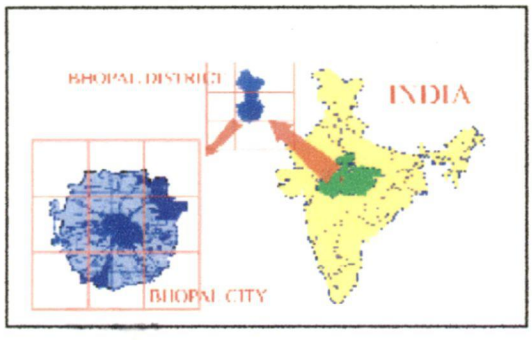
- LESS THAN 1%
- 1%-2%
- 2%-3%
- 3%-4%
- 4%-5%
- 5%-10%
- MORE THAN 10%

ALTERNATIVE MODEL FOR PERI URBAN DEVELOPMENT OF BHOPAL



MAP32: Percentage of area irrigated by well without electricity 1991 Census of India

LOCATION MAP

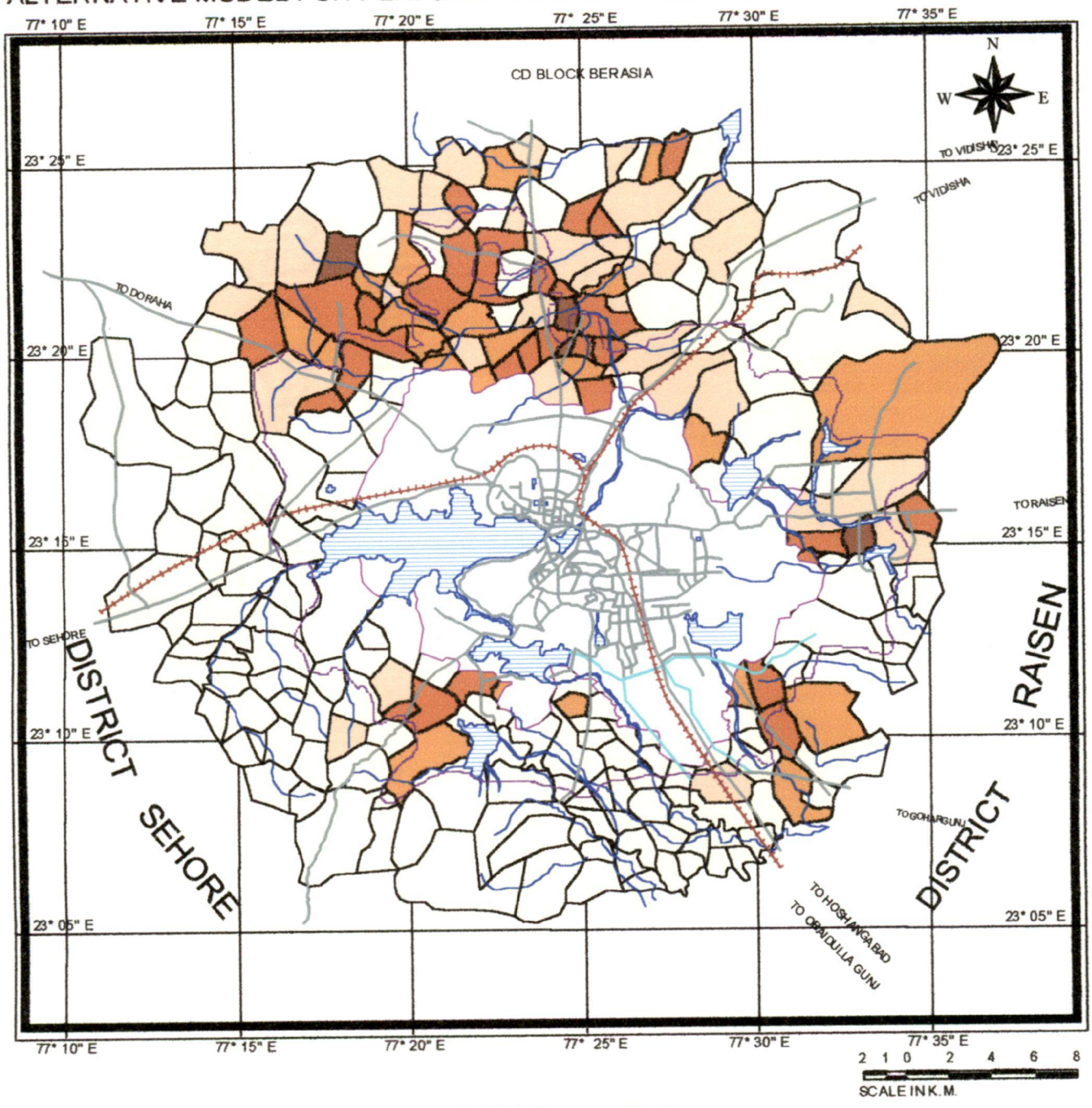


DATA SOURCES
CENSUS OF INDIA 1991, 2001
MAP SOURCE:
DISTRICT CENSUS HANDBOOK 1991
BHOPAL DEVELOPMENT PLAN 2005
SOI TOPOSHEETS 1:50,000 SCALE
MUNICIPAL CORPORATION WARD MAP

LEGEND
- BDA limit
- Roads
- Rail network
- Rivers and streems
- Canal
- Lakes & reservoirs
- Municipal area
- Municipal / Urban area limit

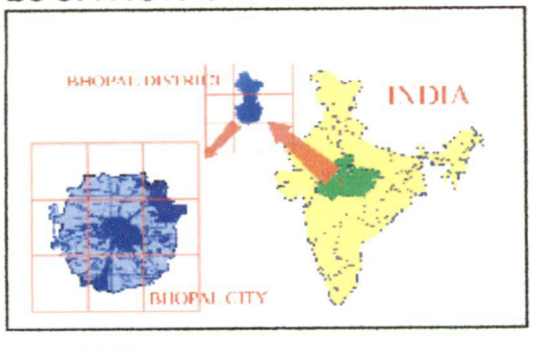
Area under irrigation by well w/o ele
- < 5%
- 5 - 10%
- 10- 15%
- 15- 20%

ALTERNATIVE MODEL FOR PERI URBAN DEVELOPMENT OF BHOPAL



MAP33: Percentage of area irrigated by well 1991 Census of India

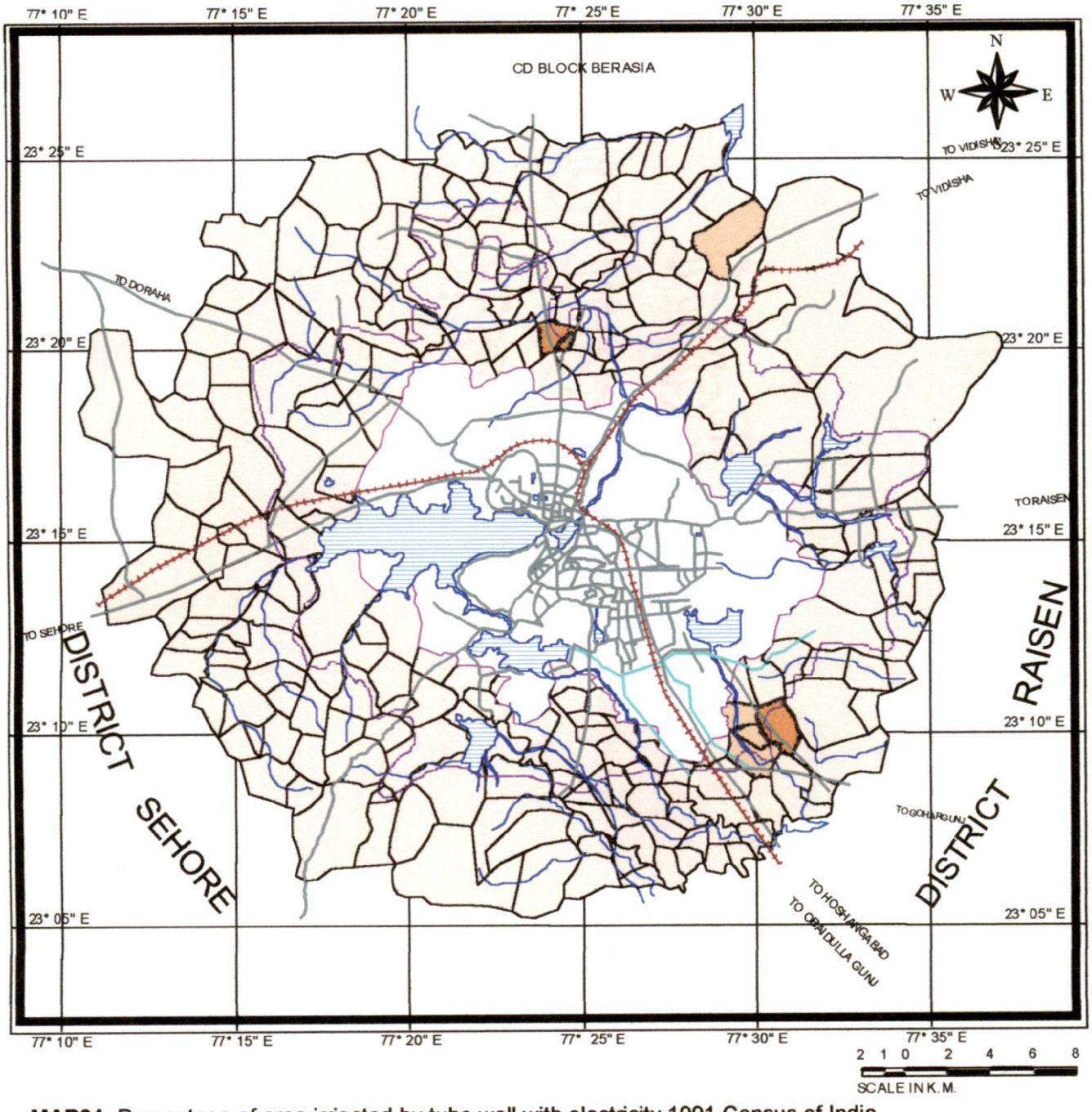
LOCATION MAP



DATA SOURCES
CENSUS OF INDIA 1991, 2001
MAP SOURCE:
DISTRICT CENSUS HANDBOOK 1991
BHOPAL DEVELOPMENT PLAN 2005
SOI TOPOSHEETS 1:50,000 SCALE
MUNICIPAL CORPORATION WARD MAP

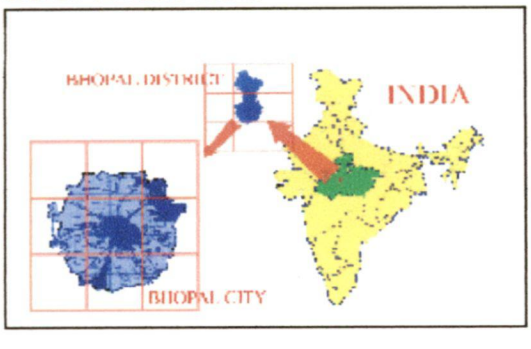
LEGEND
BDA limit
Roads
Rail network
Rivers and streems
Canal
Lakes & reservoirs
Municipal area
Municipal / Urban area limit
Area under well irrigation
LESS THAN 20 %
20%- 40%
40%- 60%
60%- 80%

ALTERNATIVE MODEL FOR PERI URBAN DEVELOPMENT OF BHOPAL



MAP34: Percentage of area irrigated by tube well with electricity 1991 Census of India

LOCATION MAP

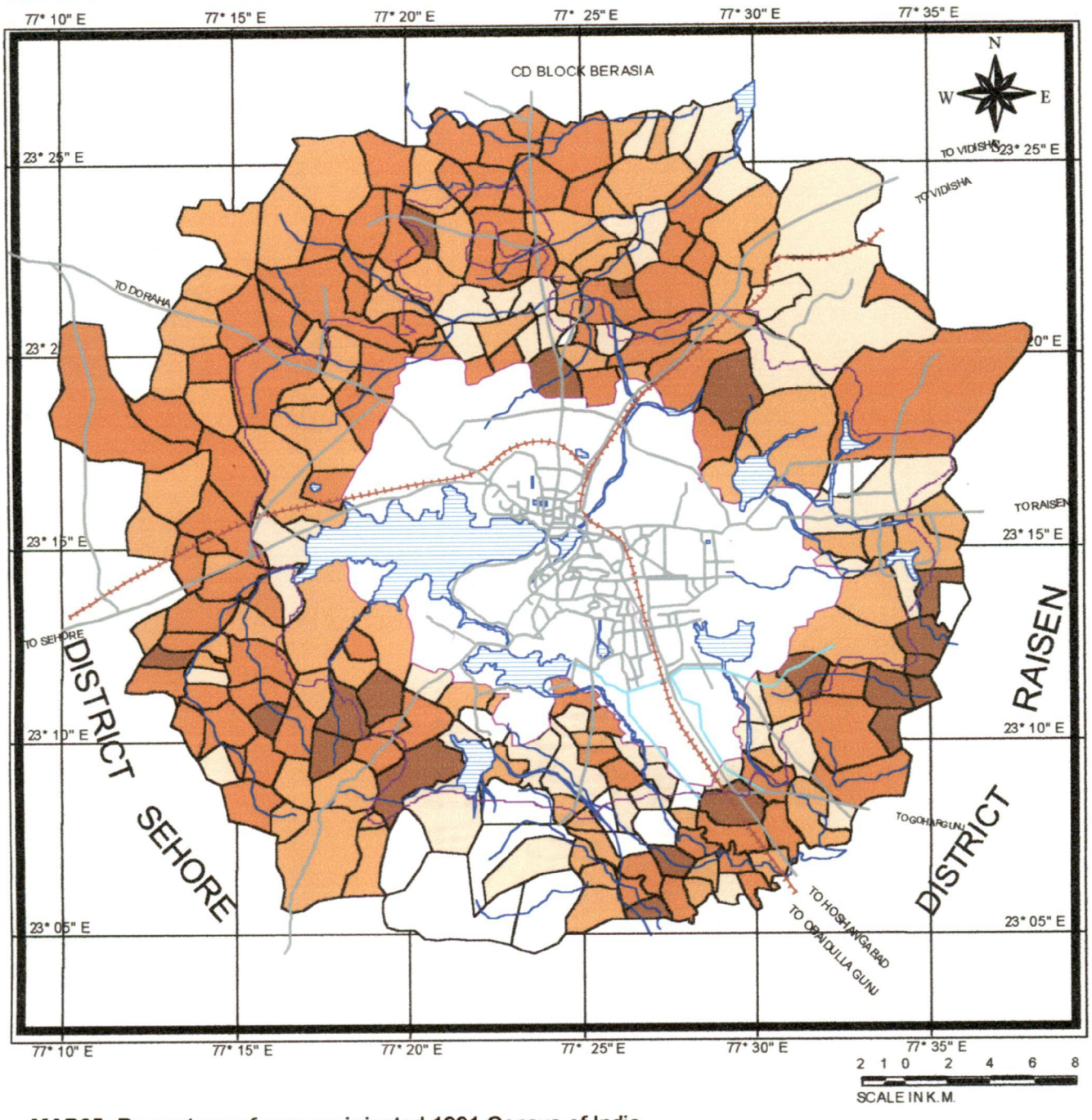


DATA SOURCES
CENSUS OF INDIA 1991, 2001
MAP SOURCE:
DISTRICT CENSUS HANDBOOK 1991
BHOPAL DEVELOPMENT PLAN 2005
SOI TOPOSHEETS 1:50,000 SCALE
MUNICIPAL CORPORATION WARD MAP

LEGEND
- BDA limit
- Roads
- Rail network
- Rivers and streems
- Canal
- Lakes & reservoirs
- Municipal area
- Municipal / Urban area limit

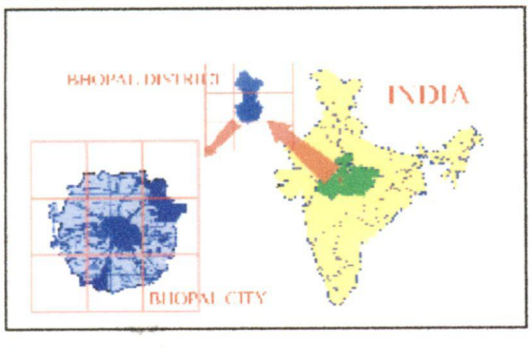
Area under tube well ele irrigation
- LESS THAN 20 %
- 20%- 40%
- 40%- 60%
- 60%- 80%

ALTERNATIVE MODEL FOR PERI URBAN DEVELOPMENT OF BHOPAL



MAP35: Percentage of area un-irrigated 1991 Census of India

LOCATION MAP



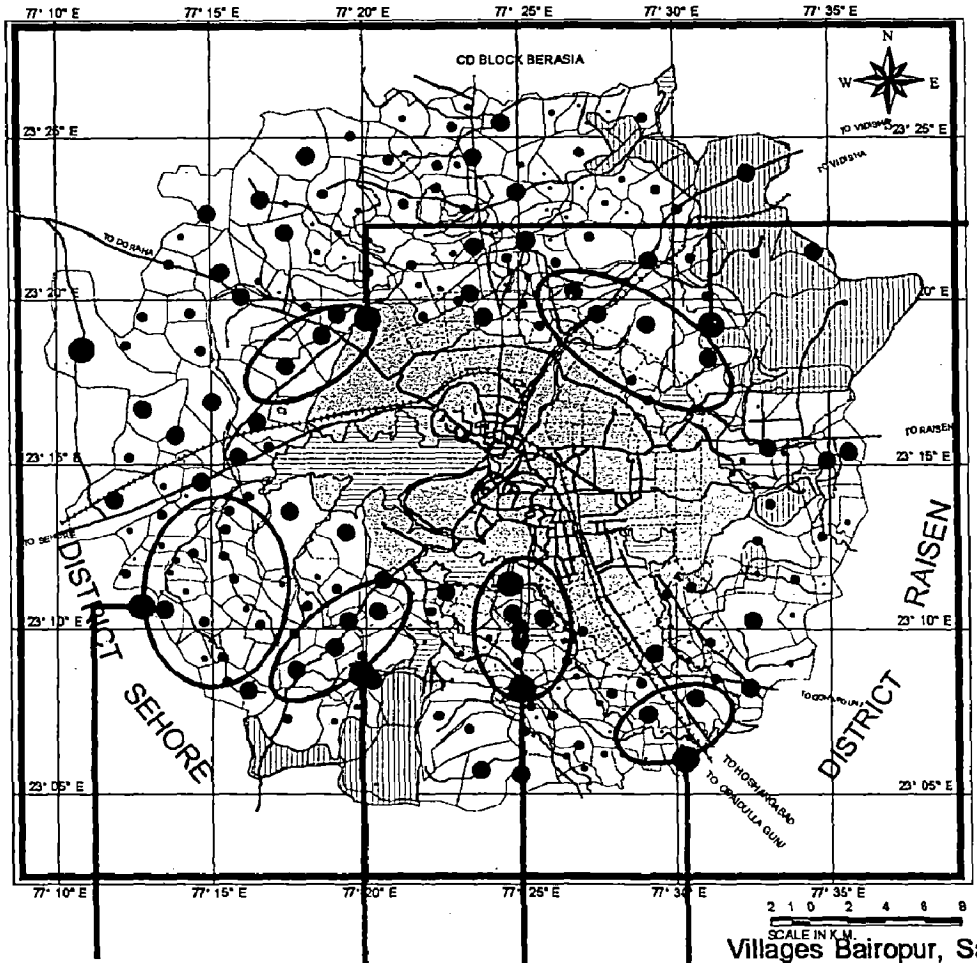
DATA SOURCES
CENSUS OF INDIA 1991, 2001
MAP SOURCE:
DISTRICT CENSUS HANDBOOK 1991
BHOPAL DEVELOPMENT PLAN 2005
SOI TOPOSHEETS 1:50,000 SCALE
MUNICIPAL CORPORATION WARD MAP

LEGEND

- BDA limit
- Roads
- Rail network
- Rivers and streems
- Canal
- Lakes & reservoirs
- Municipal area
- Municipal / Urban area limit

Unirrigated area

- LESS THAN 20 %
- 20%- 40%
- 40%- 60%
- 60%- 80%
- 80%-100%



Villages on the North of the Bhopal city have developed mainly because of the newly constructed bypass road

These villages have are setteled along the water sources, they are basically agricultural areas

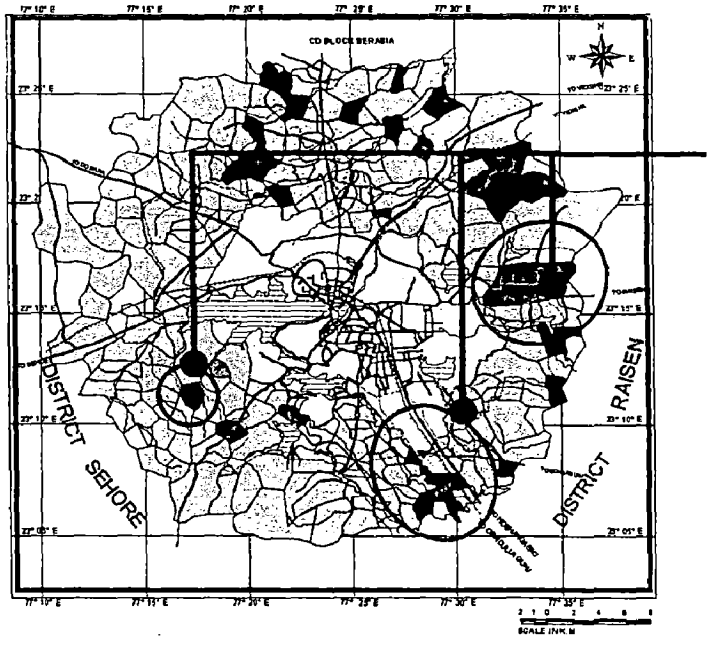
Villages Bairopur, Samardha Kalisot, Narela Hanumant Singh outside the urban boundary have grown under the pressure of Ribbon development on National Highway no 12

The development is mainly private sector housing, institution and recreation and hotels along the national highway

Villages on Bilkisgunj road are on initial stages of Urbanization induced by the growth of present city. Most of the villages are having population around 1000 persons

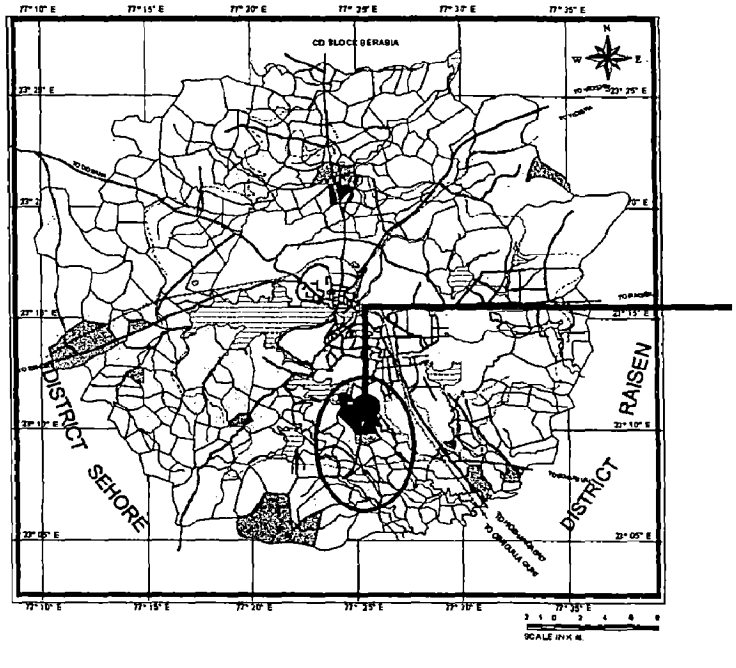
Dam Kheda, Akbarpur, Banjari, Nayapura Genhu Kheda Villages on Kolar road have high percentage of population growth in last decade, in the course of time the leapfrog development of the parent city across the natural barrier of Kalia sot river has become contiguous with the city limits

figure 6.1: Location of settlements and population (Tehsil Huzur CD Block Phanda) 2001 Census of India (Ref: **Map no 3**)



Lower sex ratio in villages along the traffic corridors are indicator of presence of in migrated male workforce from remote areas, these areas witness lot of construction activity and thus employment opportunities to migrants

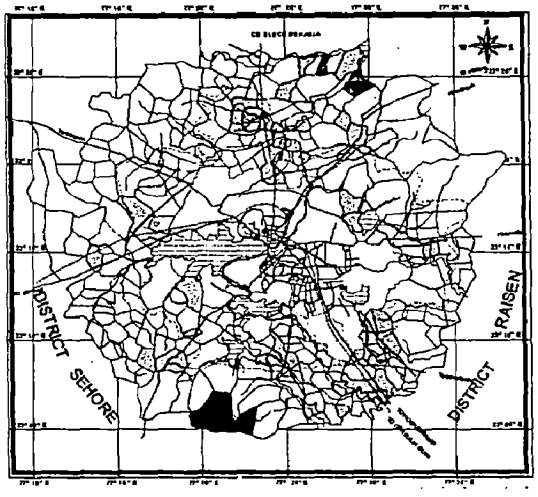
figure 6.2: Sex ratio in Villages around Bhopal City (Tehsil Huzur CD Block Phanda) 2001 Census of India (Ref: **Map no 7**)



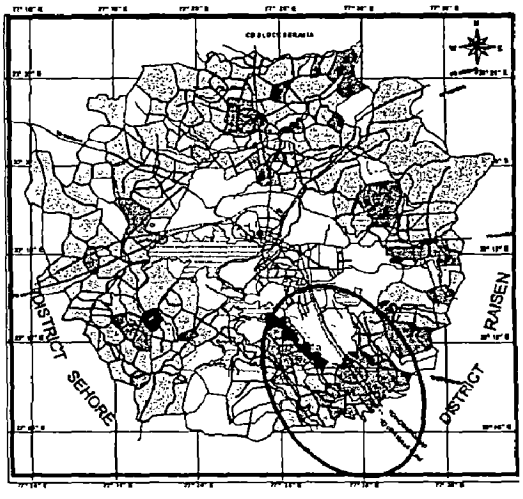
High population density of these villages is result of presence of city infrastructure and facilities at nearby distance earlier there was a lack of connectivity because of presence of natural barrier of a Kalisot river. Once the connectivity was established the opportunity cost of these areas increased rapidly and unplanned development by private builders defaced peri urban area

figure 6.3: Population density of villages around Bhopal City (Tehsil Huzur CD Block Phanda) 2001 Census of India (Ref: **Map no 20**)

Literacy rate in female and male population has increased in all villages from 1991 to 2001

