

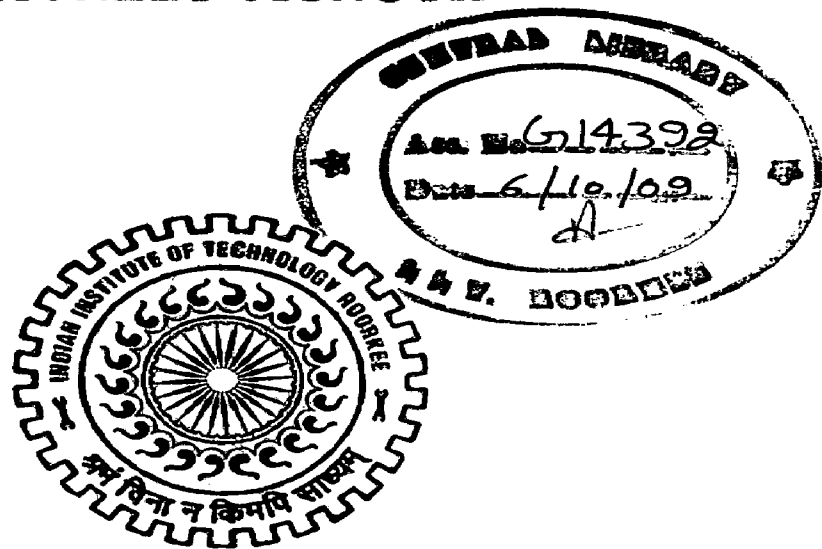
PLANNING FOR PUBLIC TRANSPORTATION SYSTEM FOR AJMER CITY

A DISSERTATION

*Submitted in partial fulfillment of the
requirements for the award of the degree
of*
MASTER OF URBAN AND RURAL PLANNING

By

NAVNEET MUNOTH

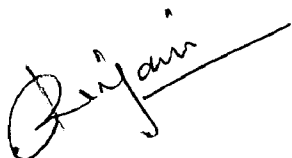


**DEPARTMENT OF ARCHITECTURE AND PLANNING
INDIAN INSTITUTE OF TECHNOLOGY ROORKEE
ROORKEE-247 667 (INDIA)**

JUNE, 2009

CERTIFICATE

Certified that this report titled “**Planning for Public Transportation System for Ajmer City**”, which has been submitted by Mr. Navneet Munoth, in partial