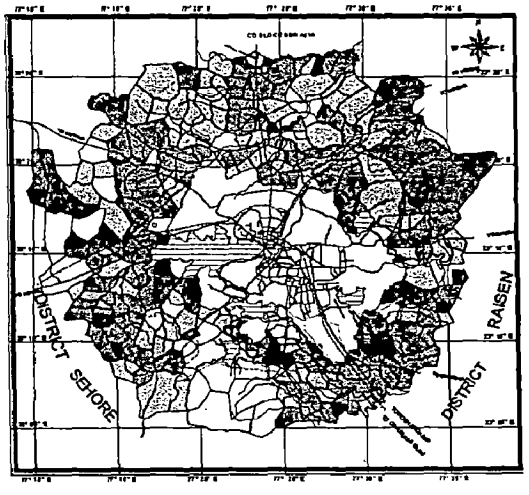


1991 census

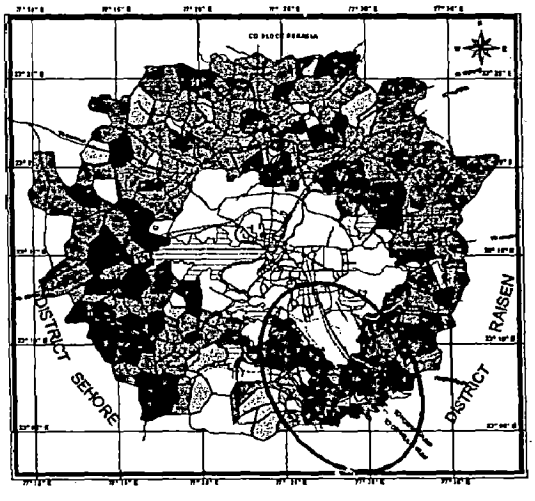


2001 census

figure 6.4: Literacy in female in Villages around Bhopal City (Tehsil Huzur CD Block Phanda) (Ref: **Map no 18 ,19**)



1991 census



2001 census

figure 6.5: Literacy in male in Villages around Bhopal City (Tehsil Huzur CD Block Phanda) (Ref: **Map no 16,17**)

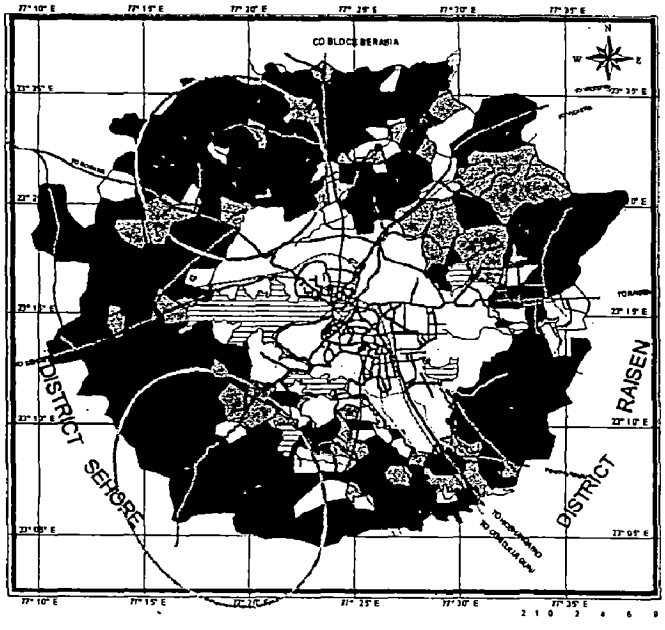


figure 6.6: Ratio of cultivators to total working male population in Villages around Bhopal City (Tehsil Huzur CD Block Phanda) 1991 Census of India (Ref: **Map no 10**)

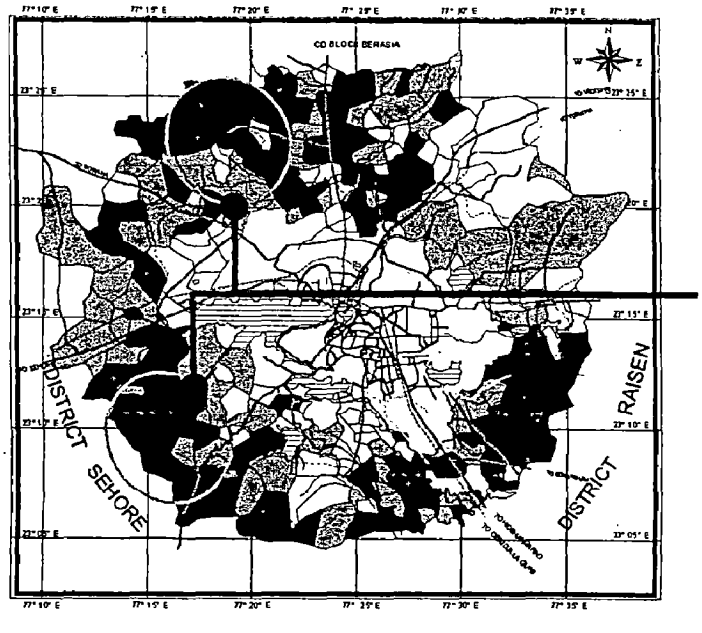
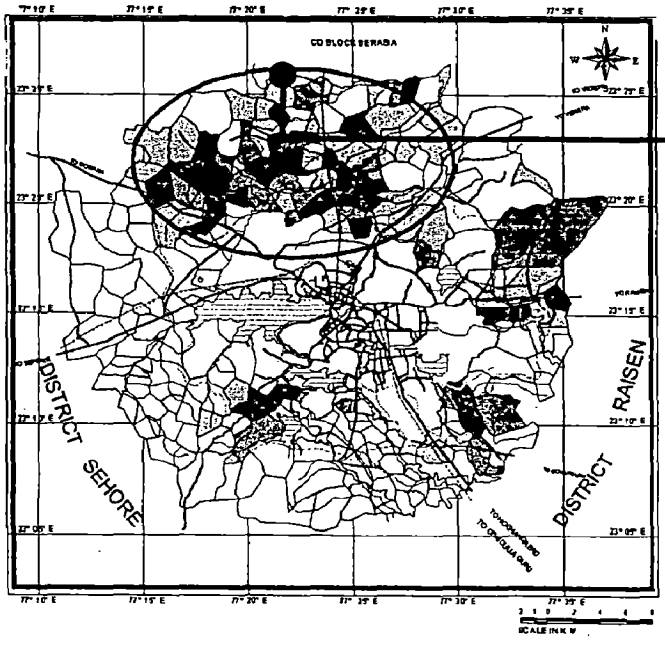
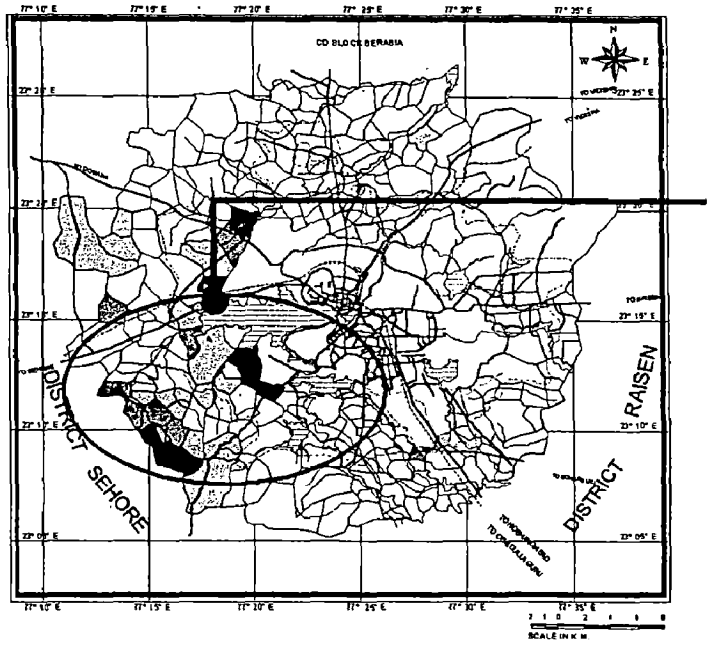


figure 6.7: Ratio of cultivators to total working male population in Villages around Bhopal City (Tehsil Huzur CD Block Phanda) 2001 Census of India (Ref: **Map no 11**)



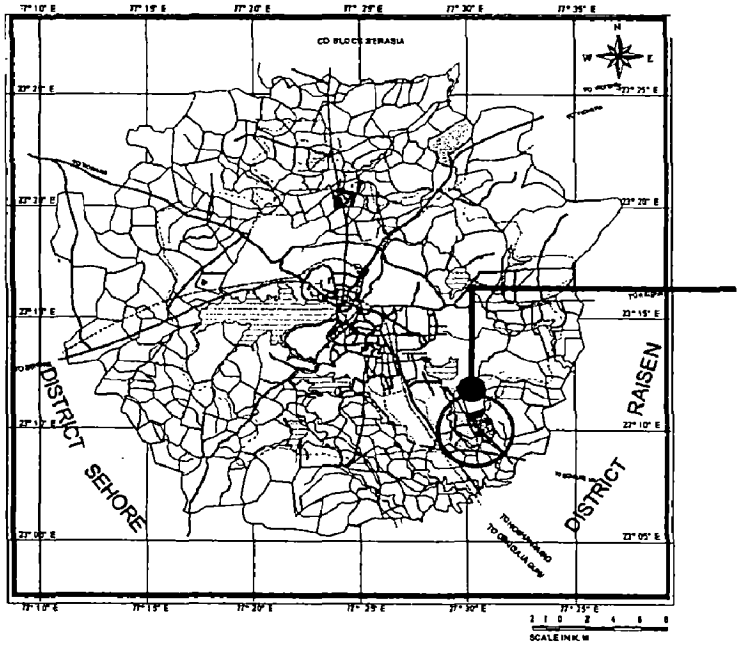
Villages in the north of Bhopal city are mainly having well irrigation based agriculture

figure 6.8: Area under well irrigation in Villages around Bhopal City (Tehsil Huzur CD Block Phanda) 2001 Census of India (Ref: **Map no 33**)



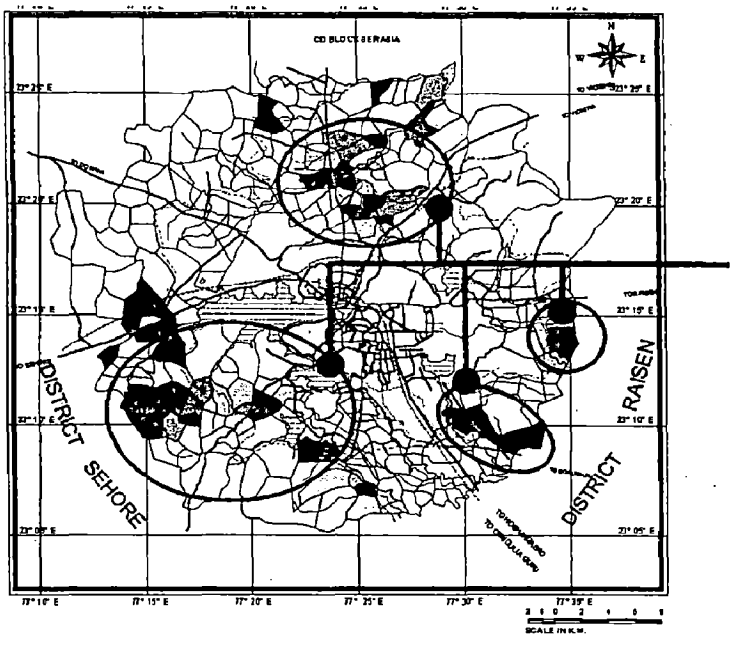
Villages in the south west of Bhopal city are less developed, having mainly well irrigation without electricity

figure 6.9: Area under well irrigation without electricity in Villages around Bhopal City (Tehsil Huzur CD Block Phanda) 2001 Census of India (Ref: **Map no 32**)



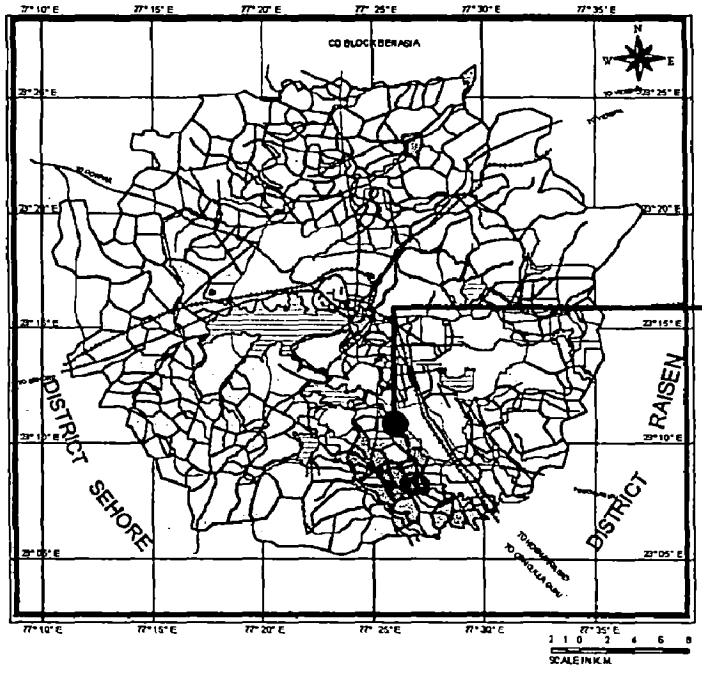
Very few Villages around Bhopal have substantial tube well based irrigation system

figure 6.10: Area under tube well irrigation in Villages around Bhopal City (Tehsil Huzur CD Block Phanda) 2001 Census of India (Ref: **Map no 34**)



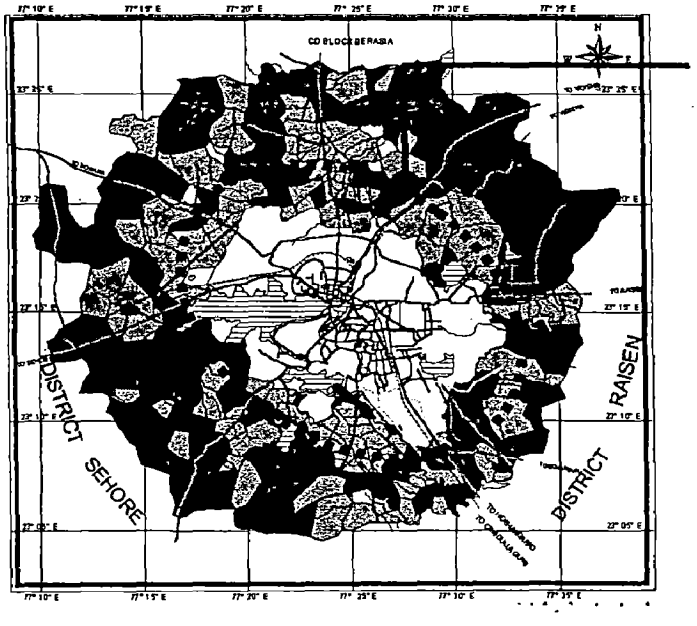
Well irrigation is augmented by river irrigation in these villages

figure 6.11: Area under river irrigation in Villages around Bhopal City (Tehsil Huzur CD Block Phanda) 2001 Census of India (Ref: **Map no 31**)



Fertile area on the east of Kalia sot river is supported by govt. Canal based Irrigation

figure 6.12: Area under Govt. canal irrigation in Villages around Bhopal City (Tehsil Huzur CD Block Phanda) 2001 Census of India (Ref: **Map no 30**)



Ratio of male working population has reduced in the fringe areas, this means that more working population of the peri urban areas is in-migrating to the city for better employment opportunities

figure 6.13: Ratio of male working population to total male population in Villages around Bhopal City (CD Block Phanda) 2001 Census of India (Ref: **Map no 9**)

DELINEATION OF PERI URBAN AREA

7.1 GENERAL

Delineation of developmental phenomena is a complex problem of regional development; for the delineation of Peri urban area determinants have to be such that they are compatible with the availability of data. In absence of 2001 district census hand book a primary analysis is made using 1991 census data.

From the guide lines and inferences of the case studies and literature survey following set of determinants are followed in various studies and reports

Determinants followed in census 2001 for census town

Determinant 1: census town is village with minimum population of 5000

Determinant 2: population density of at least 400 persons/ Sq. K.M.

Determinant 3: at least 75% of male population is engaged in pursuance of non agricultural activity

Determinants followed in census 2001 for urban agglomerations

Urban agglomerations is continuous urban outgrowths, of two or more physical contiguous towns together and any adjoining urban outgrowth of such towns

Determinant 1:at least one of the constituent towns of urban agglomerations should necessarily be a statutory town and

Determinant 2: the total population of all the constituents should not be less than 20,000 (as per 1991 census)

7.2 IDENTIFICATION OF DETERMINANTS

Determinants followed in the study for delineation of peri urban area of Bhopal

The following determinants stipulated to delineate the urban fringe of Bhopal are based broadly with the due consideration to demographic aspects, the residential land use and the density, the occupational structure and the likely chances of speculation in land prices.

Determinant 1: Percentage of workforce engaged in non agricultural activities. Villages which exhibit a value above 80 per cent as per 1991 Census are categorized for selection in urban fringe.

Determinant 2: In the cases where the population density is observed to be above 400 persons/sq.km in year 1991 is considered for the delineation of urban fringe.

Determinant 3: The land price is an important determinant in the delineation of urban fringe as it is the immediate repercussion of the demand for land. The villages which satisfy a value above Rs.200 per sq.ft. in year 2003 are selected for the categorization under the urban fringe.

Operationalization of the stages of urbanisation

1. Rural: > 50% of total workers are cultivators and > 50% of the total land under agricultural use
2. Occupational change: < 50% of total workers are cultivators and > 50% of total land under agriculture
3. Increasing urban land-use: 50%-80% of total workers non agricultural pursuits and <80% of total land under Agriculture
4. Increasing urban land-use: 50%-80% of total workers non agricultural pursuits and >80% of total land under Agriculture
5. Urban: > 80% of total workers in non agricultural pursuits and < 50% of total land under agriculture

Agricultural land is Calculated as total of 'cultivated area' (irrigated + unirrigated land) and forest according to the Census of India 1991

7.3 USE OF GEOGRAPHICAL INFORMATION SYSTEM FOR DELINEATION

GIS technique is used to identify the peri urban areas of Bhopal and areas with different level of urbanization around Bhopal in Phanda CD block. Arc View GIS Software was used to integrate the spatial data with the census data of 1991 for the 236 villages in CD block Phanda in Bhopal District. The determinants of peri urban area were converted into a series of queries which have given various patterns of

different aspects at village level. Coupled with the information of settlement size etc these patterns were analyzed to demarcate the peri urban area of Bhopal city.

7.4 Preparation of database

a data base of census variables was made which is attached in annexure

7.4.1 Delineation of peri urban area

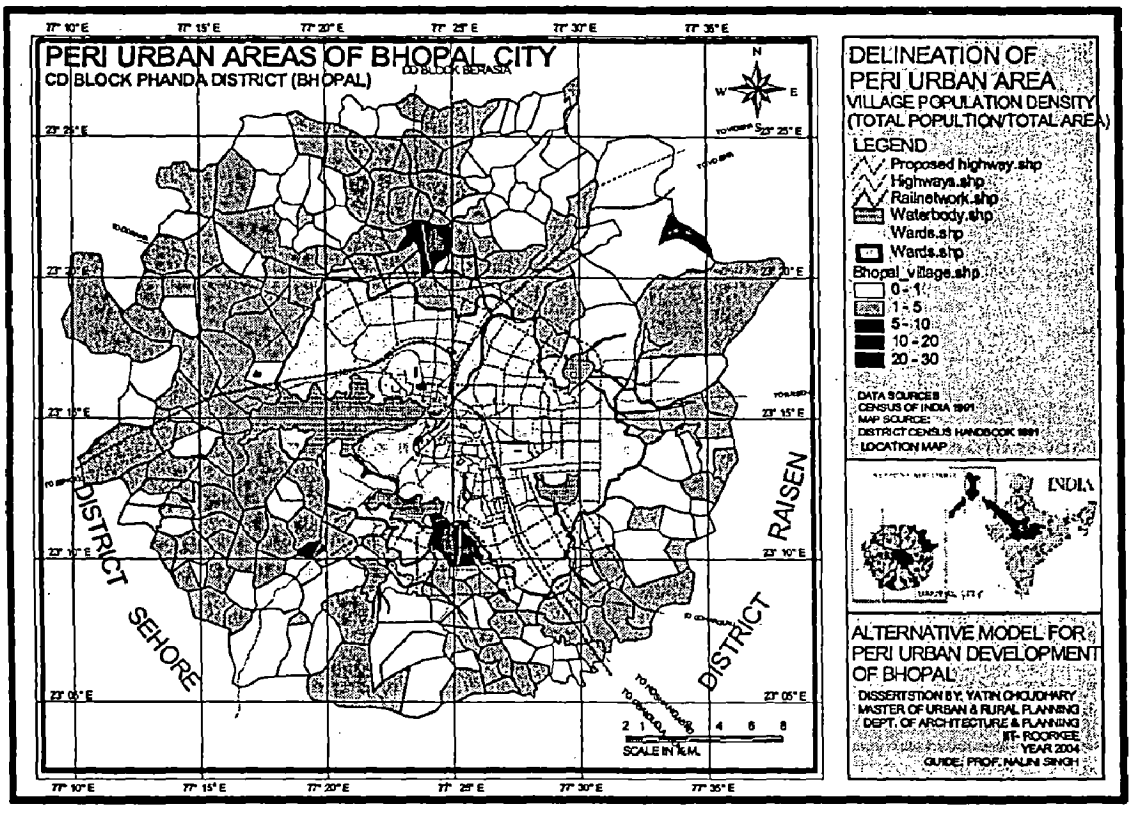


figure 7.1 Village population density

Above figure shows that 4 village towards the kolar road Damkheda Akbarpur Banjari and Nayapura and three villages on Berasia namely Parevakheda Bairupura and Ghasipura an one village towards bilkisgunj namely Ratibad are having considerably higher over all population densities than surrounding villages

The calculation of over all population density of a village may give a wrong picture of the concentration of population however it may be used as factor for availability of land resource to the population.

A good depiction of population concentration in village area can be given by availability of habitated land (or the area which is not under agriculture or forest) to the population residing in the village the.above figure depicts the same the Phanda Block in this figure again we find four villages Damkheda Akbarpur Banjari Nayapura and three villages Neelbad Ratibad and Kal khedi on the road towards Bilkisgunj all these villages are contiguous to the city growth and have population density ranging from 50-more than 500 persons per hectare

figure 7.2 Density of habited land in villages

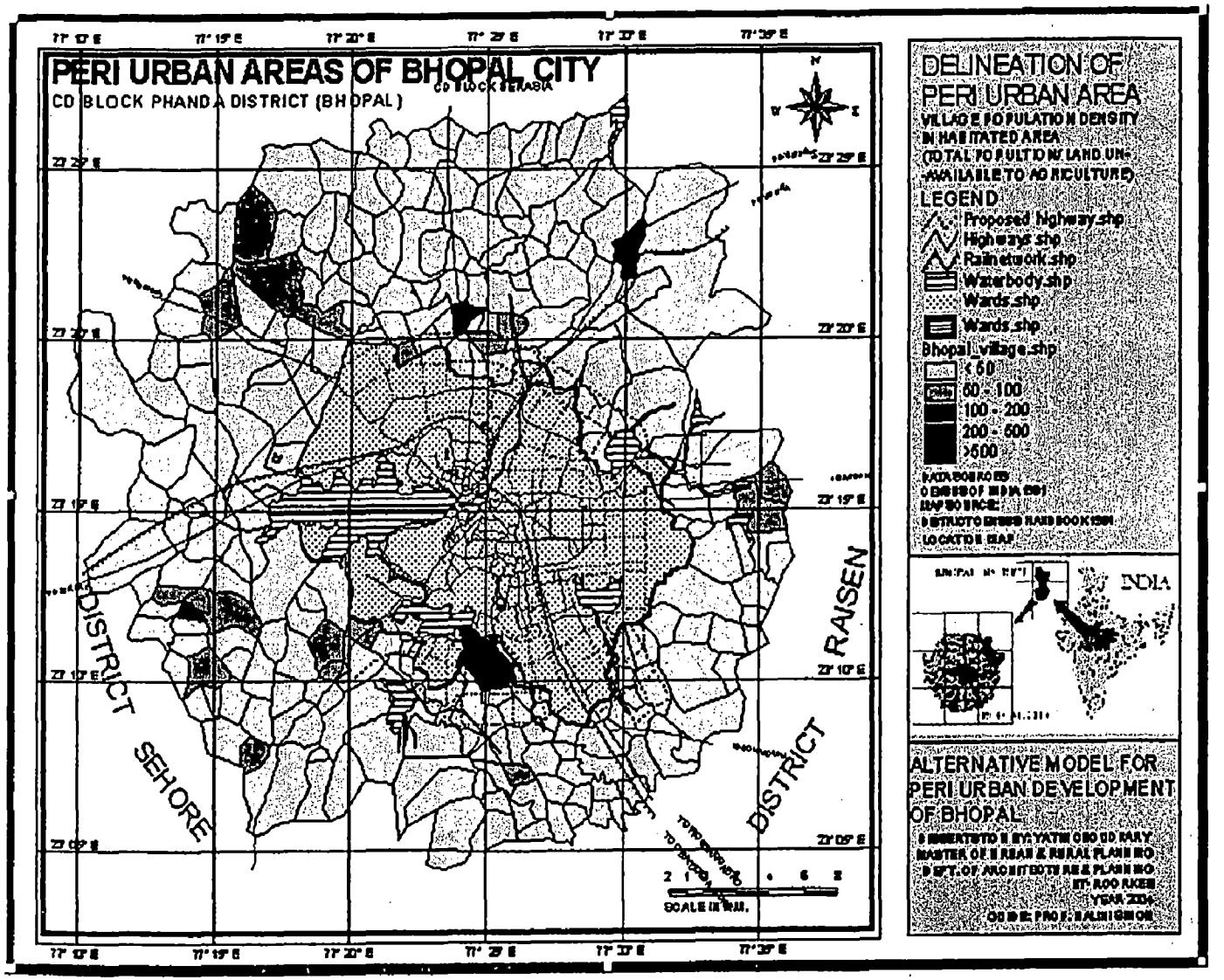
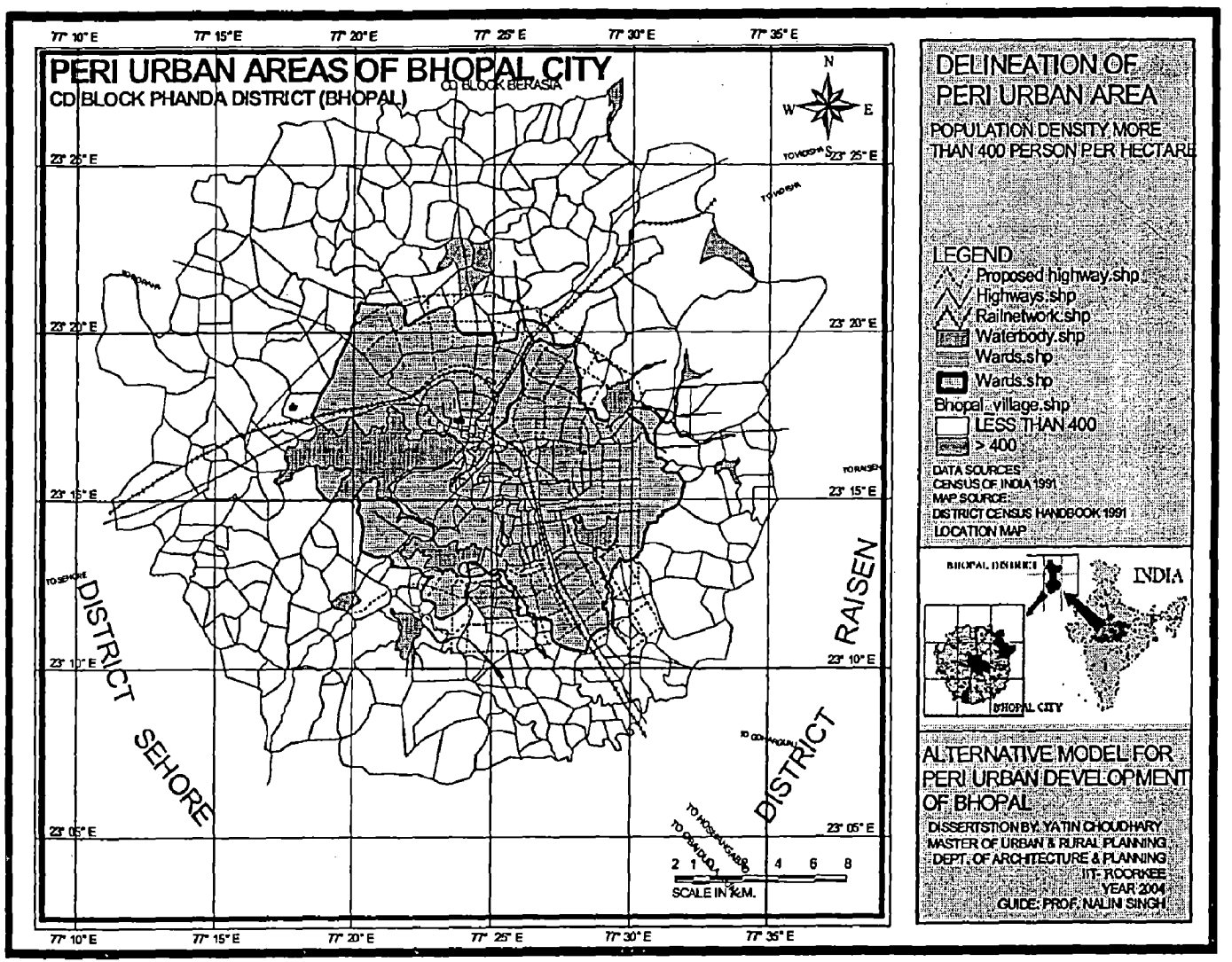


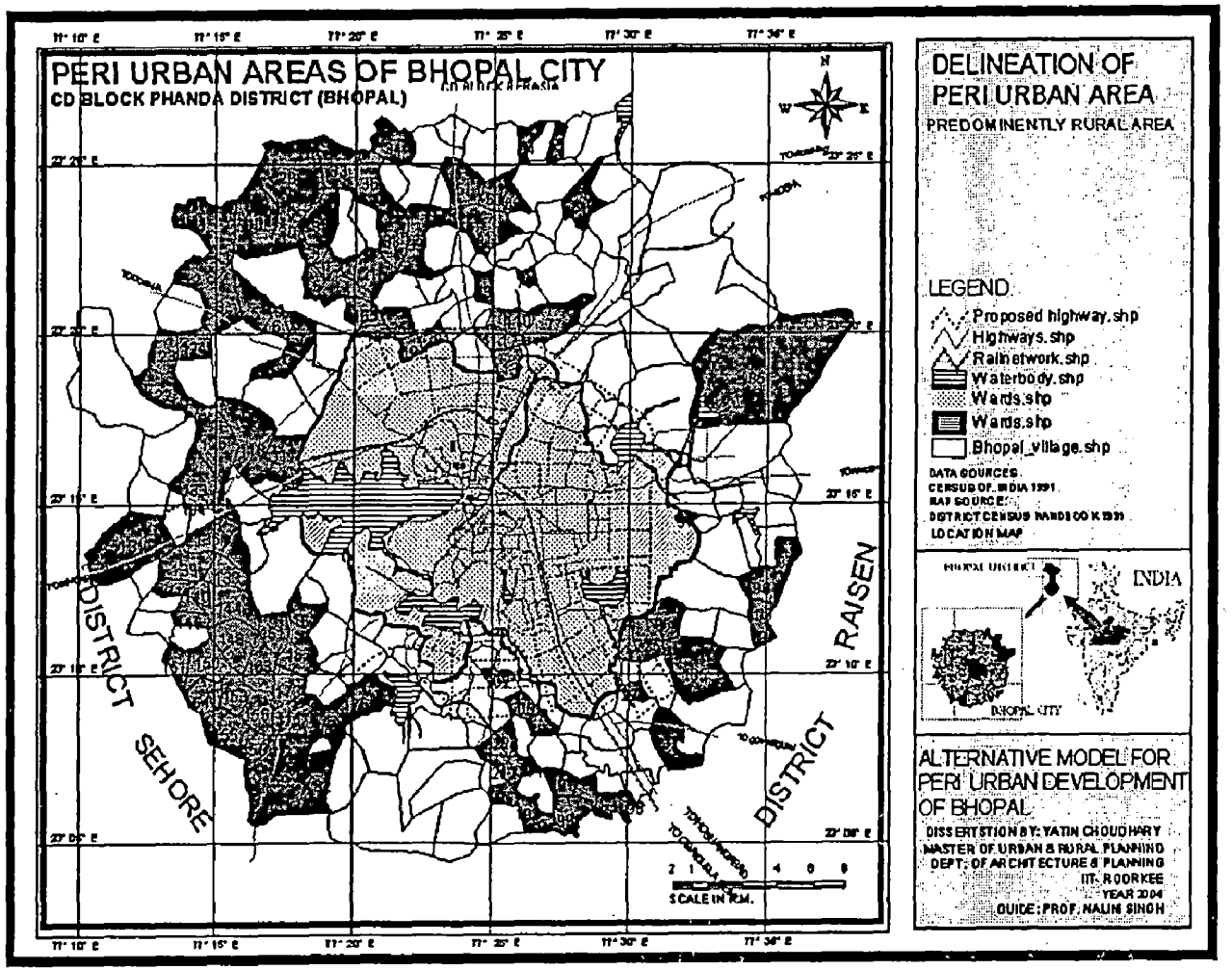
Fig 7.3 Peri urban area by population density determinent



7.4.2 PERI URBAN AREA BY LEVEL OF URBANIZATION DETERMINENT

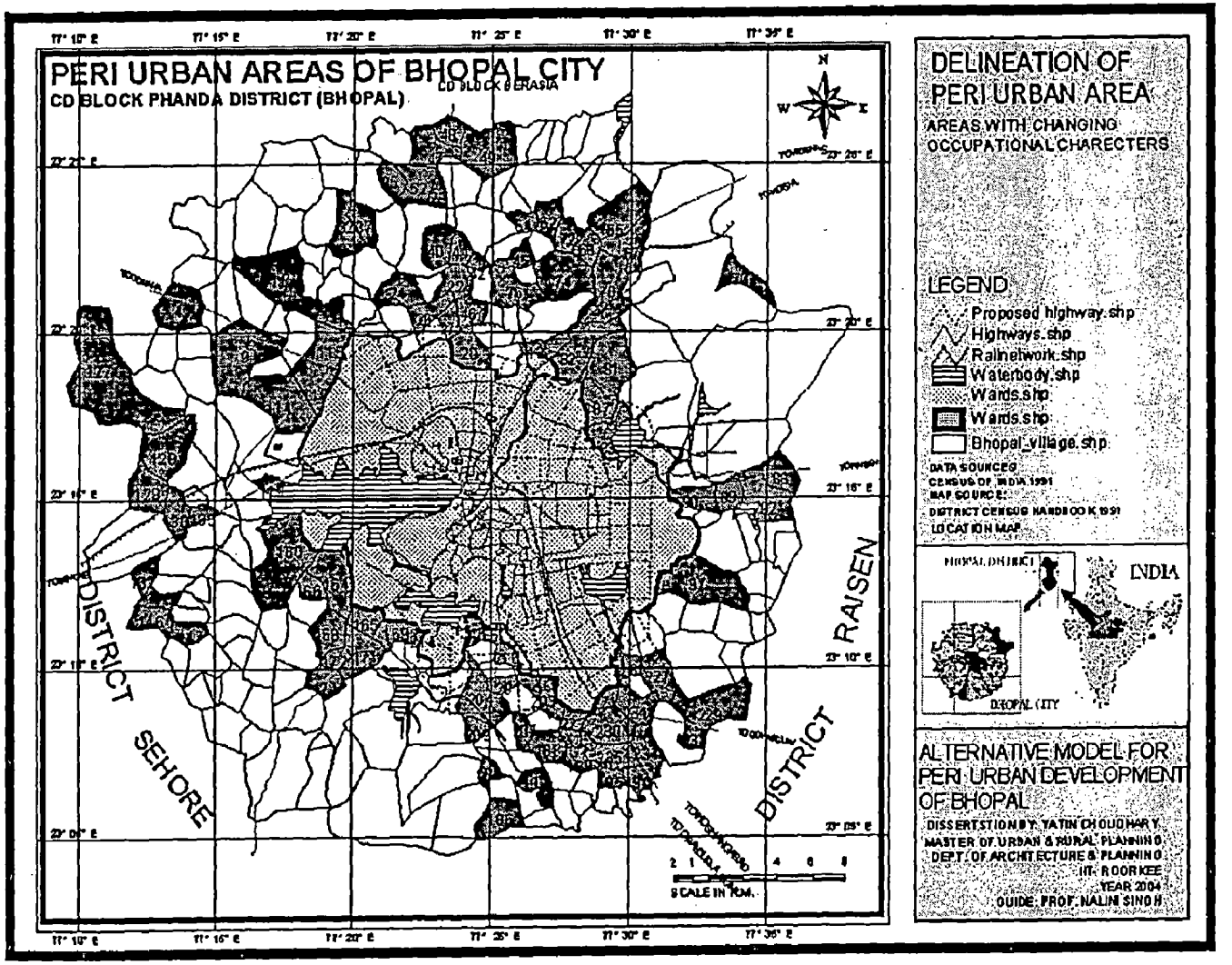
Condition1 predominantly rural area

figure 7.4 Rural: > 50% of total workers are cultivators and > 50% of the total land under agricultural use



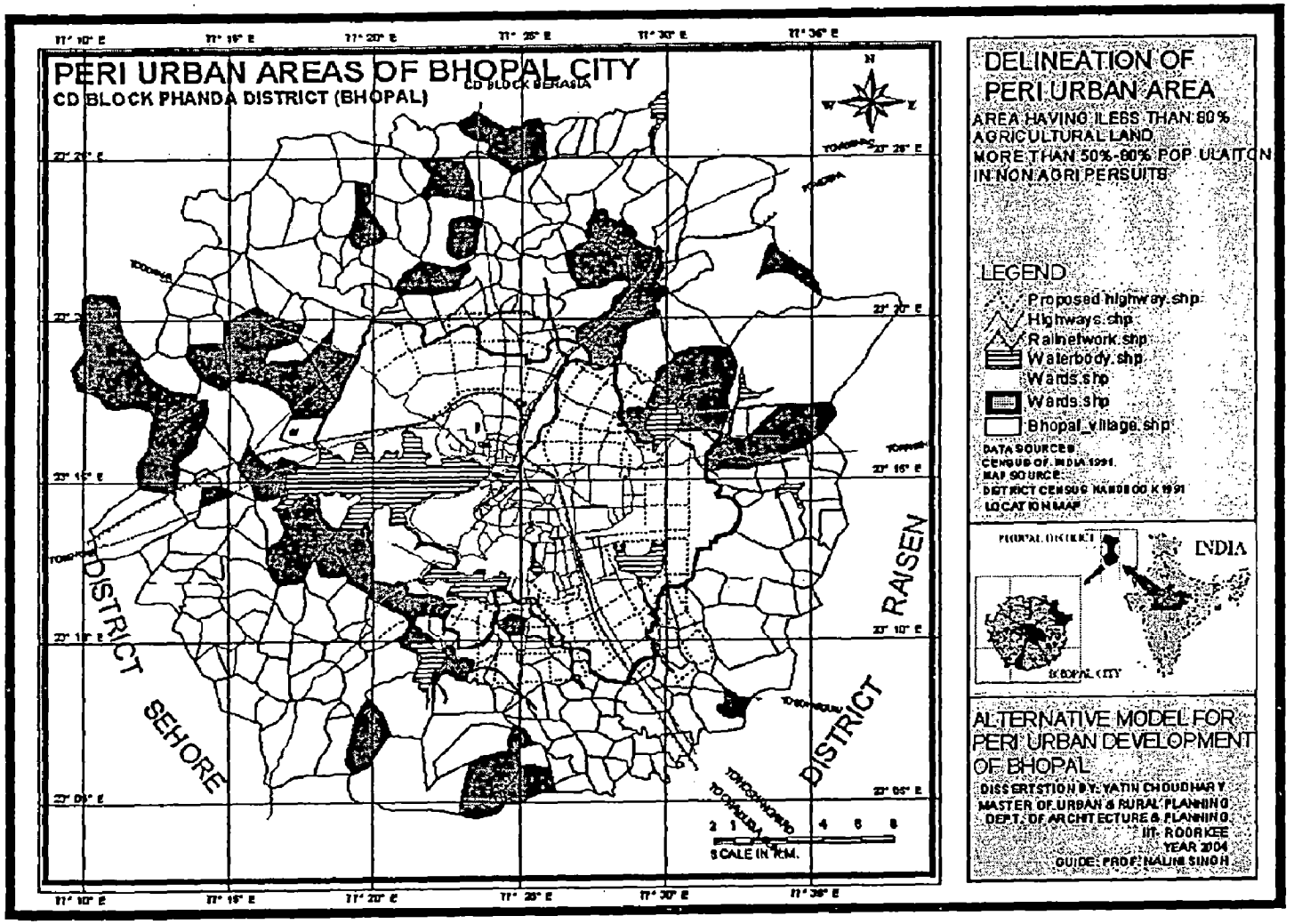
Condition2 Areas with change in occupational characters

figure 7.5 Occupational change: < 50% of total workers are cultivators and > 50% of total land under agriculture



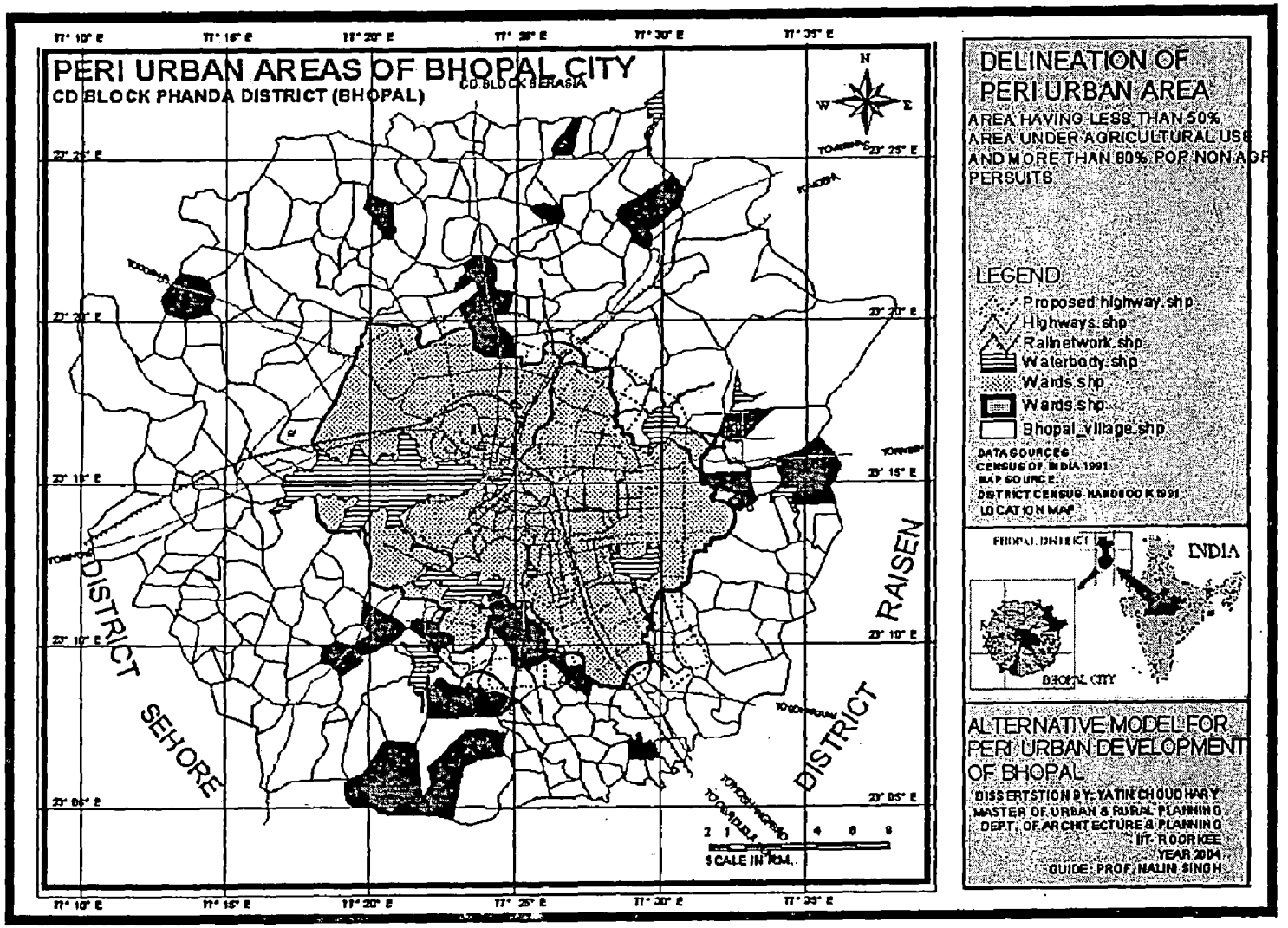
Condition 3 Increasing urban land-use: 50%-80% of total workers non agricultural pursuits and <80% of total land under Agriculture

figure 7.6 Increasing urban land-use



Condition 4 Urban: > 80% of total workers in non agricultural pursuits and 1< 50% of total land under agriculture

figure 7.7 Urban area



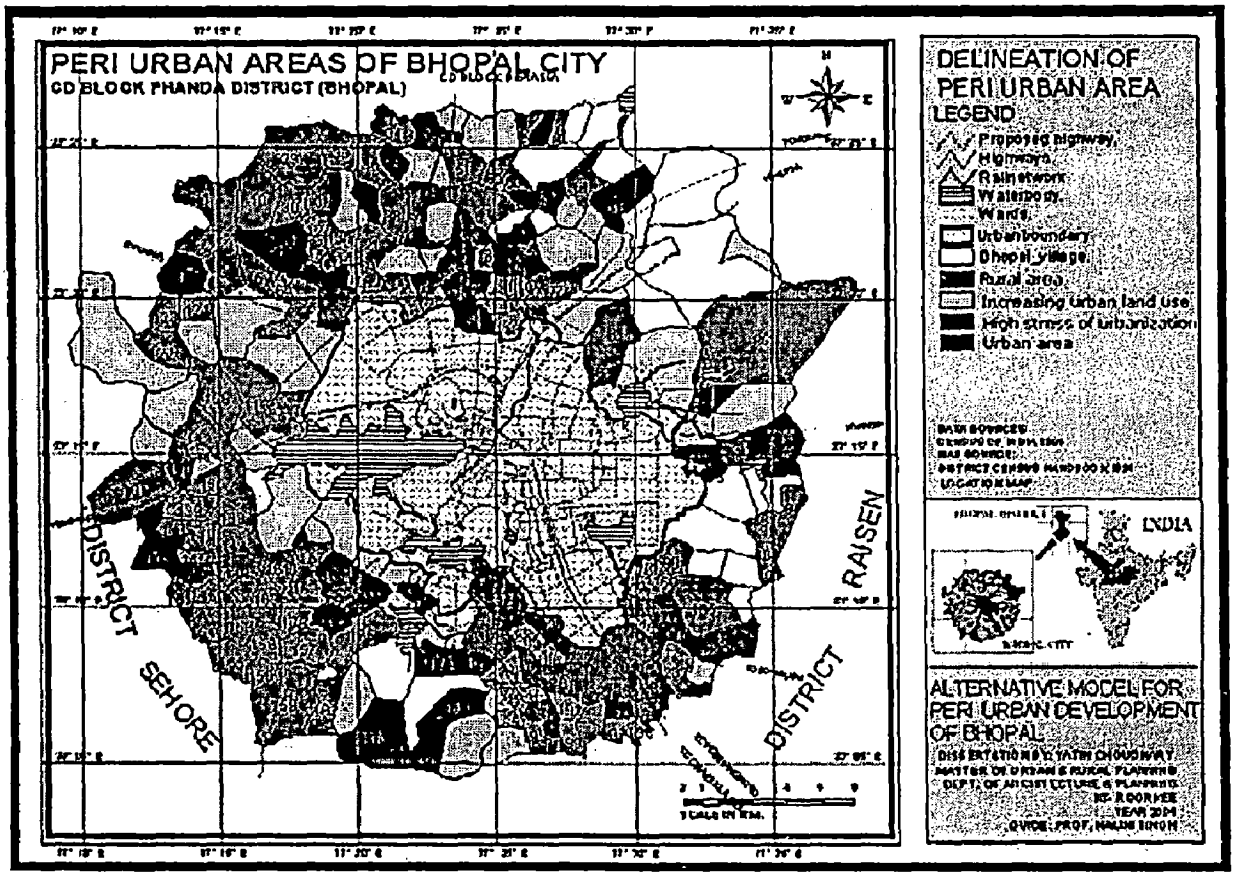


figure 7.8 Resultant pattern of peri urban development

7.5 INFERENCES

the above figure shows the delineation of different levels of urbanization in cd block Phanda of Bhopal District. From the above delineation we can identify the changing socio-economical characteristics supported by the landuse change data. The most urbanized villages in peri urban area of Bhopal are Damkheda, Banjari, Akbarpur and Nayapura Ratibad on the south of the Bhopal city. The villages on the either side of NH 12 towards hoshangabad are under high stress of urbanization in addition to these there are villages on the south west of upper lake and on the SH 18 towards Vidisha are experiencing occupational change under the influence of the parent city.

FIELD SURVEY

8.1 FIELD SURVEY

Field survey is the most important tool in the hands of an Urban planner. The objective of a survey is to find comprehensive information of the whole population with the use of proper sampling. In this dissertation the survey is made in villages delineated as peri urban areas of Bhopal. The survey is also used to verify the secondary sources of information which are used in the dissertation

8.1.1 Objective of the Field survey

The objective of this study is to analyze the impact of urbanization on the peri urban villages in Bhopal city's rural-urban fringe. the field survey puts to light different aspects of the peri urban areas, which focuses on finding following central information

Q. What is the influence of urbanization on:

1. Occupational features of villages in the rural-urban fringe?
2. Land use in and around the villages?
3. The actors and their strategies for coping with urbanization?
4. The livelihood of the villagers?
5. The living conditions of villagers and workers in urbanizing villages?

8.1.2 Formation of research questions

These central research questions can be expanded to form more specific research Questions:

1. The rural-urban fringe and the villages

Q What are the characteristics of Bhopal's rural-urban fringe?

Q How do the villages differ in type of development?

2. Land use

Q How does urbanization affect rural land?

Q What are the indicators of urbanizing land and what are the influencing factors?

Q Does land degradation occur from a socio-economic perspective?

3. The actors influencing land use

Q Who are the key local and extra-local actors with a stake in spatial developments?

Q What are the strategies of the actors in the urbanization process?

Q How does the interaction between actors influence patterns of land use and the supply of urban land?

4. Household livelihood

Q What is the former and current situation regarding agricultural assets, occupational diversity, and sources of income in peri urban area?

Q Which factors influence the integration into urban occupations and income?

Q What are the livelihood patterns are emerging and what is the resulting standard of living?

Q What are the prevailing perceptions of urbanization in occupants?

5. Living conditions

Q What are the consequences of urbanization in terms of living conditions?

Q Who is most vulnerable to negative living conditions?

Q What are the most precarious locations?

Q What are the prevailing perceptions about living conditions?

8.1.3 Methodology of field study and data sources

In order to draw upon a comprehensive range of information, the study makes use of a variety of resources and methods. The census data and other records are used to get a more general picture of the population profile and employment structure.

Interviews in different forms (surveys and interviews with key informants) are the main instruments to find out about peri urban livelihood issues.

Secondary data sources

Secondary sources include information and figures from census documents, publications, and the media.

Census data

Census data provide useful information at the village level and, more generally, about the land and population in the area. Census data are used to categories the research villages within the rural-to-urban continuum on the basis of land use and occupational characteristics Geographic Information System (GIS) is used to analyze the census data spatially.

Maps used for GIS

Detailed maps are crucial to this study because they show the physical aspects of the urbanizing environment of the villages.

Primary surveys

The basic household survey provides basic information about the peri urban population. The basic household survey includes variables on the following subjects:

- Land ownership
- Place of origin
- Demographic structure (age, type of household, number of children)
- Occupational characteristics (type of work, place of work)
- Assets and living standards.

The basic household survey provides quantitative data about the livelihood characteristics of the population. The economic standard of living can be determined through household assets. This survey sheds light on the differences between the distinguished groups in the population. The questionnaire prepared for the purpose is added to annexure. Statistical analysis is performed for the main independent variables.

The weekly market in different parts of Bhopal and in peri urban areas proved to be good field of study as most of the sellers in the market belonged to the peri urban areas. Interview were carried for the insights on following topics

- Land prices
- The local structure of agricultural employment and income
- The aspects of change in occupation and income
- Change of occupations between generations (mostly father-son change)
- The spatial aspects of livelihood: urban and other extra-local work versus local economic activities
- Perception of village and household changes related to urbanization
- Perception of living conditions in peri urban areas.

8.1.4 Selection of field study areas

The study was carried out in four areas:

1. 6 villages in out growth of Bhopal city namely Damkheda, Banjari, Akbarpur, Nayapura, Genhun Kheda and Bairaghar chichli **(Kolar road)**
2. 3 villages on the either side of NH 12 towards Hoshangabad these include Ratanpur, samardha kaliuasoth, Narela Hanumant Singh **(Hoshangabad road)**
3. 3 villages towards Bilkisgunj near Bhadbada namely Neelbad Ratibad and Kalkhedi **(Ratibad)**
4. 4 village on the SH 23 towards Berasia town namely Lambakheda, Golkhedi, inthkhedi sadak and Beenapur **(Berasia)**

The three field study areas are on the highways. These are the areas which are most sensitive to the influence of the parent city. The basic household survey was carried out these areas, where 16 villages, representing the different stages of urbanization, were surveyed. This information, in combination with practical considerations (such as access, settlement size, etc.), was used to make a analysis.

8.2 SECONDARY DATA REPRESENTATION FOR DELINEATED AREA

Profile of villages delineated as peri urban areas

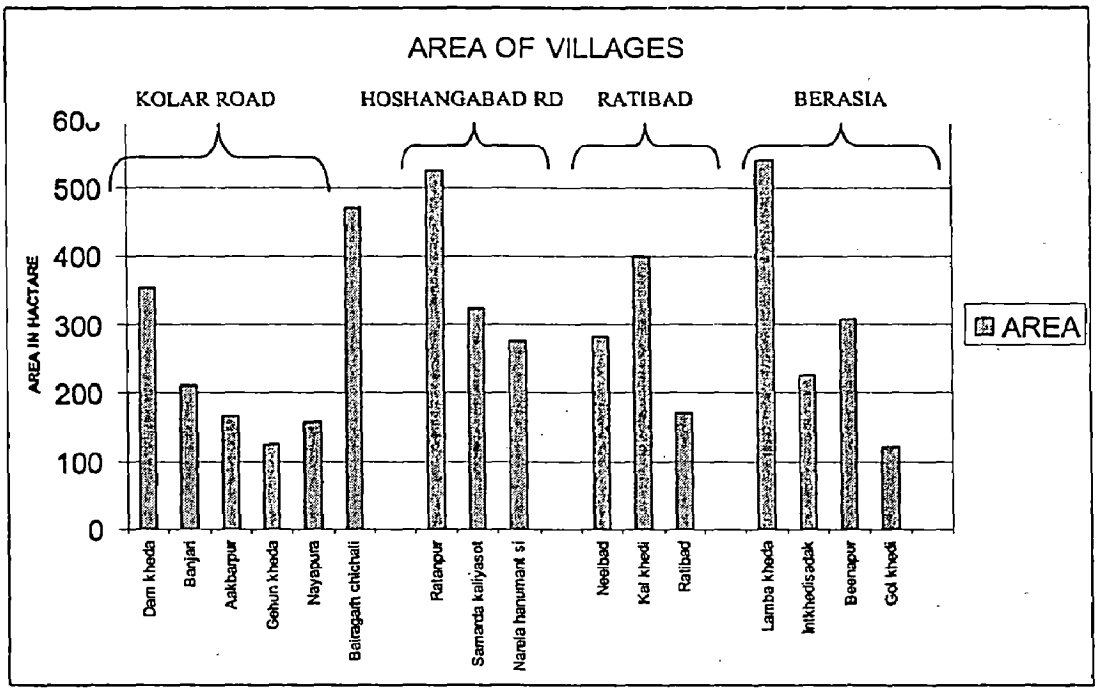


figure 8.1 Comparative analysis of area of villages in peri urban area of Bhopal

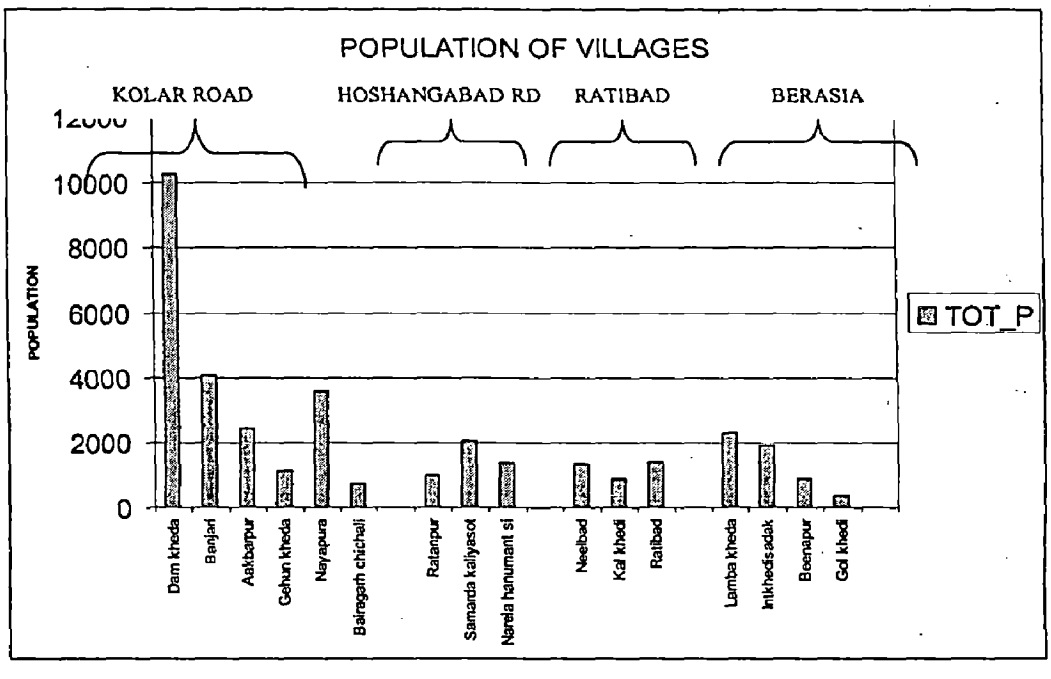


figure 8.2 Comparative analysis of Population of villages

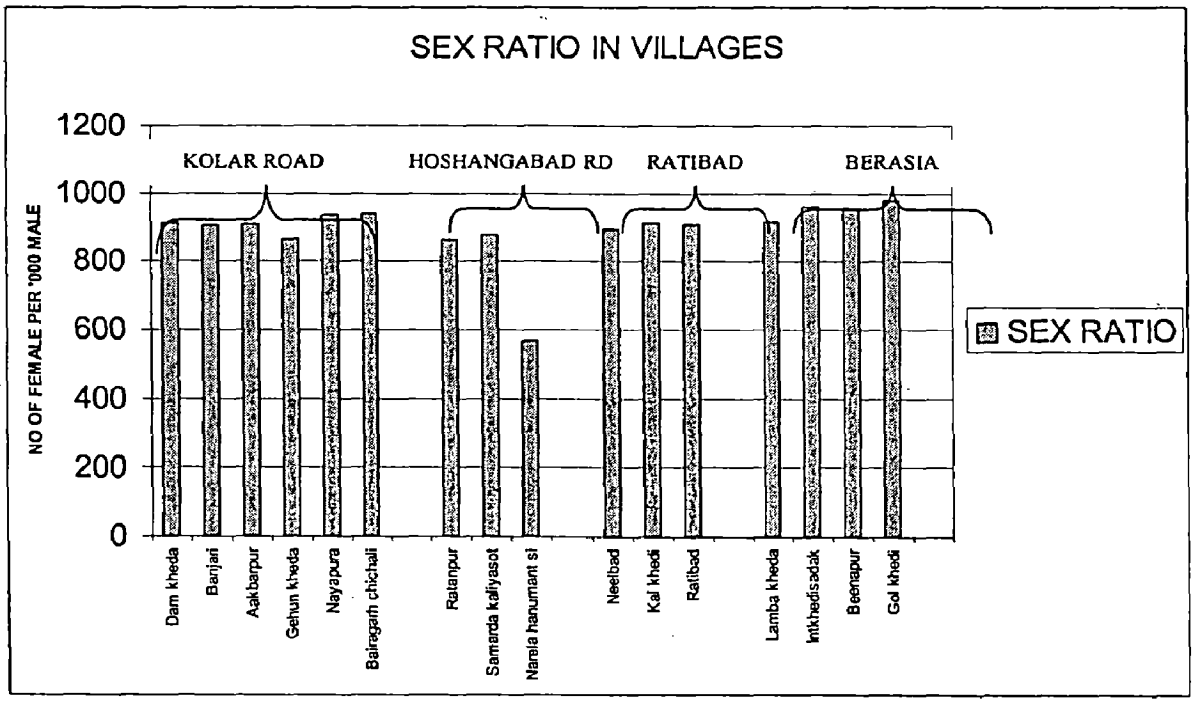


figure 8.3 Comparative analysis of sex ratio of villages

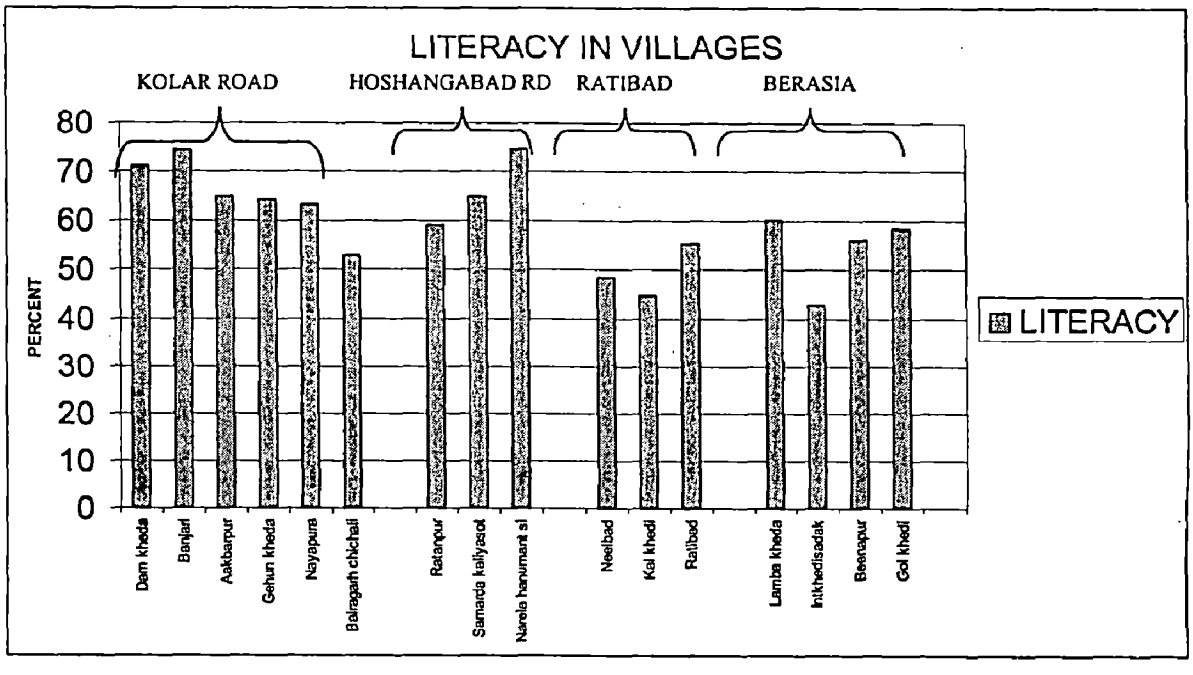


figure 8.4 Comparative analysis of literacy in villages

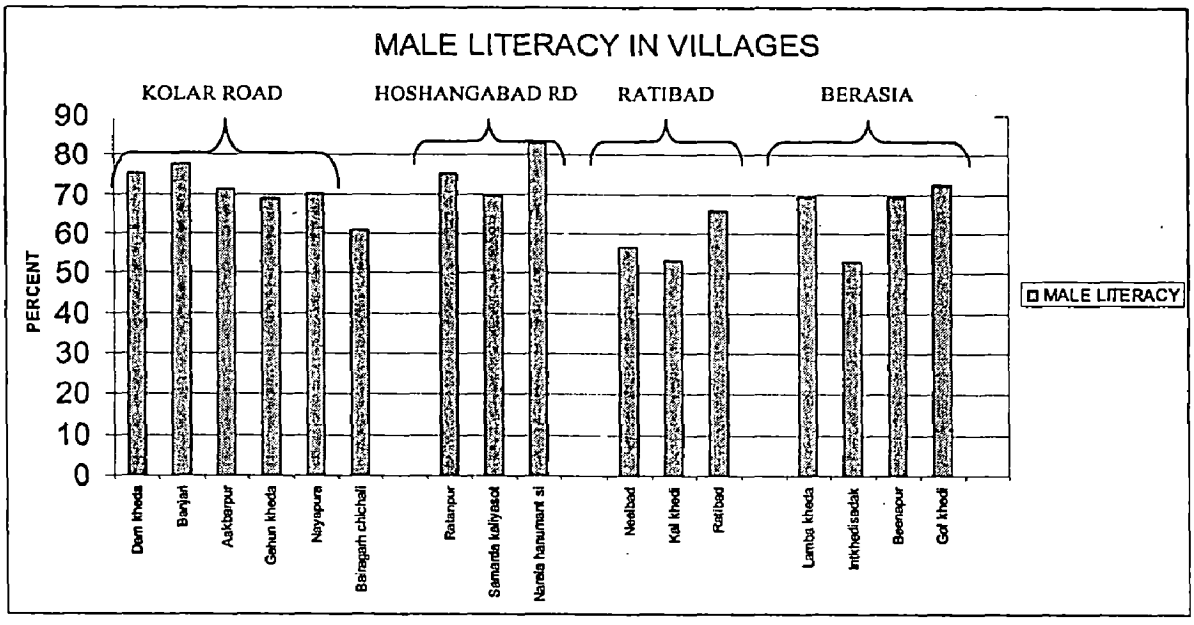


figure 8.5 Comparative analysis male literacy in villages

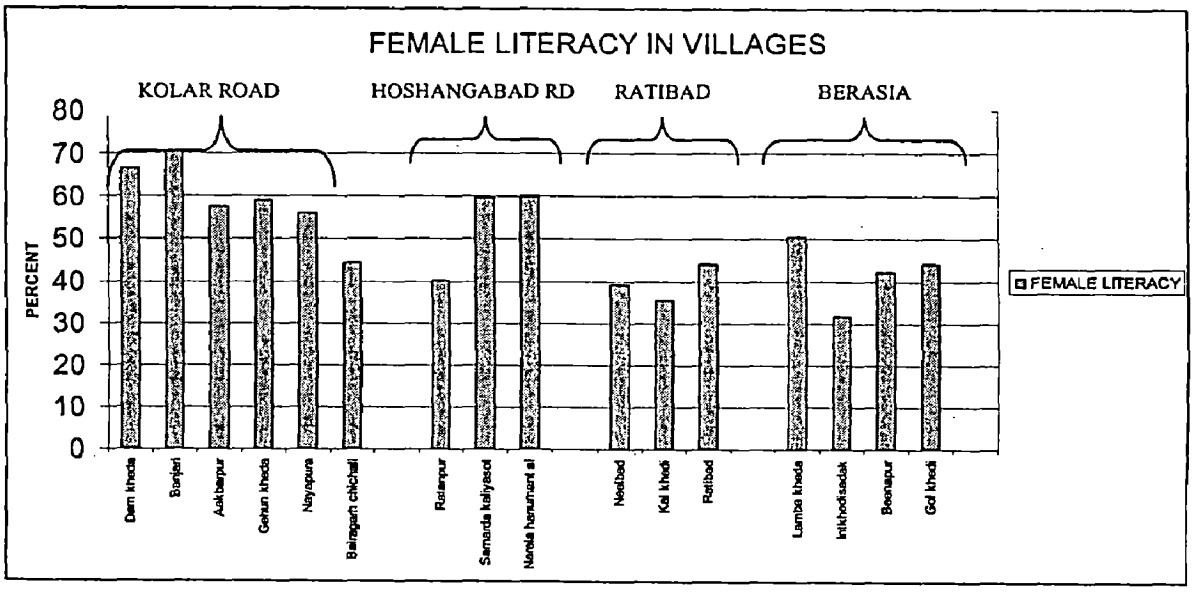


figure 8.6 Comparative analysis of female literacy villages

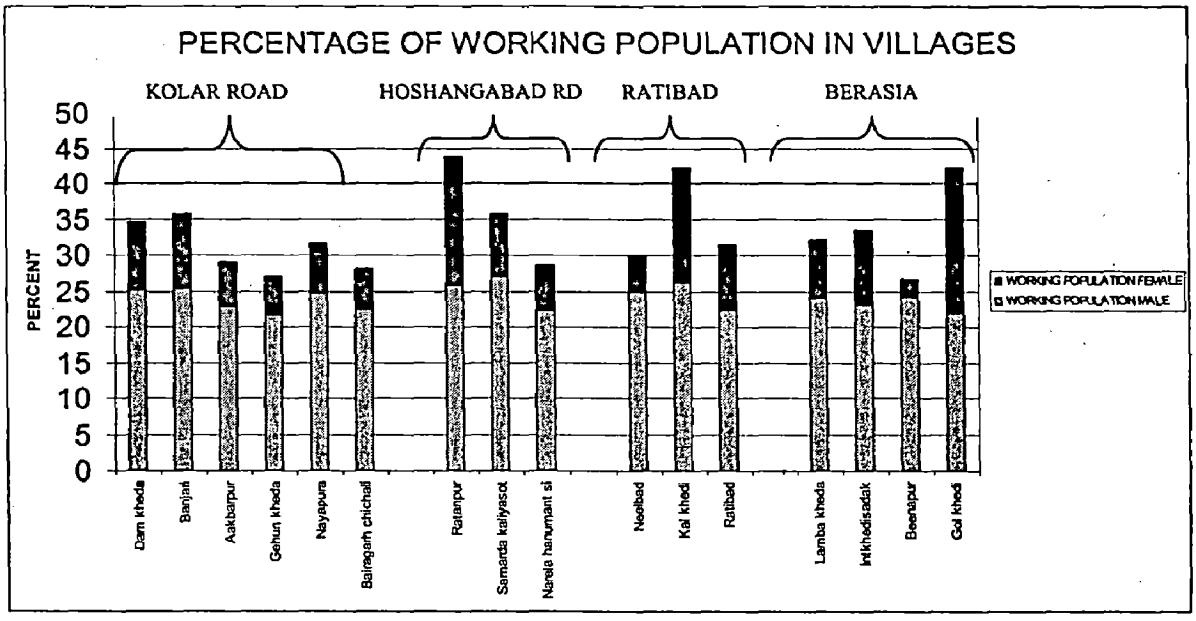


figure 8.7 Comparative analysis of percentage of working population

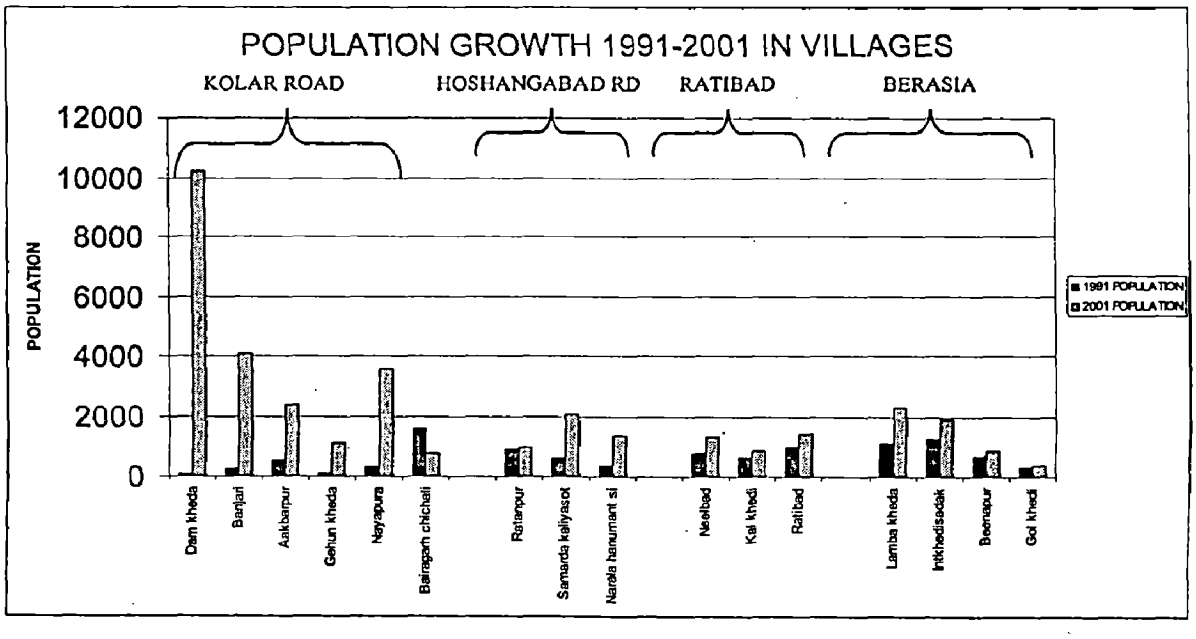


figure 8.8 Comparative analysis population growth in villages during 1991-2001

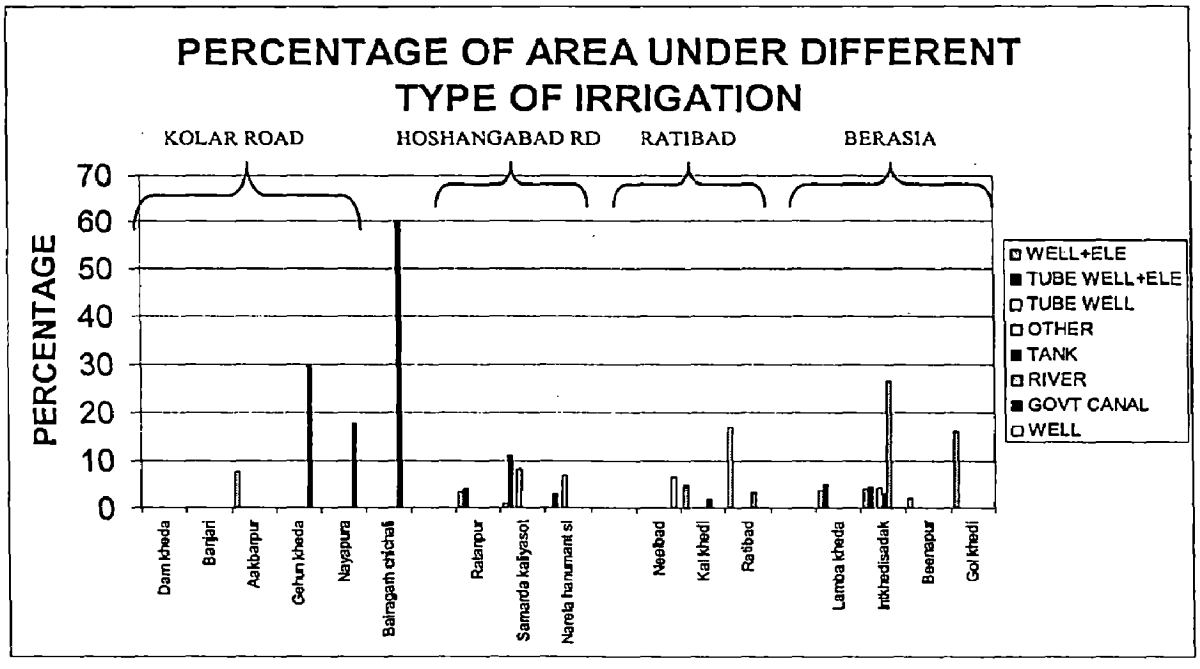


figure 8.9 Comparative analysis of percentage of area under different type of irrigation

8.3 DATA PRESENTATION OF PRIMARY SURVEY

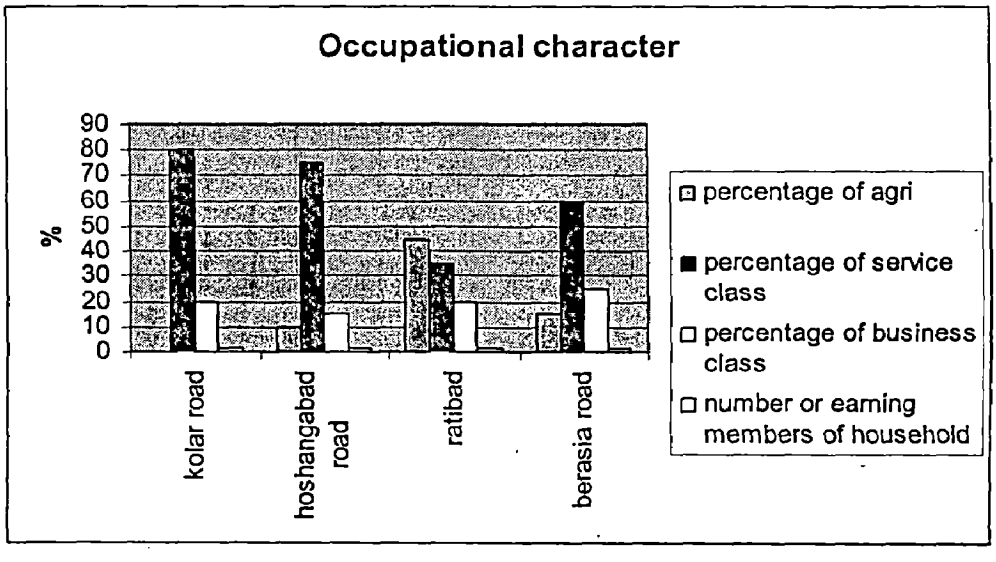


figure 8.10 Comparative analysis of occupational character in peri urban area

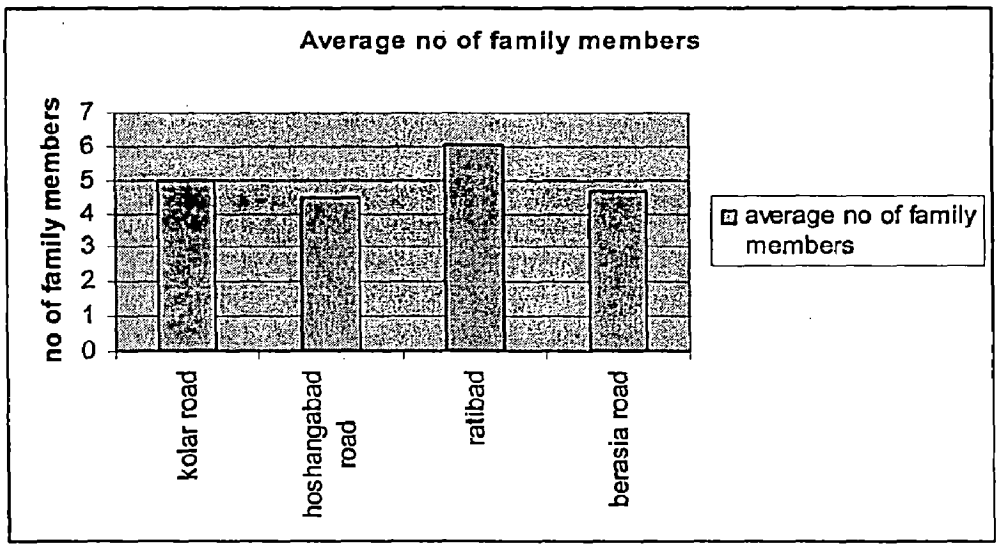


figure 8.11 Comparative analysis of size of family in peri urban area

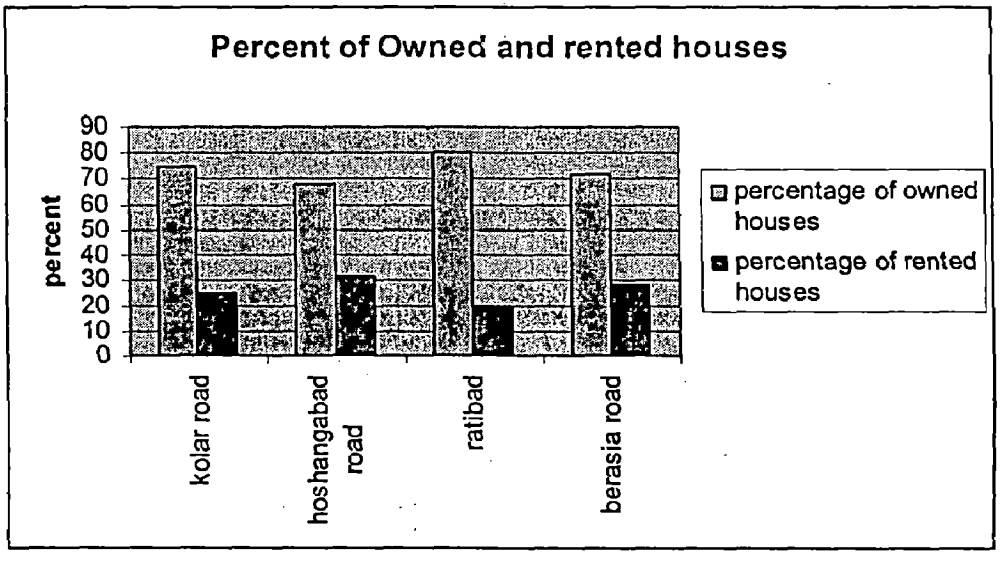


figure 8.12 Comparative analysis of percent of owned and rented houses in peri urban area

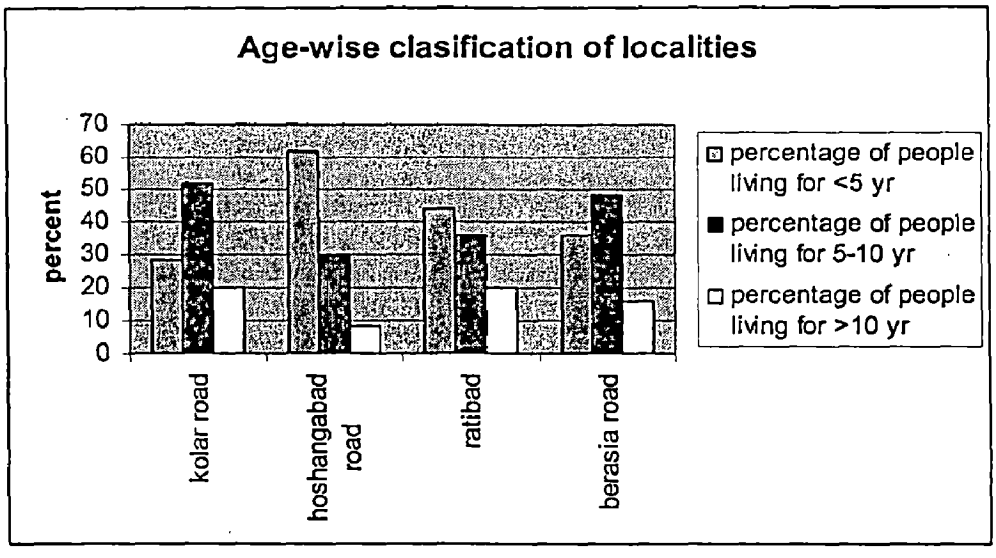


figure 8.13 Comparative analysis of age wise classification of peri urban area

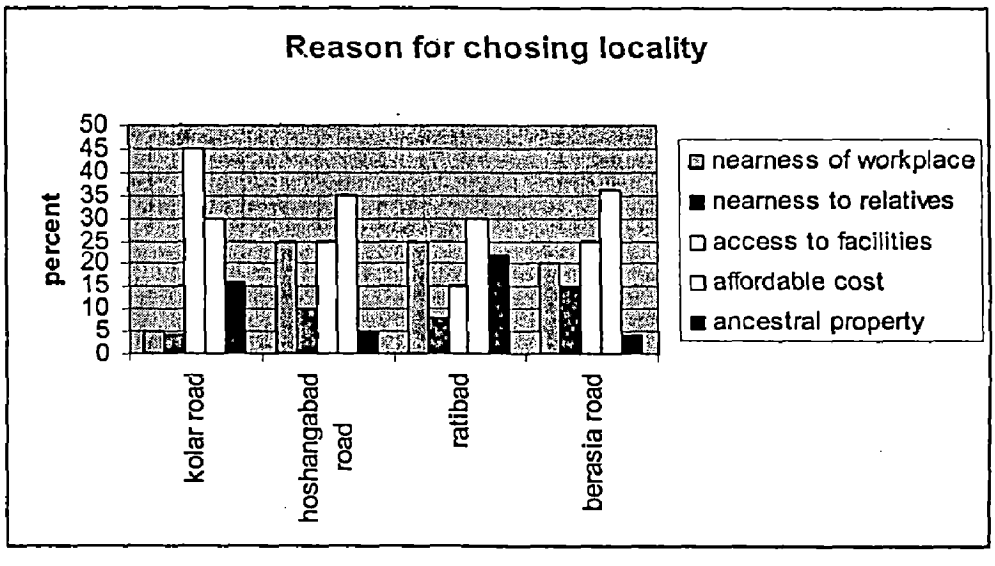


figure 8.14 Comparative analysis of reason for choosing locality in peri urban area

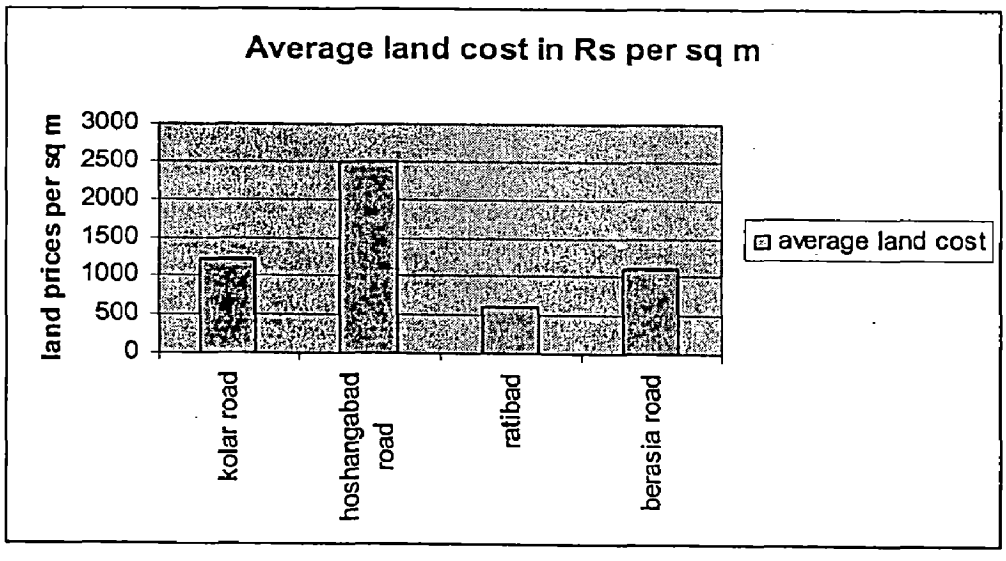


figure 8.15 Comparative analysis of average land cost in peri urban area

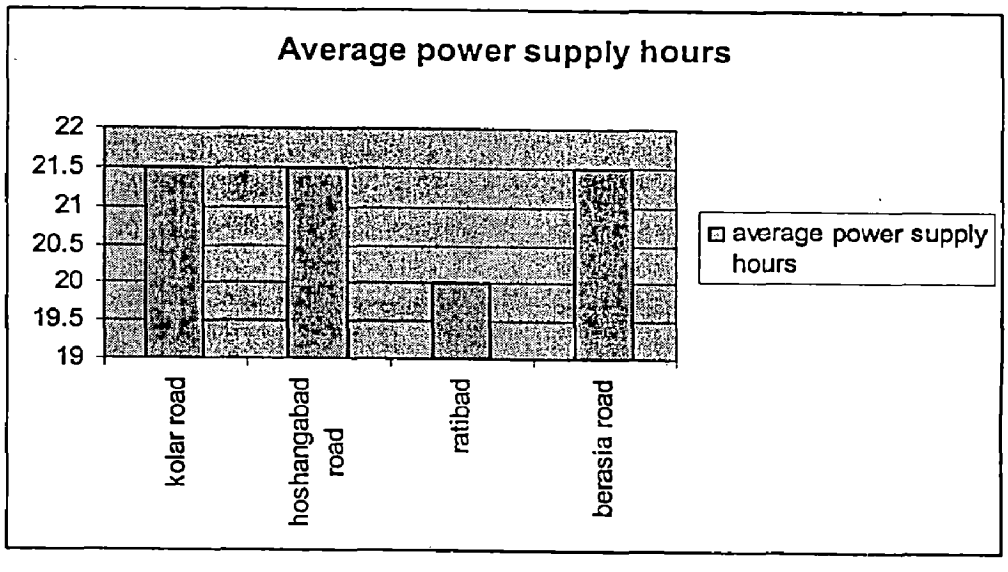


figure 8.16 Comparative analysis of Average power supply in peri urban area

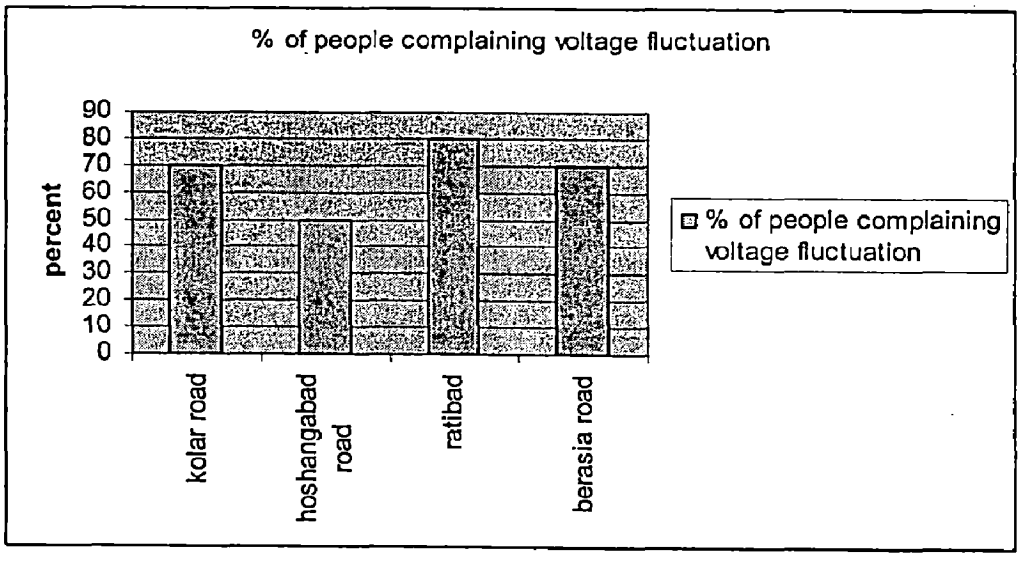


figure 8.17 Comparative analysis of failure of electric supply in peri urban area

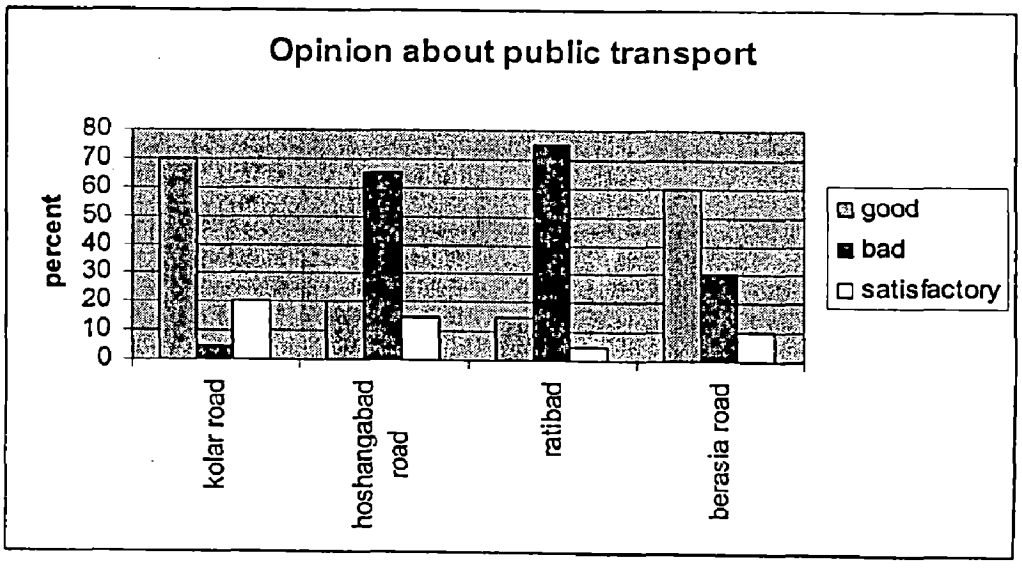


figure 8.18 Comparative analysis of opinion about public transport in peri urban area

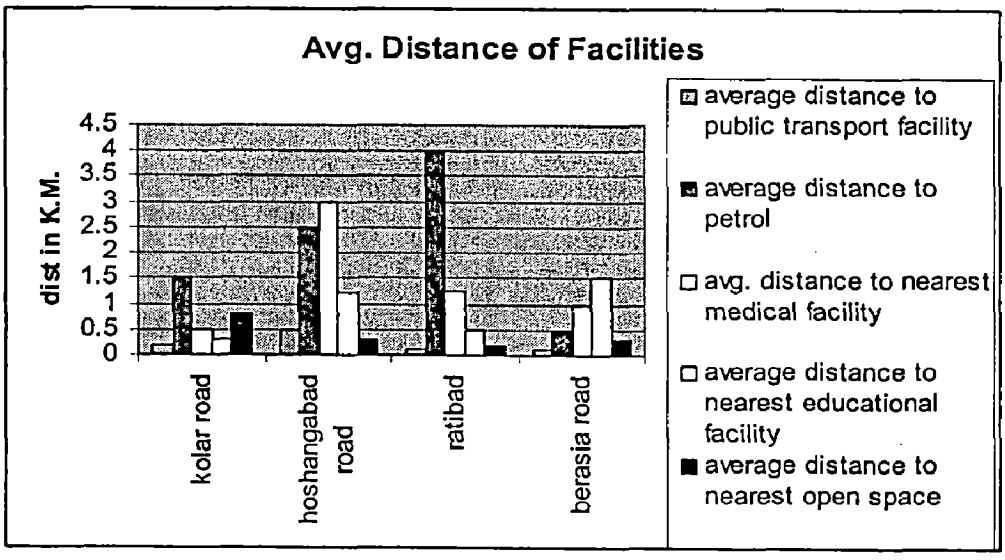


figure 8.19 Comparative analysis of average distance of facilities (set 1)

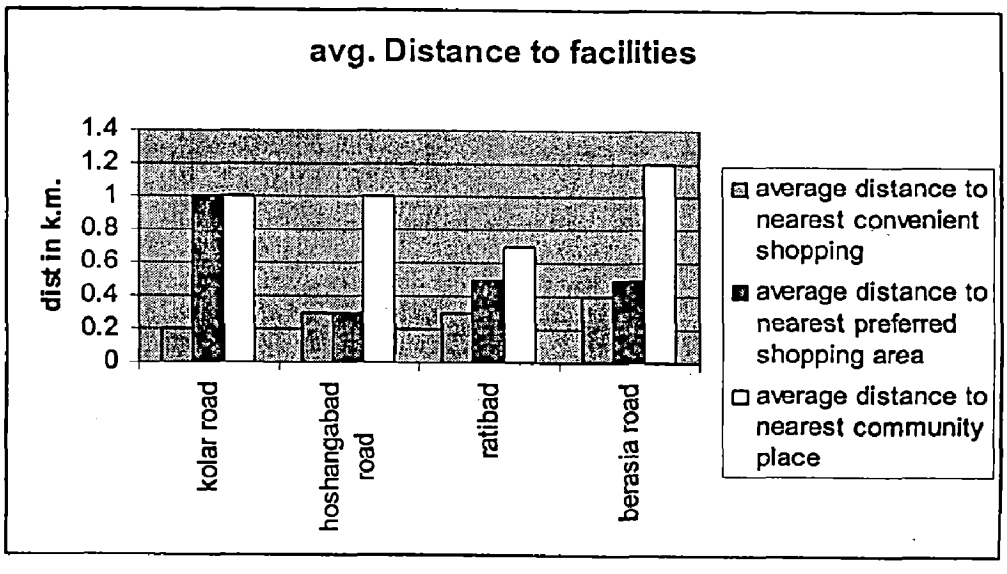


figure 8.20 Comparative analysis of average distance of facilities (set 2)

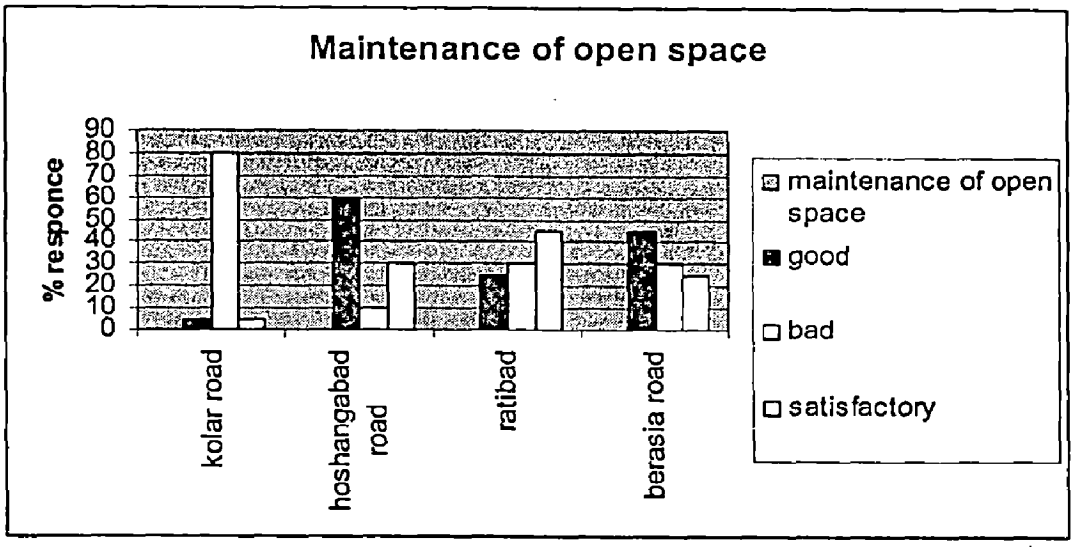


figure 8.21 Comparative analysis of maintenance of open spaces

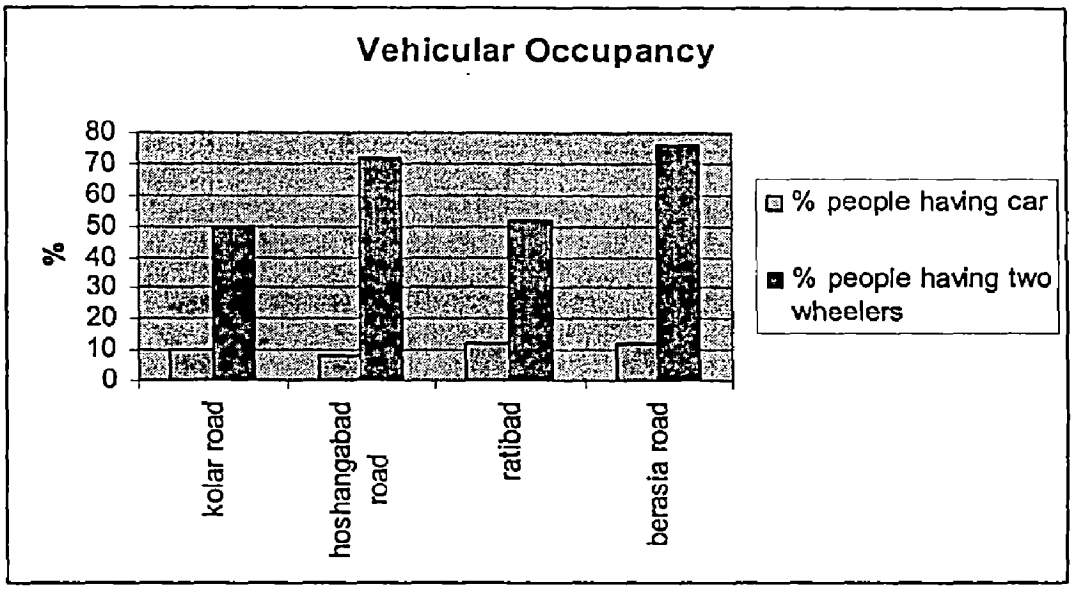


figure 8.22 Comparative analysis of vehicular occupency

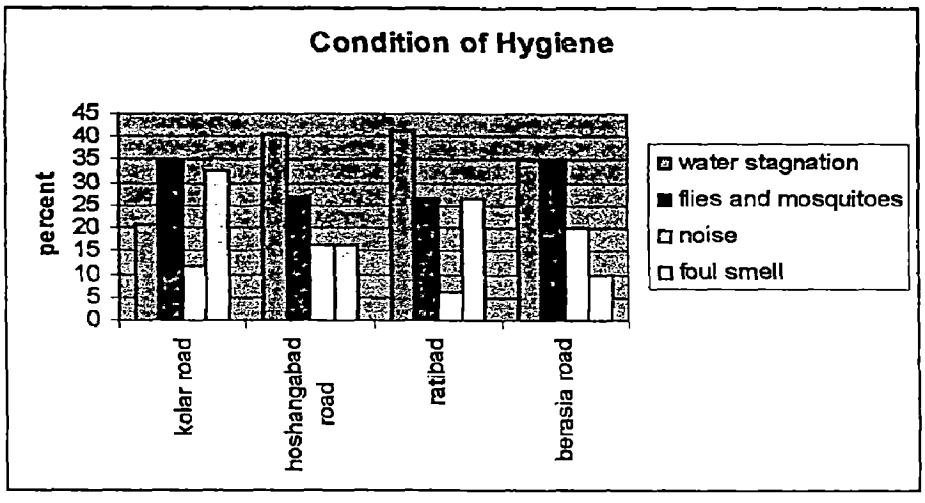


figure 8.23 Comparative analysis of condition of hygiene

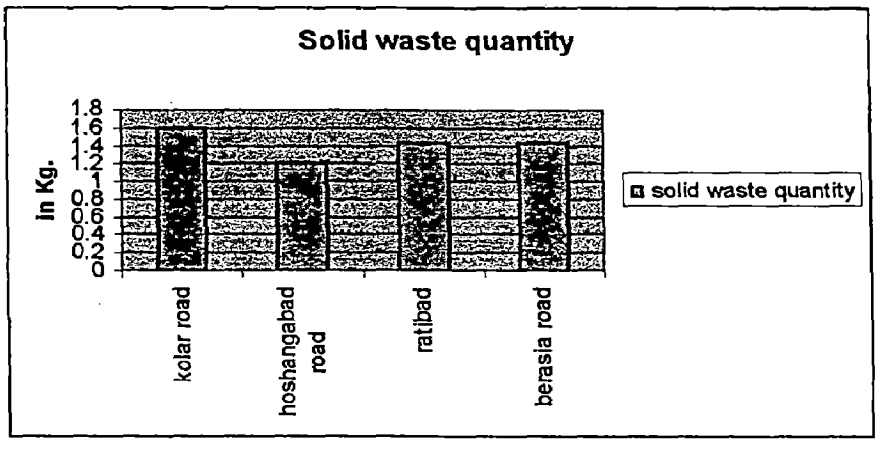


figure 8.24 Comparative analysis of solid waste quantity

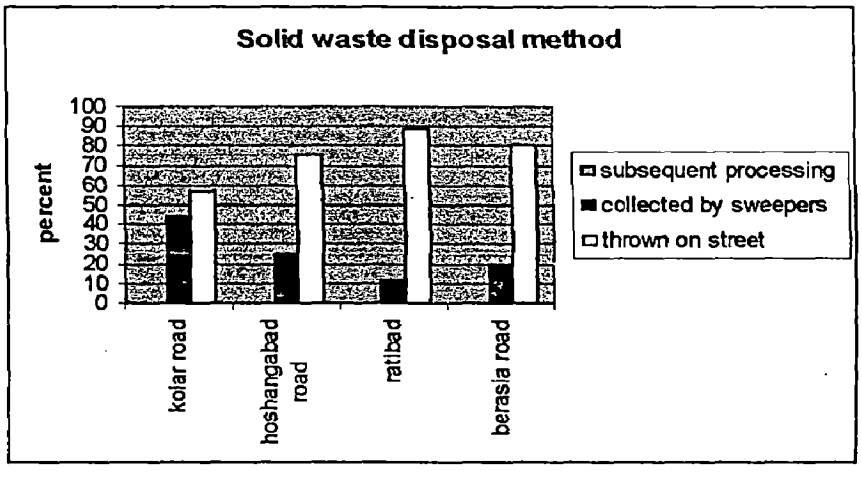


figure 8.25 solid waste disposal method

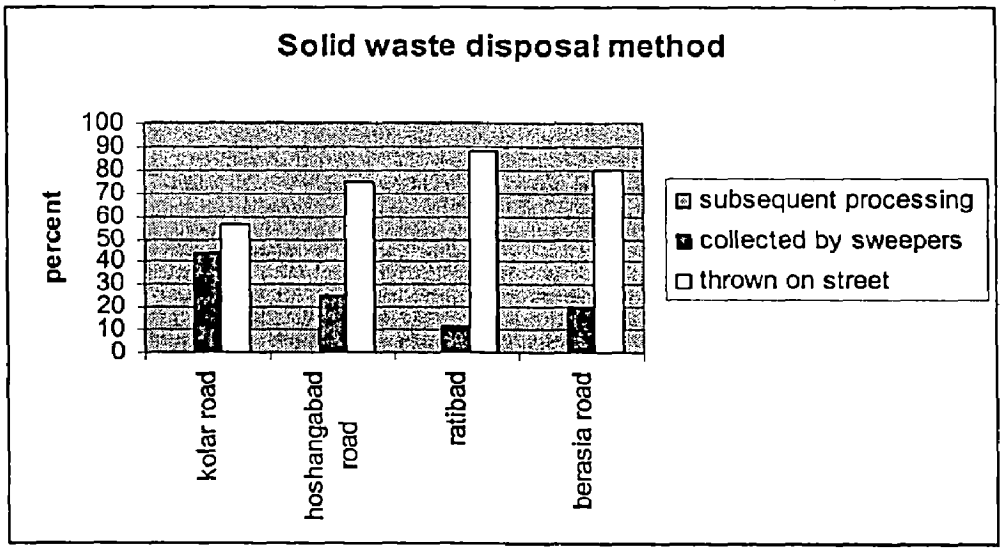


figure 8.25 solid waste disposal method

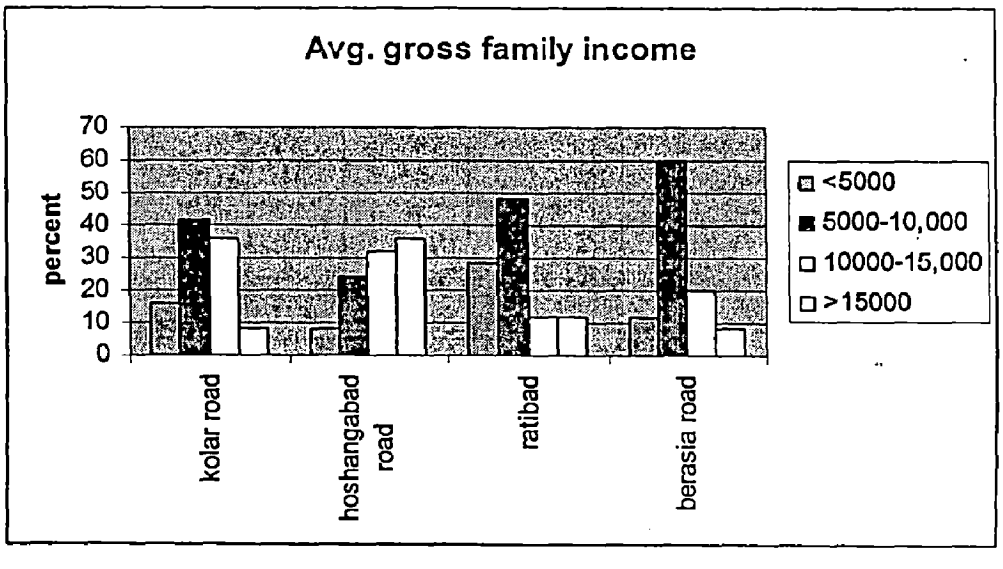


figure 8.26 Comparative analysis of average gross family income

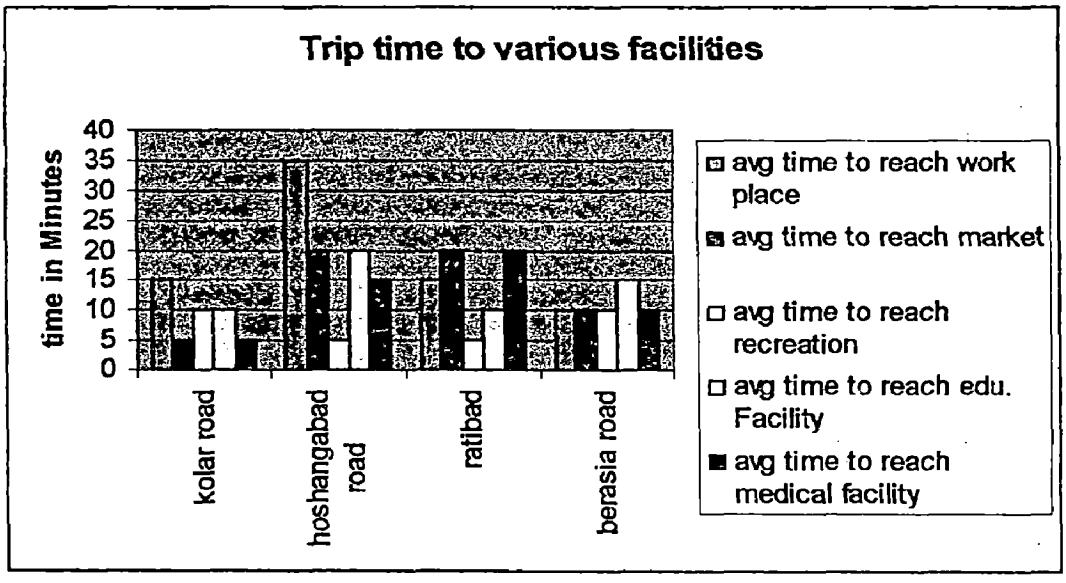


figure 8.28 Comparative analysis of trip time to various facilities

8.3 CONCLUSION

the primary survey and field study undertaken in the study area gives the vision of the socioeconomic character information about the occupational behavior, land use, hygiene, relation ships of residential and work areas, availability of infrastructure facilities and distance, demographic profile of families etc. are found which are represented in the graphs. This information together with GIS representation of geographical data and field observation give in-depth information of the study area

(see appendix for tabular database)

DISCUSSION

9.1 SPATIAL DIMENSIONS OF THE PROBLEMS IN PERI URBAN AREAS OF BHOPAL

Rapid urban development is witnessed in Bhopal it has resulted in an unequal distribution of infrastructure and urban facilities. The economy and society of Bhopal are constantly changing. In the period after independence and especially after the capitalization Bhopal witnessed very rapid growth. During the last decades the city growth was mainly shaped by the modernization of economy and increase in mobility. Traditional industries and trades in Bhopal have declined by the effect of industrial location policy. New jobs in the city have developed mainly in the service sector and at new locations. Telecommunication and technical innovations in transportation have had a decisive influence on the economy and on our way of life. All these developments have spatial impacts on the city. They have changed the space in which we live:

- Urbanization of city has resulted in considerable in migration; its spatial consequence is rapid expansion of the city and ribbon development. An ever increasing proportion of land is being used for housing as well as for industrial and commercial buildings.
- The distances between places of residence and workplaces have increased; the present development trend of the city is to procure the cheap agricultural and fellow land for housing. The areas where the main occupational character is agriculture are hard hit. The decentralization of housing is growing, due to the progress in transport technology, telecommunication.
- Agricultural land on the periphery of the Bhopal city is being transformed into building land or it is left fallow since cultivation is no longer profitable. Agriculture's drastic loss of importance as a sector of employment in immediate rural area has resulted in an assimilation of employment structures in the city and the countryside. There has been considerable increase in daily commuters from peri urban area to main city

- The influx of former city-dwellers in to peri urban area also leads to an adjustment of living conditions
- In the agglomeration areas and peri urban areas, which are characterized by the highest population density, the quality of life and the environment have deteriorated due to the expansion of settlement areas and increased traffic volume.
- Urbanization is continuously shifting outwards towards rural areas. The biggest growth occurs less and less in the areas in the immediate neighborhood of the central cities but rather in the less densely populated and rural areas which are further away from the agglomeration areas.
- Settlement dispersion: Population and employment growth is becoming more and more scattered; it often takes place independently of the spatial planning goal to concentrate growth on focus locations designated by planning. Thus it can be observed that peri urban area without central place functions have the greatest growth.
- Functional enrichment of suburbanization: Not only the manufacturing industries have discovered the urban fringe as a preferred location. Enterprises of the tertiary sector e.g. hotels and recreation and educational institute are also locating there, even though they were assumed to be dependent on factors such as contact, image cultivation and proximity to customers in the central cities.
- The appearance of our landscapes has changed drastically. The amount of undisrupted open spaces and natural landscapes is continuously decreasing. These spatial development trends are alarming, especially because of their Negative effects on the environment and hence on our quality of life. Increasing land claims and impairments through housing, industry, commerce and traffic endanger the quality of natural resources.

The peri urban areas have problems which correspond to the problems of an urban land but appear in an interface that is intermediate of rural and urban area. They

have ineffective or in-appropriate land use controls which push the settlement towards the urban periphery and later amalgamate into it.

9.2 DEVELOPMENT PROCESS IN PERI URBAN AREAS OF BHOPAL

In case of Bhopal, the dominant sector behind the developments within the city is private sector. While the role of the public sector has been limited to implementing development schemes or town planning schemes. The major setback in Bhopal's case is in the pace of synchronization of urban planning schemes and actual development. The factors behind development in peri urban area, which make the private sector more active and dynamic, are:

- The availability of land resource at a lower price;
- Proximity and connectivity with city by road and public transport;
- Availability of land and greener areas, freedom from congestion and pollution of the city;
- Minimal planning regulations, freedom from rigorous approval and permission problems from Bhopal Development Authority and Municipal Corporation

9.2.1 Features of the Existing Development in Bhopal

a. The urban development in the fringe area towards Kolar road continues without any guidelines due to absence of any statutory development of the area.

b. haphazard development by private builders is coming up for the increasing housing needs of the population of Bhopal

c. Residential development is occurring along the transportation corridors. This is particularly the case on Hoshangabad road development, the existing transportation corridors and/or availability, of access has spurred ribbon development.

d. The housing by private builders is the main component of the peri urban development in Kolar road, Hoshangabad road, and Berasia road. However

development of social facilities, open spaces and infrastructures has not kept pace with it.

e. The overall built environment in the peri urban area lacks character and cohesiveness.

f. The low intensity but high quality luxurious developments are noted at frequent interval.

g. The quality of physical environment in terms of infrastructure such as waste water disposal, storm water disposal, street light, educational and health facilities, fire fighting and recreational areas is rather poor and inadequate.

h. The bare minimum infrastructure needed for selling the houses and plots has been provided by the promoters and organizers of the private housing scheme.

i. The development pattern within the scheme of pockets is of low-rise high density in character, for minimizing the burden of infrastructure provision.

j. The management and maintenance of infrastructure is inadequate and poor, as it is left to the users. This, however, does not apply to the other luxurious schemes.

9.3 NON SPATIAL DESIGN POLICIES AFFECTING PERI URBAN AREA

There is a range of policies and strategies which, though lacking an explicit spatial or environmental focus, have intended or unintended environmental consequences on the peri-urban interface. Such policies are mainly of a sectoral nature. In this category macroeconomic policies of regional importance are also included; they indirectly exert an influence upon the nature and volume of flows (of goods, people, and services, waste) between urban and rural areas. Some of these sectoral policies affect environment more than others. Such is the case, for example, of transport, energy, agricultural and rural land-use policies. This is because these sectors have a set of direct or indirect links to the environment, the resources found in the peri-urban interface or the poor who either live in it or depend on it for a living

9.3.1 Transport

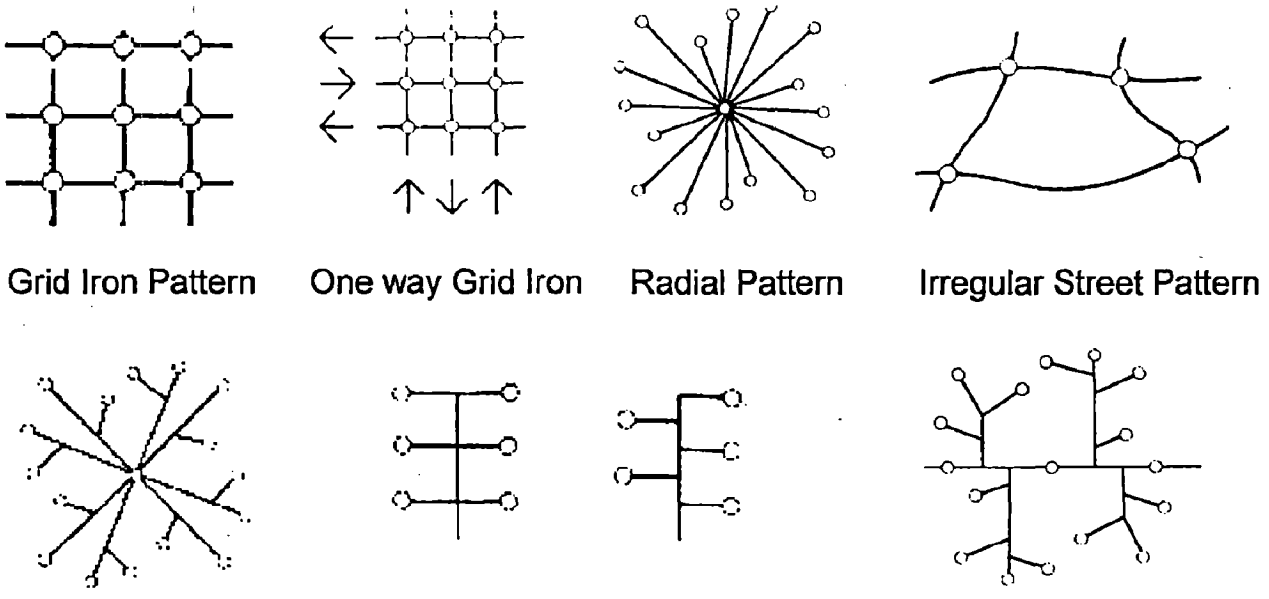
Road networks are like lifelines of any city optimum solution of road infrastructure for any city may differ. In the west, zoning and location planning has tended to be based on transportation system, with commuting time being the determinant of where each type of activity will be located. Because of the existence of mass transit and rapid transit systems , coupled with traffic problems in core areas western planners have tended to expand the city spatially and to locate industrial activity in distant suburbs. In the case of peri urban areas of Bhopal the situation is just reverse of the western model Bhopal is basically a administrative and service oriented city and the suburbs and peri urban areas are mainly consisting of residential development while work sites are situated in the core of the city. In the city resource constraints prevents our developing really efficient transportation systems. There is question of both public and individual affordability, which imposes severe restriction on the type of transportation system that can be adopted or the extent to which the majority of city dwellers can use it. If work sites are located at a great distance from the residential area the following result will ensue.

- Exiting communication arteries would be chocked by density of traffic
- There will be excessive to and fro movement, requiring heavy investment in developing new communication arteries and transportation modes
- Because of low level of individual affordability the transportation system would run at a loss and would need heavy subsidization
- The very poor , to whom all transport , other than there own two feet, is beyond reach will encroach on vacant land near work sites and build squatter colonies . [6]

In Bhopal city the above four phenomenon can be simultaneously observed. Insensitive land use planning is one of the major contributing factors in the rapid decline of our cities, breakdown of transportation system and growth of slums.

Local transport policies are usually designed to increase accessibility of a given population. They set the framework for enlarging or improving the supply of roads or railways and related infrastructure, as well as for enhancing and extending public transport networks. [7]

Transport policies are likely to either seek to increase the accessibility of peri-urban areas to a growing number of local residents. The main environmental impact that such policies are likely to have on the peri-urban interface relate to the direct or indirect destruction of protected habitats, natural parks, forests and other environmentally sensitive areas; they also destroy scarce agricultural land either directly through the construction process or by improving accessibility to it and hastening the process of land conversion to urban uses. While accessibility is issue of prime importance for the transportation network design; the strategic planning is required for optimal selection of transportation network system [ibid]



Grid Iron Pattern | One way Grid Iron | Radial Pattern | Irregular Street Pattern

Branching Radial Pattern | Linear Branching | Irregular Branching

Figure 9.1 Different type of transportation network

9.3.2 Water supply and drainage and sewage disposal

A well distributed settlement draws from water source spread over a large geographical area without exerting pressure at one point, highly decentralized supply system many of them dependent of hand drawl, and are less wasteful users of water than a single monolithic system which mechanically pumps out vast quantities of water and whose distribution system leaks and leads to massive waste.

Direct connection to the question of water supply is drainage, there is no a single city in India which is wholly sewered. The basic approach for serving the cities increasing drainage requirements should be made keeping a long term objective in mind. For this new infrastructure has to be developed at the fringe areas and peri urban areas. The other option is systematic increase in the capacity of drainage system coupled with the improved efficiency of present infrastructure. An alternative to this is that since the development in peri urban areas is private residential development the private participation should be sought; the large residential colonies should be asked to cater for there own need of drainage and sewage disposal

9.3.3 Solid Waste Disposal

The major challenge for solid waste deposal is to increase the awareness of the public to dispose of waste in designated storage bins and containers. Residents generally prefer to dispose of waste when and where it is generated. The practice of recycling is not well organized and segregation of recyclable waste at source has to be adopted.

9.3.4 Energy

The process of economic growth is generally accompanied by a disproportionate growth in the demand for energy. Development is generally constrained by power shortages.

The following possible alternatives to this situation have been suggested:

- More efficient distribution and use of electricity
- Use of renewable resources

The fact that energy consumed by transport will tend to grow faster than either population or incomes is due to a combination of increases in the use of individual forms of motorized transport resulting from increased personal incomes. Thus adaptation of efficient transportation system is also important from the point of energy consumption.

9.4 REGULATORY ENVIRONMENT AND STRETEGIES

The Bhopal municipal limit includes all the developed areas of the city, and already a framework exists for planning, and controlling of development and provision of infrastructure. The Bhopal Development Authority takes care of the area's beyond the municipal limits, which are already witnessing or likely to witness the process of urbanization. For development in the peri-urban areas, permissions have to be taken from the district Panchayat or the Taluka Panchayat.

There are basically two major components; one is non-agricultural permission, and secondly non-agricultural building permission Non-agricultural permission is given by the Taluka Panchayat or the district Panchayat, For the non-agricultural building permission, technical opinion is being taken from the Town and country planning Department . As the district Panchayats do not have any technical staff. Technical opinion from the Town Planning and Valuation Department is given as per development authority guidelines, or of the other nearest development authority, whichever is applicable. The revenue department has procedure for conversion of rural land to the urban use.

9.4.1 Strategies relating to regulatory measures pertaining to land and housing development in peri urban areas

The problem of sprawl and related issues should be checked through a package of tax and subsidy measures, aimed at changing relative attractiveness of the farther areas in fringe as in peri urban area. vis-a-vis nearer areas (including the city area) for the potential buyers. Land farther from the city could be made less attractive, by making non-agricultural permission charges progressively higher with distance from periphery, thereby making the land more expensive.

Another way of discouraging indiscriminate conversion from agriculture to non-agriculture for speculative purposes could be to give non-agricultural permission for limited period of six to eight years only. If the land is not actually put to non-agricultural use within this period, the permission should lapse. The owners then would be required to pay conversion tax again at the current rate for getting fresh permission.

9.4.2 Reforms in procedures for approval of plans

The changes in approval procedure have to be considered at three levels. Simplification of forms and procedures, implementing the procedures in a more efficient way, and reforms in approval philosophy. This could be attained by:

a) Single window approach, with adequate delegation of power and redesign of jobs, so that the application does not have to move over several tables, and be seen and approved by several officers in different offices.

b) Computerization with view to expediting processing of applications.

c) Bringing about openness in the process which eventually will also bring about considerable improvement in the processing time. [3]

9.4.3 Measures to facilitate Public Sector Participation and Public Private Partnership

Formulation of special development area management company with part of shareholding amongst the land owners provides possibilities of private participation, not only in infrastructure provision but also its operation and management. If suitably empowered, it can bring about qualitative changes in regulating developments, including plan approval forms and procedures.

In case of compulsory land acquisition by the public agency to develop the high-pressure zone area, the concept of reserve price mechanism, as adopted by CIDCO in New Bombay should be adopted, in which cost of land acquisition and development of total infrastructure and social facilities along with institutional overheads is converted to per sq.mt. of marketable land. This reserve price is the minimum selling price at which the development agency will make no profit and no loss. Then the prices of various parcels of land according to their use and location are fixed as a multiple of reserve price. Depending on the expected market price of land for various purposes reserve price can be higher or lower. This will ensure proper financing and profitability to the public sector agency, developing the high pressure zone area.

9.5 EQUIVALENT LIVING CONDITIONS IN PERI URBAN AREA

The "preservation of equivalent living conditions This does not mean equality, for instance in terms of economic power or homogeneous development, but it does mean that equal opportunities for housing, jobs, education, the provision of goods and services, good environmental conditions and recreational opportunities should be available in all regions. For development of a peri urban area, the local jobs need to be preserved and new opportunities must be created which have deep rooted consequence on development of the area.

9.6 STRENGTHENING OF REGIONAL RESOURCES

Peri urban area of Bhopal shows a great variety of strengths and weaknesses. These attributes are best known to those who live and work in the respective regions. Therefore measures for spatial development are most effectively executed by the regions them-selves. 73rd and 74th constitutional amendment act provides this autonomy to the rural areas

9.6.1 Development of peri urban area with regard of rural out look

Planning the peri-urban interface cannot be seen in isolation from the cities and rural areas with which in some way or another peri-urban interface is connected The problems of development concentrate in peripheral rural regions which are sparsely populated, far away from the bigger centers or close to the country's borders. The following factors have been identified as impediments to growth in rural region:

- The technological and social infrastructure is often insufficient in these regions,
- Local public transport is very limited,
- Growth in the industrial and service sectors is not sufficient to absorb the unemployed population from the agrarian sector,
- The investment activity remains low,
- Especially the young and qualified population is moving away.

With the use of GIS the developmental problems of the peri urban and rural areas are analyzed and a composite map is prepared from the GIS maps showing the level of development in rural areas and developmental problems.

To explore the relationship between city area and rural areas, rural area were classified according to their degree of "remoteness". This involved a composite scoring of each village in terms of its distance from the Bhopal and the size of those centers (in population terms).

The remoteness of village was compared to their economic performance, as measured by percentage employment growth 1991-2001. The main findings was that differences in performance between the various groups in remoteness terms appears to be most pronounced for villages in the smallest population size category, i.e. the negative impact of remoteness comes into play most strongly in the case of rural areas which also have small populations.

Key policy implications arising from the rural typology are:

- The requirement to replace agricultural jobs is most critical when growth of the labour force will be strongest and the decline of agricultural employment is the greatest.
- the GIS Analysis of data shows that remote areas, especially ones with small populations, tend to perform economically relatively poorly.
- The relationship between employment growth and accessibility raises questions in relation to appropriate rural transport policies, both infrastructure and services, to complement the roads strategy;
- improve rural transport will need to be part of a coordinated policy framework which will also guide the provision of other support infrastructures;
- the environmental and sustainability aspects of spreading the benefits from urban centers into rural areas will require careful consideration. Rural growth based along national primary routes may not always be the most desirable spatial pattern of development. In many instances it may involve urban sprawl, inappropriate housing in rural areas, and increased private vehicle commuting.

9.5 STRATEGIES TO STREAMLINE PERI URBAN DEVELOPMENT

Based on the study, the following broad strategies have been identified:

1. delineation of high pressure zones: following figure shows the delineation of high pressure zones in surrounding hinterland of Bhopal city as urban area and areas with showing high stress of urbanization

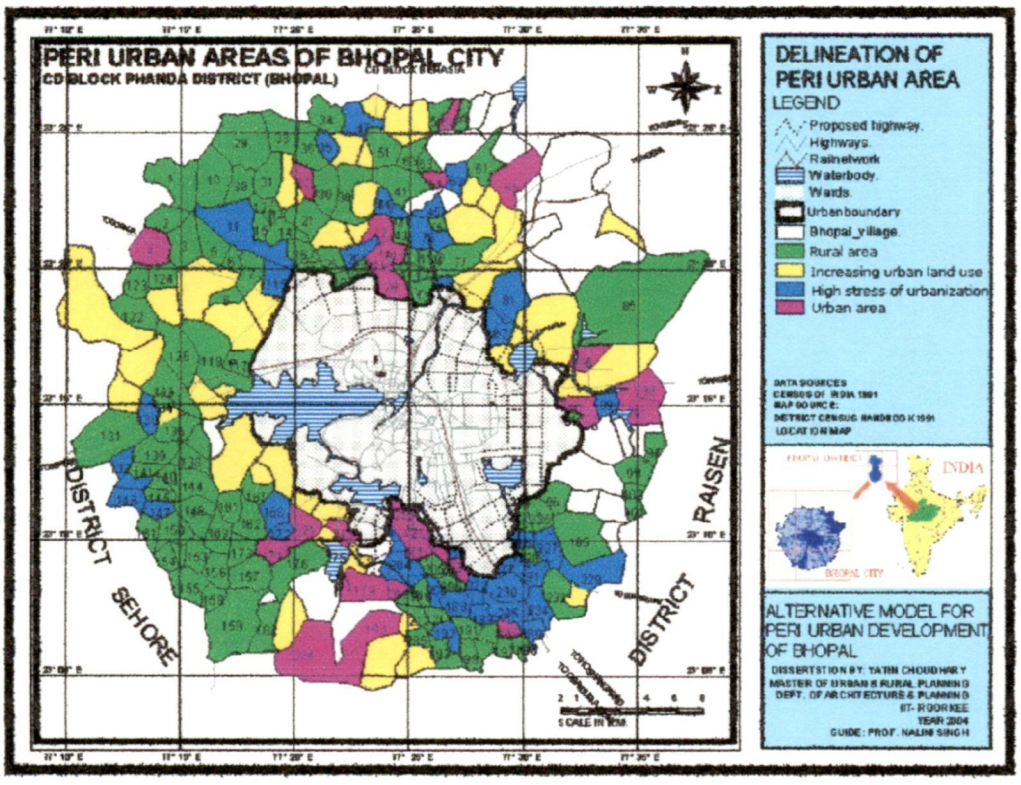


figure 9.2 Delineation of high pressure zones

2. Identification of peri urban areas based upon the field survey and on-site observations and data analysis

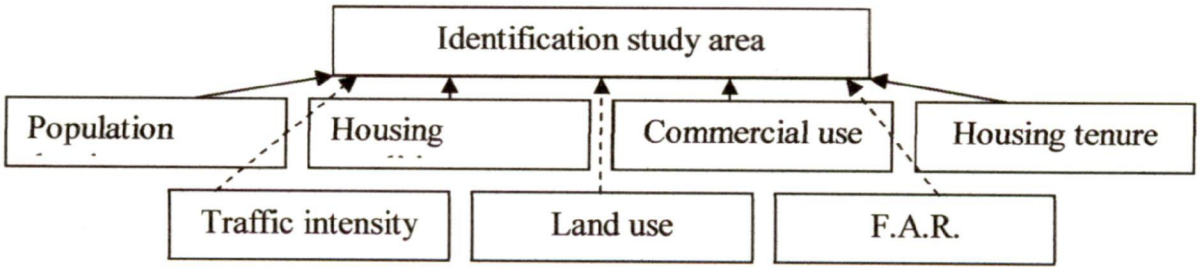
   A. Kolar road development

   B. Berasia road development

   C. Hoshangabad road development

   D. Ratibad

Following factors are considered for the identification



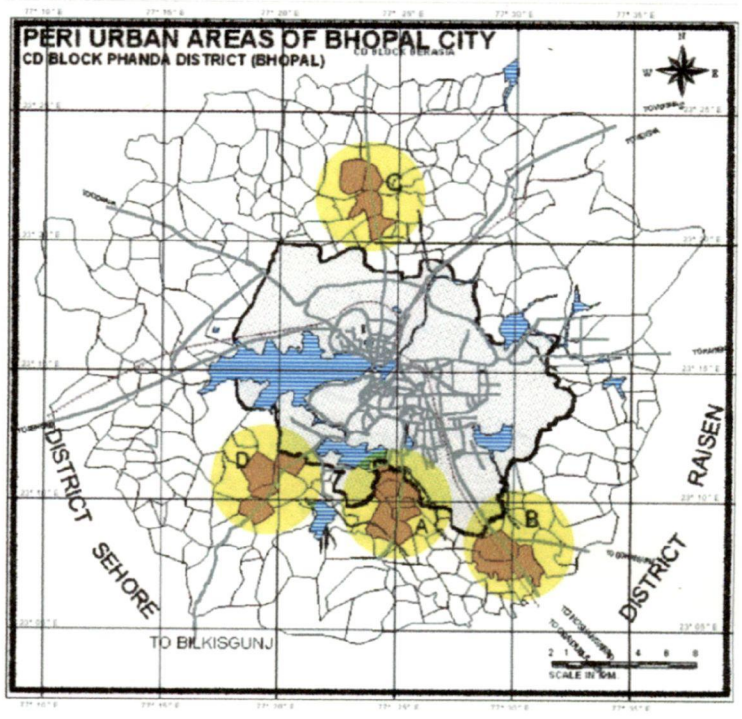


figure 9.3 Identified peri urban area for study

2. Creating separate urban development agency for peri urban area.

3. Revising planning norms and development control regulations in peri-urban areas.

4. Measures to facilitate private sector participation in land development.

5. Revising regulatory measures, pertaining to land and housing development.

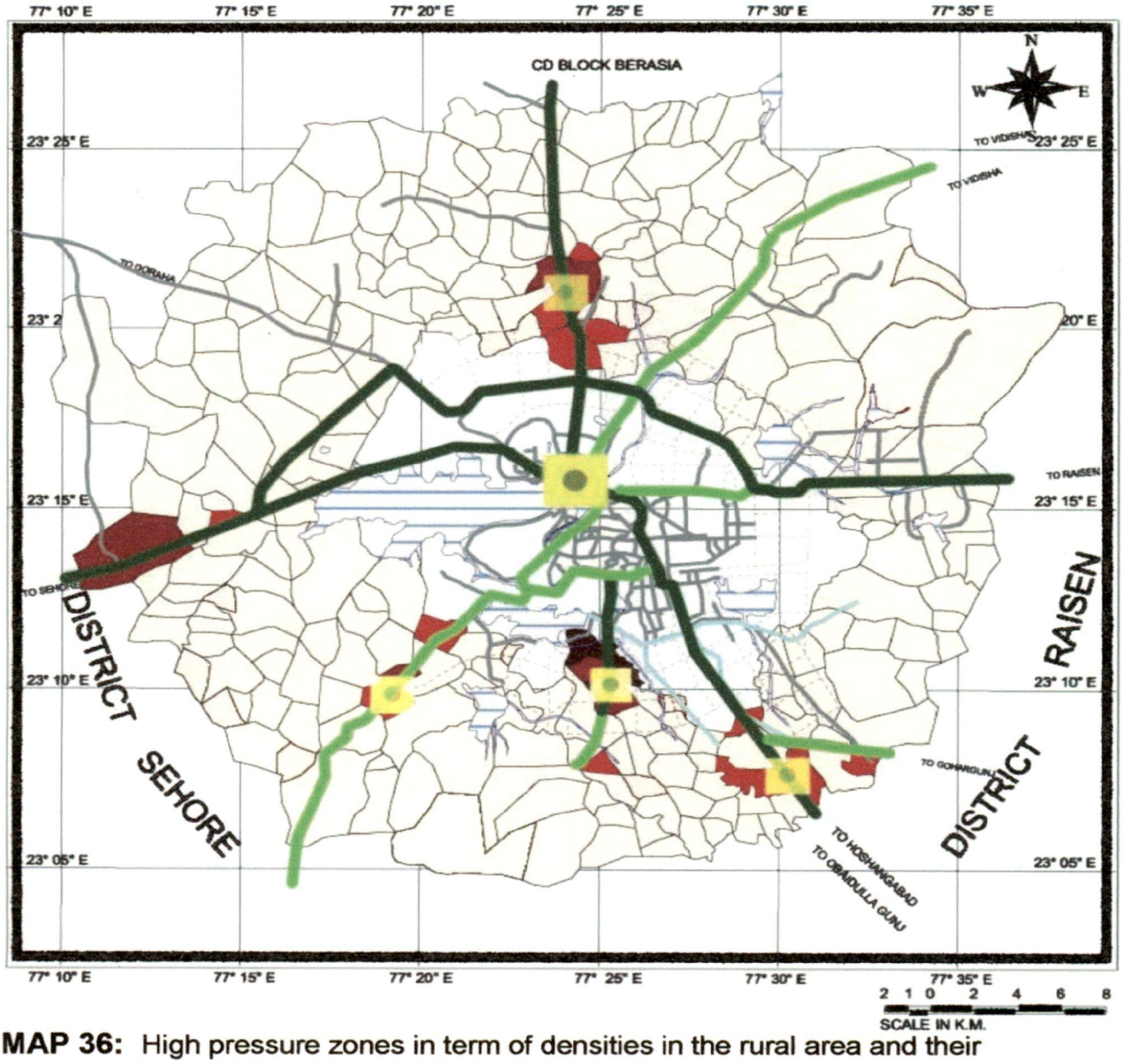
Periodic identification of peri-urban areas likely to be developed is a must. These areas need to be brought under urban development authority by regulating developments and developments plans and town planning schemes for the peri

urban area need to be made, with a view of achieving urban development in a planned manner.

To encourage intense developments within the core city area, a concept of urban growth and service boundary should be introduced. Any development outside this boundary should necessarily provide for its own infrastructure and social facilities for this the guidelines must be formed.

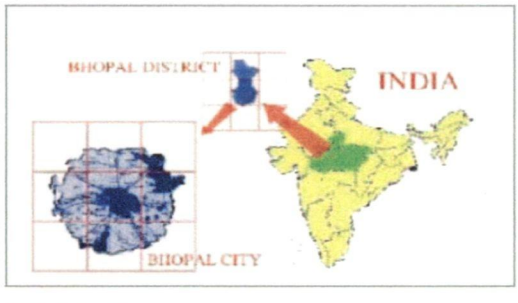
With the revisions of urban growth in peri urban areas of Bhopal city and formation of new growth and service boundaries tendency to develop areas in the periphery is likely to continue because of access to private transport. Given high industrial development in the peripheral areas; certain villages far away from the authority limits experience developmental pressure. The delineation of high-pressure zone identifies such areas; these areas shall be provided with infrastructure and services. These zones should be allowed under certain specific mechanisms as private urban development schemes

The following figure shows the high pressure zones in term of densities in the rural area and their location on the traffic corridors. it can be seen that the in most of the cases the high pressure zones is contiguous to the urban boundary of the Bhopal city. The point worth noticing is that these locations of growth are preferred to many peripheral areas just inside the urban boundary. This is because the infrastructure facilities in these areas are considered better than the infrastructure in those areas which lie inside the urban boundary but have marginal infrastructure.



MAP 36: High pressure zones in term of densities in the rural area and their location on the traffic corridors

LOCATION MAP



DATA SOURCES
CENSUS OF INDIA 1991, 2001
MAP SOURCE:
DISTRICT CENSUS HANDBOOK 1991
BHOPAL DEVELOPMENT PLAN 2005
SOI TOPOSHEETS 1:50,000 SCALE
MUNICIPAL CORPORATION WARD MAP

LEGEND

Proposed roads (2005)
Canal
Lakes & reservoirs
Roads

Sub urban settelment corridor with population density

Medium
High
Very High

city outskirts

City center

Traffic corridor

Very heavy road traffic
heavy road traffic

Within the peri-urban areas, Panchayat are smallest unit with the same responsibility structure as that of municipal corporations. Although constitution 73rd and 74th Amendment Acts give more responsibilities to the Panchayat, due to their limited administrative set-up. Poor financial status and lack of technical staff, they are institutionally weak in playing their role. Given the pace of urbanization and infrastructure requirements in the peri- urban areas, and to mitigate overlaps in the functions of various systems of Panchayat, municipalities and other development agencies, creation of a specialized urban development agency is necessary.

Development permission procedures within the urban development authority and outside area should be made simpler to discourage developments occurring just outside the urban development limit. Further, as suggested earlier it will be more advantageous to develop private townships with its own infrastructure facilities rather than scattered small scale development as is happening now-a-days in peri-urban areas.

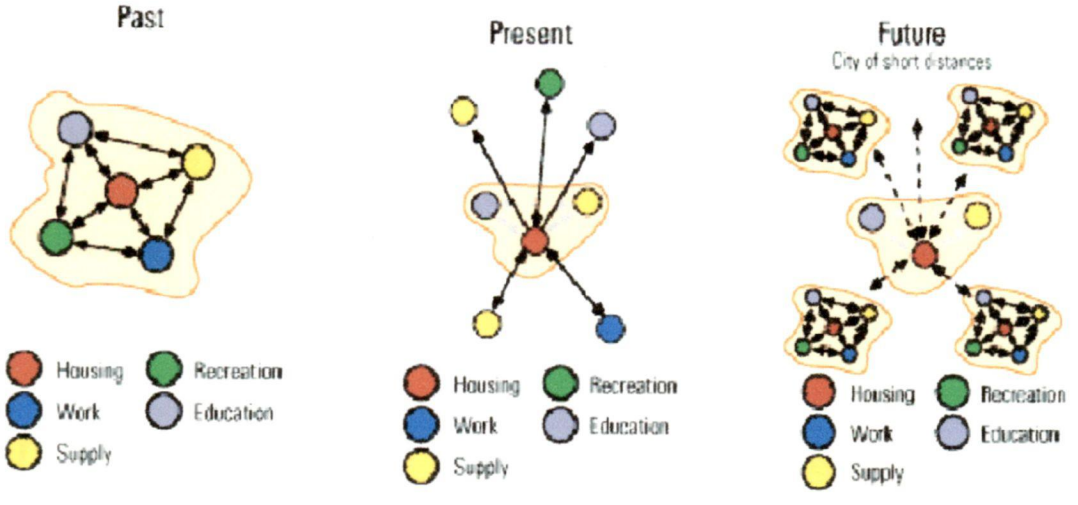


figure 9.4 Spatial structure of city and peri urban area and interlinking of different infrastructure

In the past the Bhopal city a cohesive planning, in the course of time because of growth peri urban areas have developed which are lacks infrastructure facilities. In present situation peri urban area are dependent on mother city for jobs and services. To develop this infrastructure the peri urban areas should have a certain threshold

population. Since the most important sector in peri urban area is private housing which in the case of Bhopal, is provided mainly by private builders and developers in form of housing colonies there should be a minimum threshold population and a certain size.

The Private townships with a certain minimum size of land parcel for a threshold population permitted this will check the subdivision of agricultural land for mass private housing.

As many industrial and other developments occur just outside the urban development authority limit, at least 5 -10 per cent of the developable area should be marked for low income groups, and should be sold at the reserve price.

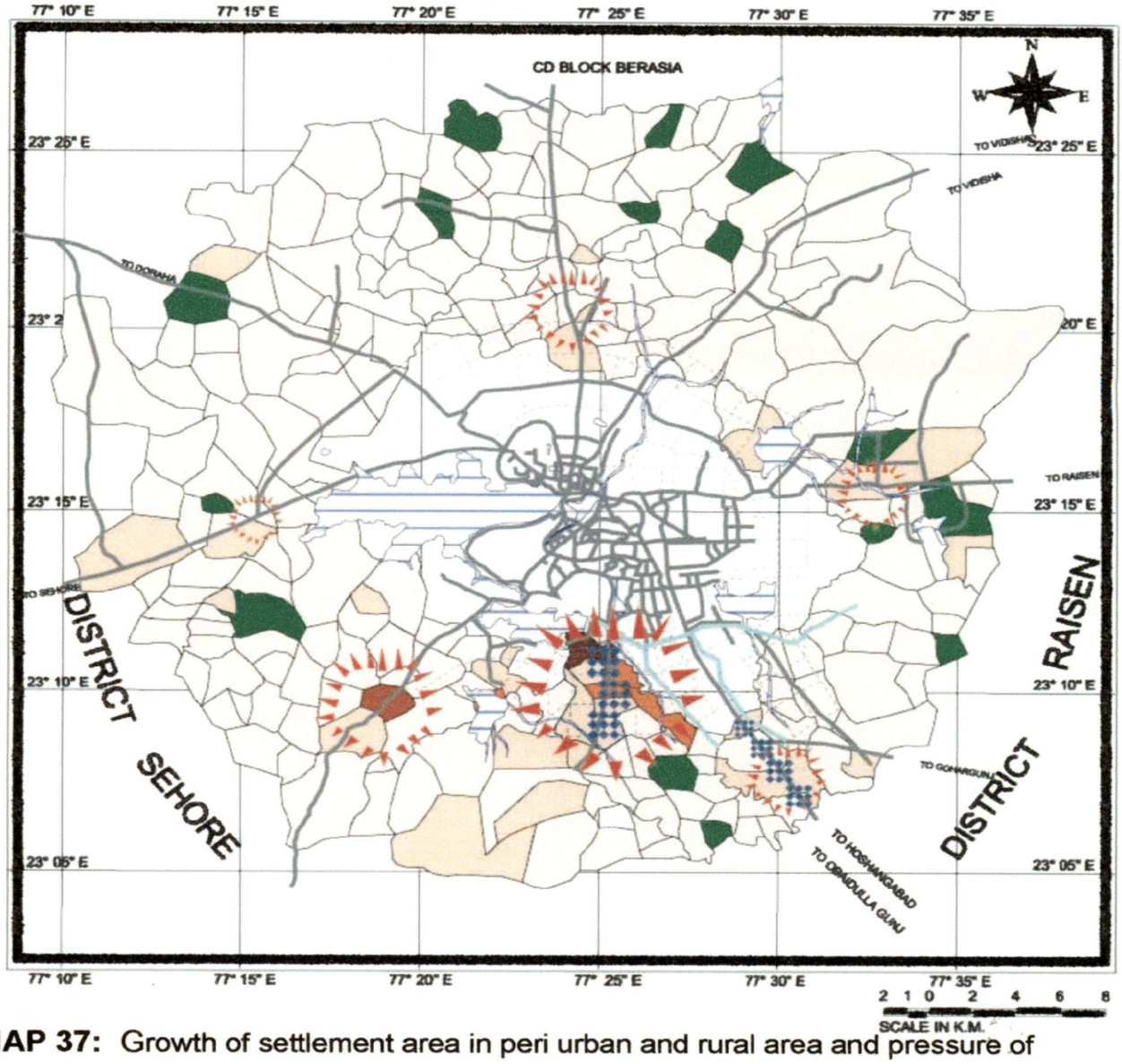
To encourage amalgamation of plots to form large private townships, FSI for the entire plot should be given to the developer. This will allow him to economically provide all facilities and infrastructure. For small plots lower FSI may be allowed.

The FSI provision should match with infrastructure availability and provision, such as traffic handling capacity of linking roads, water resources, and social infrastructure like schools and health facilities.

Further, there is a need to prepare regional plans beyond the urban development authority limits, in which suitable areas for urban development and agricultural land or and to be conserved and protected from the pressure of urban development should be identified. Peri-urban development should be permitted in a planned manner only in areas identified through the regional plan. High-pressure zones necessarily should fall within the area suitable of urban development as identified in the regional plan.

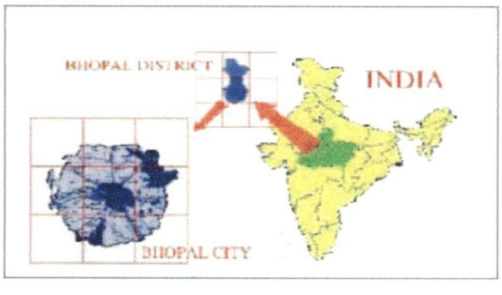
9.6 PERI-URBAN DEVELOPMENT IN BHOPAL, ALTERNATIVE MODEL

Based on the suggested strategies, alternative model of development is prepared taking in consideration different parameters for the peri urban areas as analyzed during field Observation, GIS analysis, and Primary survey



MAP 37: Growth of settlement area in peri urban and rural area and pressure of urbanization

LOCATION MAP



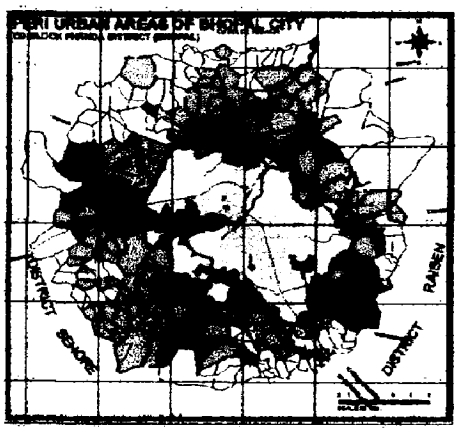
DATA SOURCES
CENSUS OF INDIA 1991, 2001
MAP SOURCE:
DISTRICT CENSUS HANDBOOK 1991
BHOPAL DEVELOPMENT PLAN 2005
SOI TOPOSHEETS 1:50,000 SCALE
MUNICIPAL CORPORATION WARD MAP

LEGEND

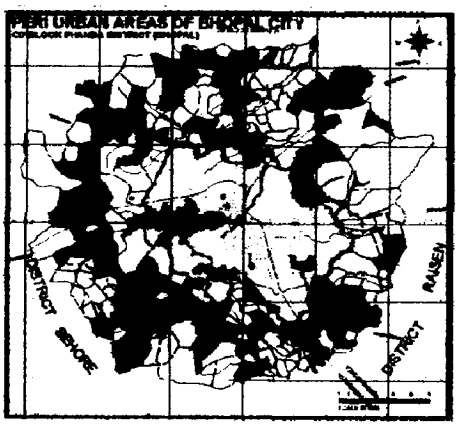
- Proposed roads (2005)
- Canal
- Lakes & reservoirs
- Roads

Growth of settelment area

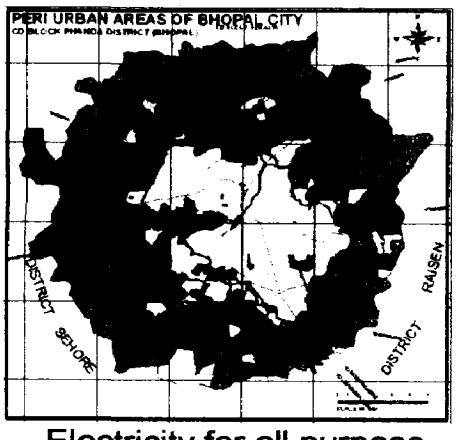
- Low
- High
- Very high increaseing growth of settelment area
- Negative Growth
- Considerable decrease in open space
- Pressure of Urbanization



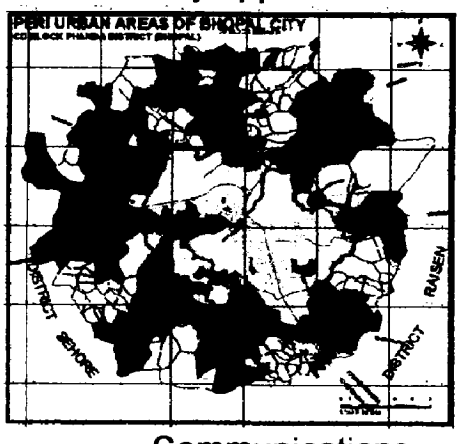
Distance from nearest town



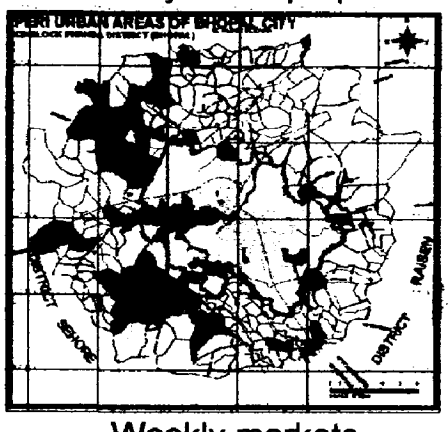
Accessibility approach road



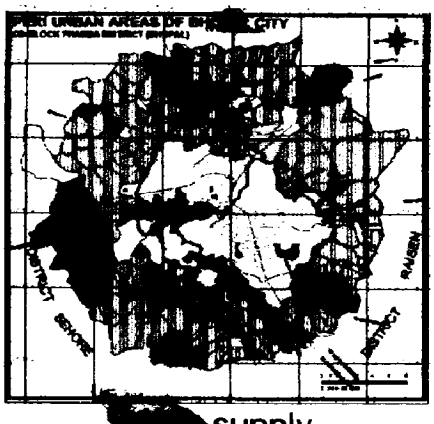
Electricity for all purpose



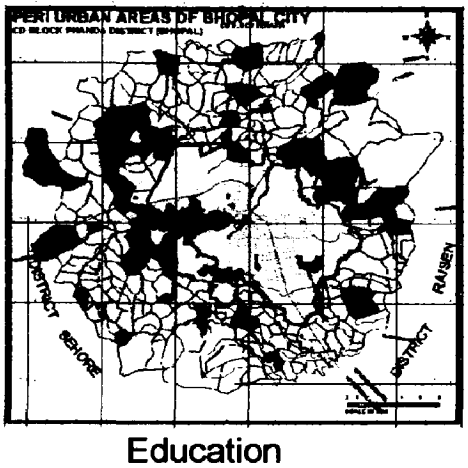
Communications



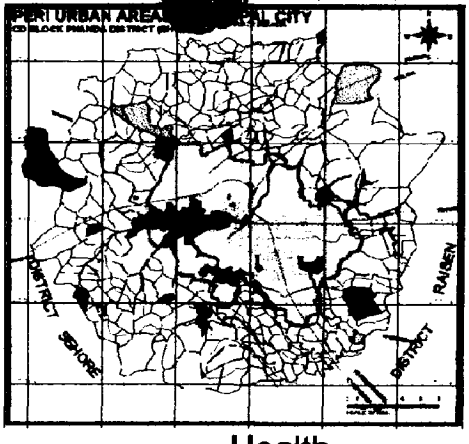
Weekly markets



supply



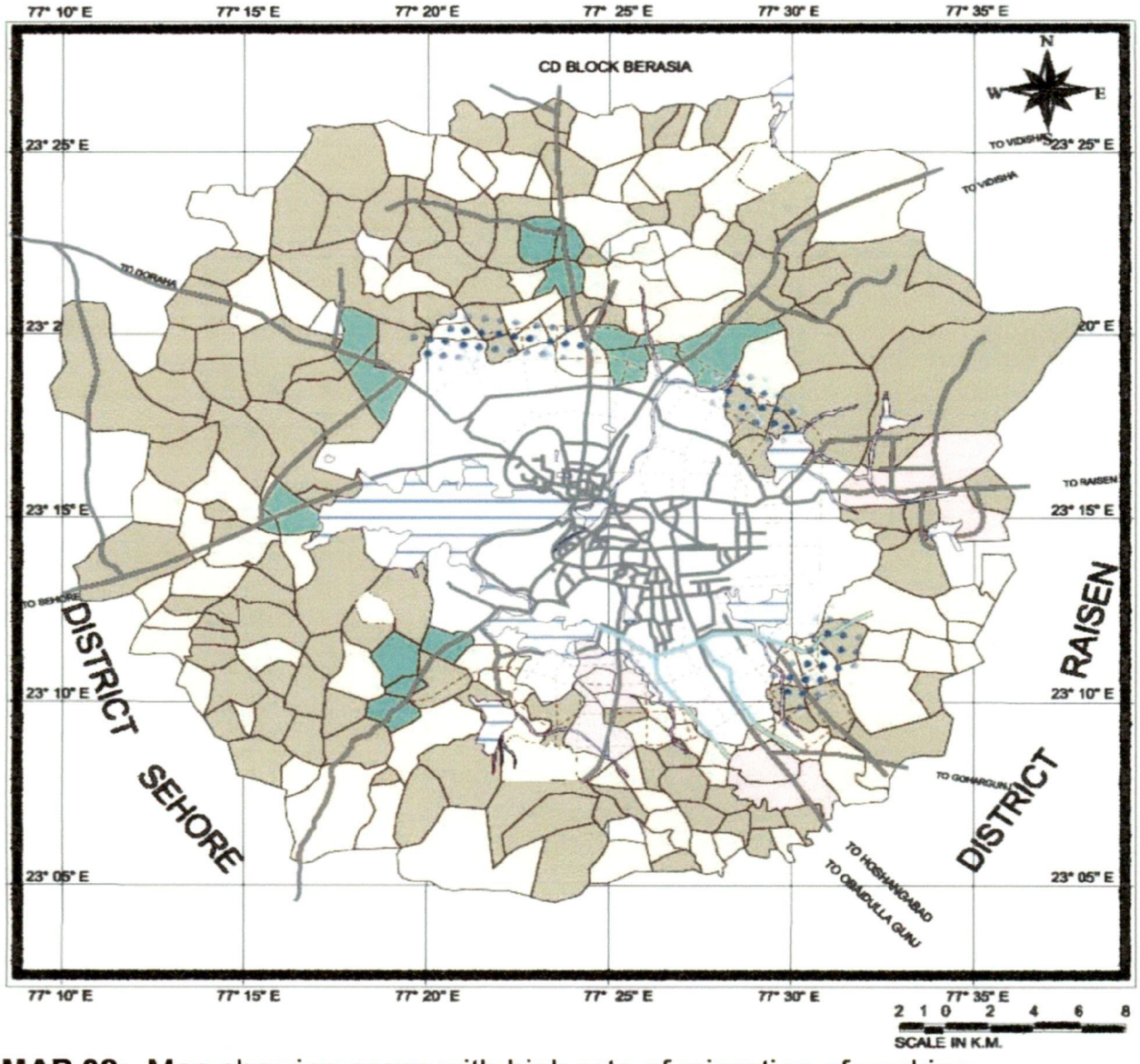
Education



Health

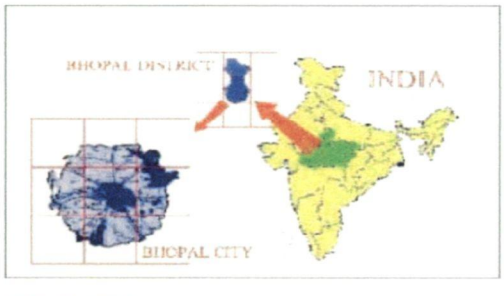
Figure 9.5 Presence of infrastructure facility data source: 1991 census

good better moderate low absent



MAP 38: Map showing areas with high rate of migration of working population

LOCATION MAP



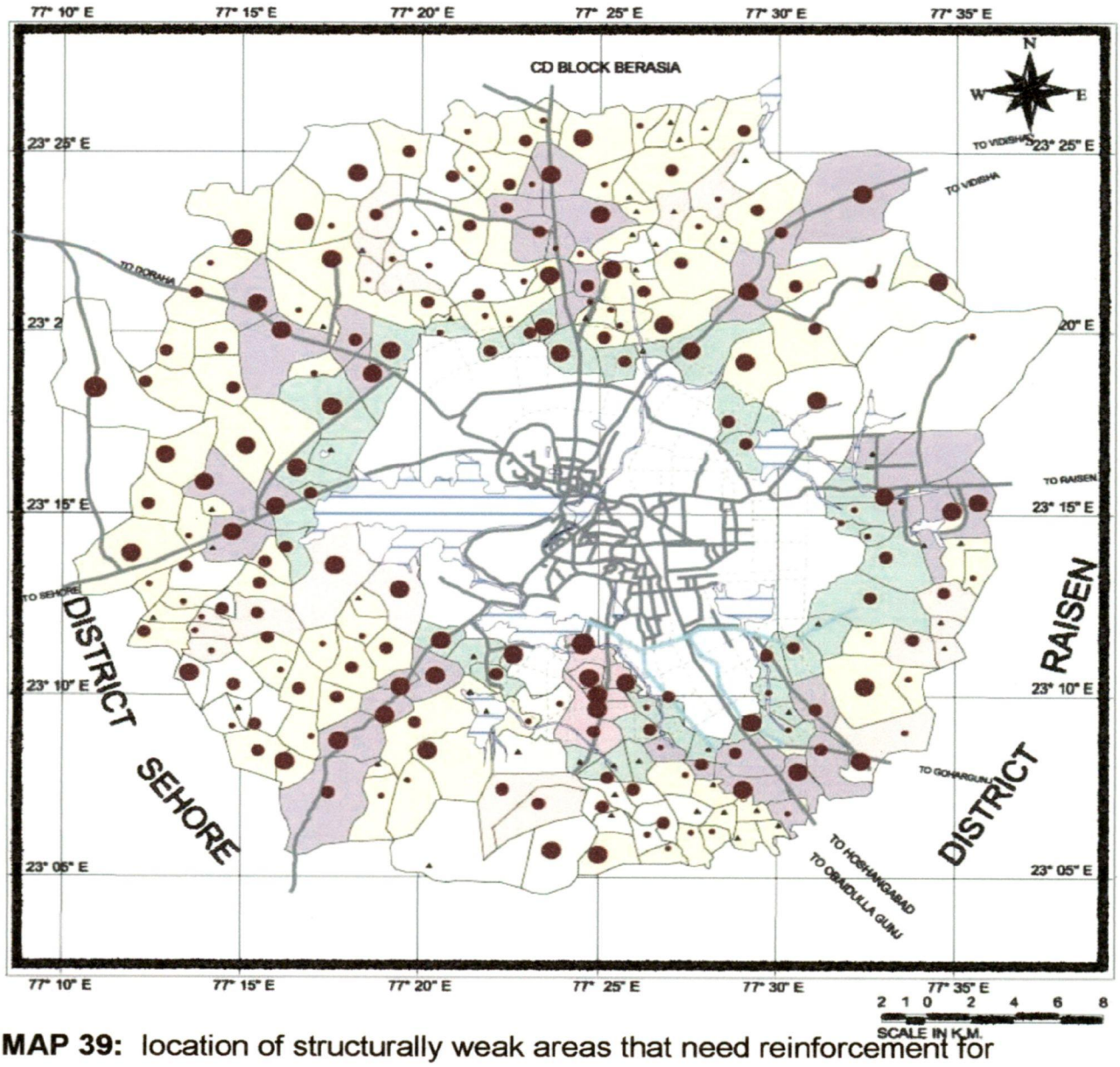
LEGEND

Proposed roads (2005)
Canal
Lakes & reservoirs
Roads

Trend of settelment growth
Strong Growth
Weak Growth
Area showing strong dispersal

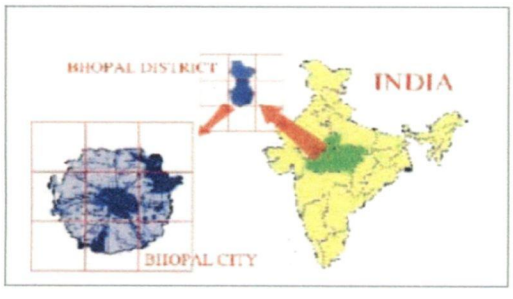
Trend of demographic growth
Villages showing out migration from villages

DATA SOURCES
CENSUS OF INDIA 1991, 2001
MAP SOURCE:
DISTRICT CENSUS HANDBOOK 1991
BHOPAL DEVELOPMENT PLAN 2005
SOI TOPOSHEETS 1:50,000 SCALE
MUNICIPAL CORPORATION WARD MAP



MAP 39: location of structurally weak areas that need reinforcement for equivalent development

LOCATION MAP



DATA SOURCES
CENSUS OF INDIA 1991, 2001
MAP SOURCE:
DISTRICT CENSUS HANDBOOK 1991
BHOPAL DEVELOPMENT PLAN 2005
SOI TOPOSHEETS 1:50,000 SCALE
MUNICIPAL CORPORATION WARD MAP

LEGEND

Village location
- Pop < 200
- 200 - 500
- 500 - 1000
- 1000 - 5000
- Pop > 5000

Proposed roads (2005)
Canal
Lakes & reservoirs
Roads
City out growth
Near urban agglomeration
Without considerable developmental problem
Severe developmental problem
Very severe developmental problem

Proposal of alternative model of peri urban development

Traditionally, Bhopal was a monocentric city, over the years that the structure of Bhopal city has departed from the mono-centric model, As the city grew in size, the original monocentric structure of the city dissolve progressively into a polycentric structure radiating out wards development of peri urban areas of a city is a process of evolution of a growing city. In the delineation of peri urban areas four areas are identified as peri urban areas. These areas are in different stages of maturity of evolution and have different set of spatial, infrastructural, socio-economic, and environmental problems.

Problems of present structure of peri urban development

Sector of problem area	KOLAR ROAD	HOSHANGABAD ROAD	RATIBAD	BERASIA
development	Leap-frog	Ribbon	scattered	Scattered
Proximity to city	Proximate	Non- proximate	Nonproximate	Non- proximate
Water supply	Good supply	Good supply	Low coverage	Low coverage
Sanitation	More access to improved sanitation	Less access to improved sanitation	Less access to improved sanitation	Less access to improved sanitation
drainage	Good drainage , occasional flooding	Good drainage , occasional flooding	Storm drains inadequate	Storm drains inadequate
Solid waste management	High quantity of solid waste, collection system inadequate	Low quantity of solid waste, collection system inadequate	High quantity of solid waste, collection system absent	High quantity of solid waste, collection system inadequate
Pollution level	High	Low	Medium	Medium
Traffic accident risk	High	High	Low	low

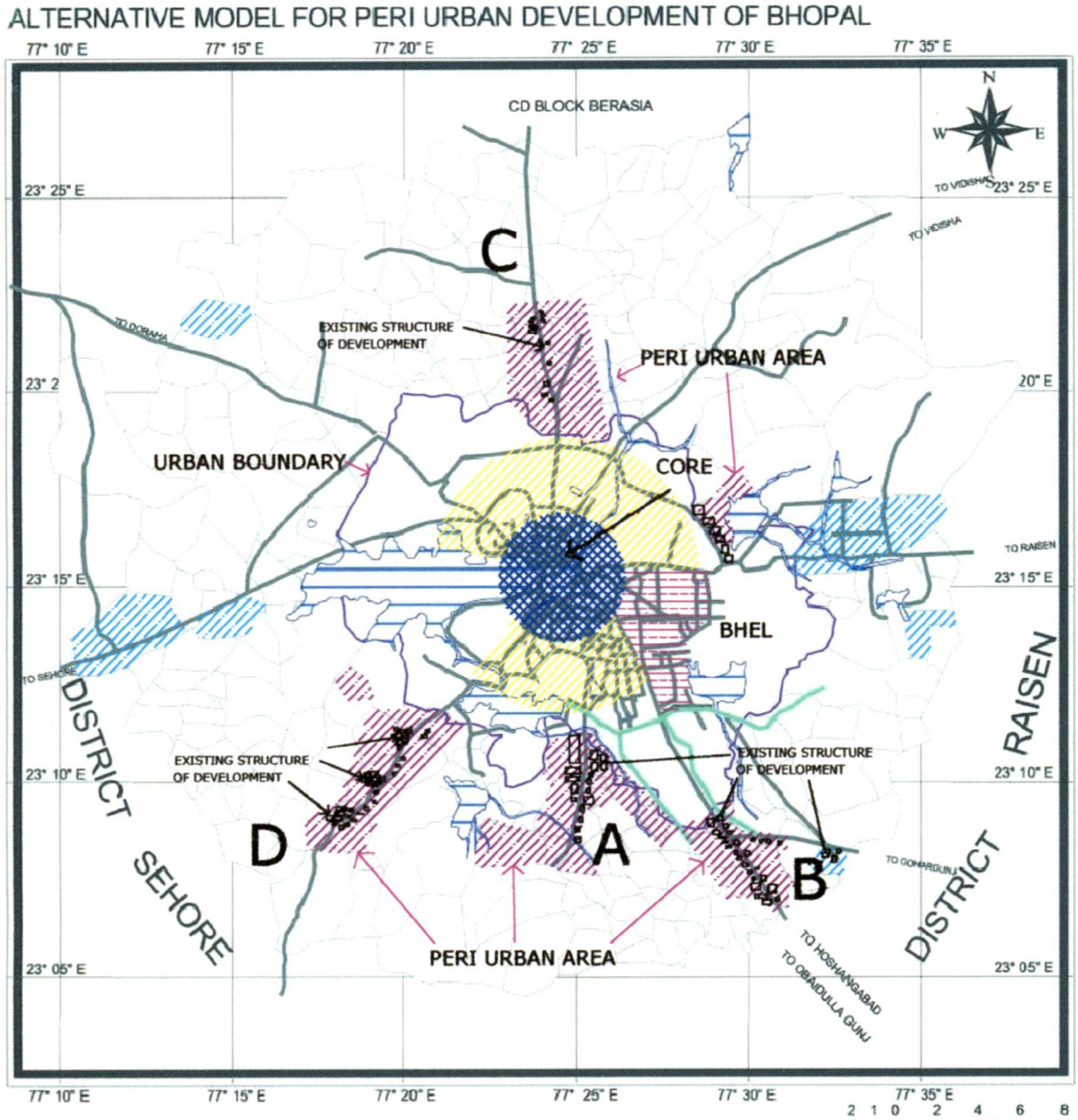


figure 9.6 Characteristics of peri urban area

A. KOLAR ROAD Peri Urban Development

KIND OFDEVELOPMENT: Leap frog development
PROXIMITY TO CITY: Proximate
NEED FOR CHANGE: High
PACE OF ADAPTION: Fast

B. HOSHANGABAD ROAD Peri Urban Development

KIND OFDEVELOPMENT: Ribbon development
PROXIMITY TO CITY: Non-proximate
NEED FOR CHANGE: High
PACE OF ADAPTION: Fast

C. BERASIA ROAD Peri Urban Development

KIND OFDEVELOPMENT: Scattered development
PROXIMITY TO CITY: Non-proximate
NEED FOR CHANGE: Low
PACE OF ADAPTION: Slow

D. RATIBAD Peri Urban Development

KIND OFDEVELOPMENT: Scattered
PROXIMITY TO CITY: Non-proximate
NEED FOR CHANGE: Low
PACE OF ADAPTION: Slow

ALTERNATIVE MODEL FOR PERI URBAN DEVELOPMENT OF BHOPAL

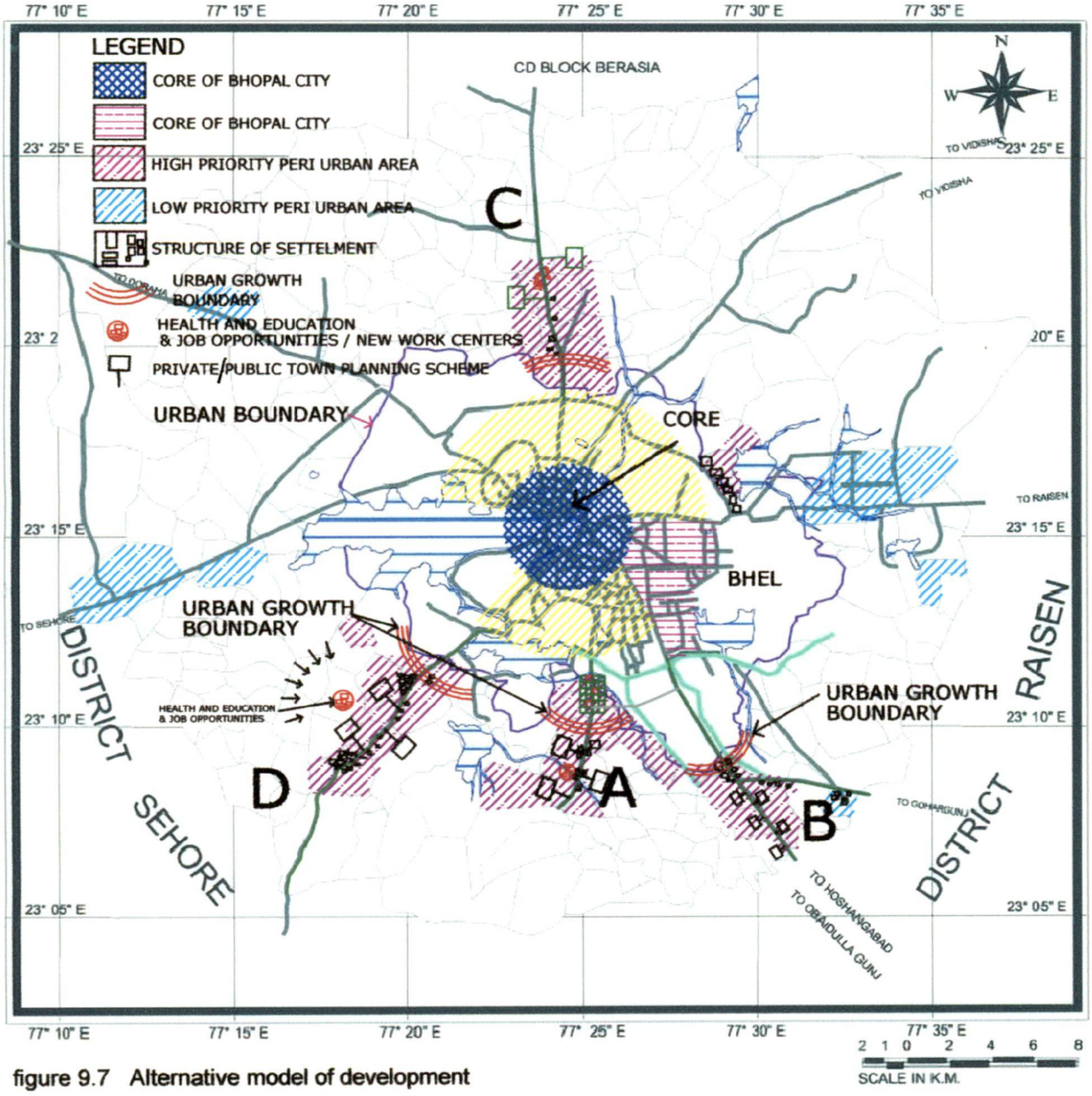


figure 9.7 Alternative model of development

GUIDELINES FOR ALTERNATIVE MODEL

* Redefine Bhopal Development Authority boundary to integrate peri urban area
* The concept of an urban growth boundary to more clearly define the Bhopal's urban area , to limit urban sprawl and prevent further intrusions into prime agricultural land.
* Clear policies for the peri-urban boundary with well defined buffer zones of vegetated open space.
* Promote the establishment of suitable buffer treatments along both sides of the urban boundary;
* Promote efficient use of urban land and compact urban form within urban growth boundary
* Private townships developed by private sector, with a minimum threshold population sufficient to maintain individual infrastructure and adequate land size should be permitted.

- In the agglomeration areas and peri urban areas, which are characterized by the high population density, an audit of open space should be done which should be maintained properly, and should be made free from encroachments

- The transportation of peri urban areas should be developed with the mother city as polycentric city model, the peri urban areas should have there own network of housing, work, recreation, education and supply system. The peri urban area should be less and less dependent on the parent city for all these facilities; development of private/public town planning schemes with enough threshold population can facilitate this.

- The peri urban areas which are contiguous with the city's urban limit should have provision of certain percentage of housing reserved for economically poor class

- The transportation network should be adopted according to the character of peri urban area.

    - Peri urban area 'A' (high density, high rise, Kaliasot river growth barrier) - Grid iron pattern

    - Peri urban area 'B' (ribbon development low rise development)- Linear branching pattern

    - Peri urban area 'C' (scattered low rise development) – Irregular branching

    - Peri urban area 'D' (scattered low rise development) – Irregular branching

- While designing the transportation network maximum utilization of existing network should be made, for ensuring affordability.

- The private developer should be made to provide, infrastructure of water supply drainage and sewerage system thus seeking private partnership in development.

- Water supply from a decentralized system should be adopted rather than a single monolithic system.

- Community level drainage and sewerage system should be adopted in peri urban area.

- Health and education infrastructure should be developed in the peri urban areas, and local jobs should be preserved and new job opportunities should be provide in sectors that are directly related to the primary production.

- Peri urban area should be developing with and rural out look. Rural areas which have severe developmental problems have peri urban area as intermediate interface of urban area. The development of peri urban area gives an opportunity to provide better facilities to rural areas nearer to them, thus reducing disparities of urban and rural area.

CHAPTER 10

RECOMMENDATION AND CONCLUSION

Recommendations for the development of the peri urban area are related with new housing and industrial development in prime agricultural land. A loss of agriculturally or ecologically valuable land to urban sprawl, coupled with a concern with the growing financial and environmental costs of peri-urban expansion following recommendations are made.

- Development should not be permitted merely because there is land. All new developments should conform to a basic local plan that allows for the efficient installation and operation of infrastructure.
- Development should only be encouraged and permitted in areas designated by the comprehensive plan with urban and rural outlook. Particular attention should be given to safeguarding existing irrigation systems and other aspects of farming
- Ribbon development can hinder the balanced development of the hinterland in the future. Therefore it is suggest that the municipality resist this form of development, or permit it only within the framework of specific plans for the hinterland.
- The environmental and sustainability aspects of spreading the benefits from urban centers into rural areas require careful consideration. Rural growth based along national primary routes may not always be the most desirable spatial pattern of development. In many instances it may involve urban sprawl and inappropriate housing in rural areas and increase in pressure on transportation network
- Transport has to be adapted to urban structures not the other way around, In the case of environmentally sensitive areas; development in these areas should be restricted to amicable land use.
- To make peri urban areas economically strong intervention are required which induce development to the grassroots level. For development of a peri urban area, the local jobs need to be preserved and new opportunities must be created

which have deep rooted consequence on development of the area. These jobs should be in conjunction of the activities in rural area are required.

- Strategies relating to regulatory measures pertaining to land and housing development in peri urban areas should be made keeping in mind the interaction of land market with regulations.

CONCLUSION

The study experience of this dissertation project enables us to derive useful guidelines and methodology for the development of peri urban area. It gives an 'up to date' picture of the areas around Bhopal which lack development and infrastructure. It provides us an alternative model of peri urban development with spatial and non-spatial guidelines which could facilitate the development of peri urban areas of Bhopal.

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APPENDIX-1

HOUSE HOLD SURVEY IN STUDY AREAS
Conducted by: Yatin Choudhary
Department of Architecture & Planning IIT Roorkee

Identification

1. Name of head of family.....

2. Religion.....3. Occupation.....(secondary.....)

4. Address.....

.....5. No of earning members.....

Age gr.	Male	Female	Education	Male	Female
<5			<8th std		
5-15			High school		
15-25			Intermediate		
25-60			Graduate		
>60			Postgraduate		

Issues

1. type of housing(√)

   i) Own house ii) Rented House iii) Leased house iv) Other

   Rent/ lease amount (per annum).....

2. type of housing a) pucca b) kuccha i) Flat ii)Plot iii)squatter

3. You are living in this house since(√)

   i)<5 years ii) 5-10 years iii)>10 years

4. Employment dependent on (√)

i) farm activity ii) non farm activity iii) other (manufacturing , trade commerce and services)

5. Any particular reason for opting house in this locality(√)

   i) near ness to work place ii) nearness to relatives

   iii)access to facilities iv) affordable cost

   v)ancestral property vi)proximity to good education

   vii)good transportation facilities viii)proximity to major markets

   ix)good social environment x) public services and recreation

land cost: .....

6. Electricity supply

   i) supply hours ..... ii) Voltage fluctuation yes /no

7.transportaion

   i) availability of public transport satisfactory / unsatisfactory

   ii) condition of roads satisfactory/ unsatisfactory

iii)type of moter vehicles that you own (put no)(√)

a)car b) scooter c) cycle d) any other

8. health facilities

i) nearest available health facility:.....(km)

ii) nearest available dispensary / medical shop.....(km)

9.educational facility

i) distance to nearest educational facility for children.....(km)

ii)quality of educational facility satisfactory/ unsatisfactory

10. open spaces and recreational areas

i) distance to nearest open space / recreational facility/ play area for children .....(km)

11. distance to nearest shopping area

12. Security:

i) crime rate high / moderate / low ii) Police assistance good / bad / satisfactory

13. pollution and hygiene around your residence.

i) dust and smoke ii) foul smell iii) noise source..... iv) water stagnation v) flies and mosquitoes vi)others.....

14 solid waste:

i)quantity generated

ii) disposal method a) throw on street b) community dustbin

15.gross family income monthly in Rs.

i)< 5000 ii)5000-10000 iii)10000-15000 iv) >15000

16. distance time taken and mode of transportation for various destinations

s.no.	Destination	Distance	Time taken	Mode
1	Work place			
2	Market			
3	Recreation			
4	Education			
5	Medical facility			

comments and suggestions:

.....

.....

.....

.....

APPENDIX -2

	RESPONSES FROM HOUSEHOLD SURVEY				
		kolar road	hoshangabad road	ratibad	berasia road
1	percentage of agri	0	10	45	15
2	percentage of service class	80	75	35	60
3	percentage of business class	20	15	20	25
4	number or earning members of household	1.5	1.2	1.8	1.3
5	average no of family members	5	4.5	6.05	4.65
6	percentage of owned houses	75	68	80	72
7	percentage of rented houses	25	32	20	28
8	percentage of leased houses				
9	percentage of people living for <5 yr	28	62	44	36
10	percentage of people living for 5-10 yr	52	30	36	48
11	percentage of people living for >10 yr	20	8	20	16
12	reason for choosing this locality				
a	nearness of workplace	5	25	25	20
b	nearness to relatives	4	10	8	15
c	access to facilities	45	25	15	25
d	affordable cost	30	35	30	36
e	ancestral property	16	5	22	4
13	average land cost	1200	2500	600	1100
14	average power supply hours	21.5	21.5	20	21.5
15	% of people complaining voltage fluctuation	70	50	80	70
16	opinion about public transport				
a	good	70	20	15	60
b	bad	5	65	75	30
c	satisfactory	20	15	5	10
17	average distance to public transport facilityn K.M	0.2	0.5	0.1	0.1
18	average distance to petroln K.M.	1.5	2.5	4	0.5
19	avg. distance to nearest medical facilityn K.M.	0.5	3	1.25	1
20	average distance to nearest educational facilityn	0.3	1.2	0.5	1.5
21	average distance to nearest open space n K.M.	0.8	0.3	0.2	0.3
22	average distance to nearest convenient shopping	0.2	0.3	0.3	0.4
23	average distance to nearest preferred shopping	1	0.3	0.5	0.5
24	average distance to nearest community place in	1	1	0.7	1.2
25	maintenance of open space				
a	good	5	60	25	45
b	bad	80	10	30	30
c	satisfactory	5	30	45	25
26	% people having car	10	8	12	12
27	% people having two wheelers	50	72	52	76
28	% people having motorized vehicle	65	80	70	88
29	hygiene				
a	water stagnation	20.9	40.5	41.2	35
b	flies and mosquitoes	34.8	27	26.4	35
c	noise	11.6	16.2	6	20
d	foul smell	32.7	16.3	26.4	10

	RESPONSES FROM HOUSEHOLD SURVEY				
		kolar road	hoshangabad road	ratibad	berasia road
30	solid waste quantity	1.6	1.2	1.42	1.42
31	method of disposal				
	subsequent processing of solid waste				
a	collected by sweepers	44	25	12	20
b	thrown on street	56	75	88	80
32	avg gross family income				
a	<5000	16	8	28	12
b	5000-10,000	42	24	48	60
c	10000-15,000	36	32	12	20
d	>15000	8	36	12	8
33	avg distance to work place In k.m	7.5	12.5	4.5	4
34	avg time to reach work place in minute	15	35	15	10
35	avg time to reach market in minute	5	20	20	10
36	avg time to reach recreation in minute	10	5	5	10
37	avg time to reach edu. Facility in minute	10	20	10	15
38	avg time to reach medical facility in minute	5	15	20	10

APPENDIX-3

LIST OF VILLAGES (BHOPAL DISTRICT Phanda CD Block)

1 Chhindwada
2 Daulatpur thikriya
3 Mugaliya hat
4 Jhirniya
5 Ratibad
6 Morga
7 Chandukhedi
8 Bundrkha sadak
9 Parwaliya sadak
10 Bagoniya
11 Taraisewaniya
12 Jogibarri
13 Guradiya
14 Prithvipura
15 Pipalia chapparband
16 Khejdadeo
17 Prempura
18 Dobra
19 Bishan khedi
20 Lamba kheda
21 Manikhedi kot
22 Intkhedisadak
23 Hajjampura
24 Acharpura
25 Chandpur
26 Parewa kheda
27 Arwaliya
28 Parvaliya sani
29 Chanderi
30 Jhapadiya
31 Nipaniya sukha
32 Kardai
33 Kuthar
34 Sagoniya
35 Deopur
36 Shahpur
37 Rojibeg
38 Ratatal
39 Khajuri
40 Beenapur
41 Kham kheda
42 Kanchbavli
43 Bherupura
44 Gol khedi
45 Islamnagar
46 Ghasipura
47 Kachhi barkheda
48 Dupadiya
49 Raipur
50 Khinchital
51 Nipaniya jat
52 Barkhedi hajjam
53 Hinotiya jagir
54 Kanera
55 Momanpur
56 Kadhaiya
57 Karhod khurd
58 Kirat nagar
59 Agariya
60 Rasla khedi
61 Fatehpur
62 Chanched
63 Kala pipal
64 Sumer khedi
65 Barkhedi abdulla
66 Balampur
67 Dob
68 Rusalli chungar
69 Garhmurra
70 Sukhi sevania
71 Kalyanpura
72 Ganyari
73 Mungalia kurd
74 Mungalia kot
75 Rusalli beldar
76 Semra saiyad
77 Imliya
78 Amoni
79 Prempura
80 Kalyanpur
81 Pipaliya jahirpur
82 Chopda kalan
83 Arhedi
84 Kanasaiya
85 Samarda
86 Jhiriya kheda
87 Chhawani adampur
88 Bilkhiriya kalan
89 Kolua khurd
90 Sagoni kalan
91 Dobra jagir
92 Sankalpadariya
93 Bankhedi
94 Dangroli
95 Bansiya
96 Jhagariya khurd
97 Amjhira
98 Lalpura
99 Jamoniya kalan
100 Pipaliya hatia
101 Narela bazyaft
102 Babadiya khurd
103 Padariya jat
104 Semari khurd
105 Bagroda
106 Chor sagoni
107 Sewaniya onkara
108 Puraman bhawan
109 Mohammad nagar urf
110 Shyampur
111 Deval khedi
112 Ghat khedi
113 Pipliya bajkhan
114 Barkheda bondar
115 Kurana
116 Mubarikpur
117 Meerpur
118 Bhauri
119 Jamoniyachhir
120 Kolu khedi

121 Lakhapur
122 Ratanpur
123 Kalan khedi
124 Rasuliya pathar
125 Neelbad
126 Barkheda salam
127 Toomda
128 Khori
129 Dhamaniya
130 Khar khedi
131 Phandakalan
132 Phanda khurd
133 Bakaniya
134 Khetla khedi
135 Khajoori sadak
136 Khamla khedi
137 Int khedichap
138 Kajlas
139 Pipaliya dhakad
140 Rasuliya ghat
141 Doobdi
142 Hatai khedi
143 Borkhedi
144 Kodiya
145 Khokariya
146 Saista khedi
147 Jat khedi
148 Nandni
149 Kharpi
150 Narela
151 Teela khedi
152 Kalyanpur
153 Moondla
154 Dehriya kalan
155 Khurchani
156 Jhagariya khurd
157 Sarvar
158 Badjhiri
159 Anwala
160 Mugaliyachhap
161 Rasuliya gusain
162 Sikandarabad
163 Kharpa
164 Barkheda nathu
165 Neelbad
166 Rolu khedi
167 Mali khedi
168 Kal khedi
169 Mittu khedi
170 Kushalpura
171 Berkhedi bazyaft
172 Ratibad
173 Semri bazyaft
174 Chhapri
175 Mahua kheda
176 Fatehpur dobra
177 Amarpura
178 Bhanpur
179 Satgarhi
180 Borda
181 Samasgarh
182 Samaspura
183 Mahawadiya
184 Thua kheda
185 Pipaliya barkhedi
186 Gol
187 Kalapani
188 Pipaliya kesho
189 Kodi
190 Pipaliya rani
191 Bhoj nagar
192 Amrabad kalan
193 Shobhapur jahej
194 Sewaniya
195 Khad bamulia
196 Kotra
197 Khandabad
198 Suraiya nagar
199 Bandori
200 Panchawa
201 Gehun kheda
202 Nayapura
203 Sankhedi
204 Bairagarh chichali
205 Hinotiya alam
206 Suhagpur
207 Dehri kalan
208 Kankariya
209 Rasuliya inayatpur
210 Inayatpur
211 Semri kalan
212 Imaliya zargar
213 Mendora
214 Mendori
215 Dam kheda
216 Banjari
217 Aakbarpur
218 Chichli
219 Daulatpura
220 Salaiya
221 Bhairopur
222 Bilkhiriya khurd
223 Gudari ghat
224 Katara
225 Barrai
226 Bagli
227 Rapadiya
228 Maksi
229 Pipaliya kunjadghar
230 Ratanpur
231 Chhan
232 Deepdi
233 Bangrasia
234 Samarda kaliyasot
235 Narela hanumant sin
236 Bawali kheda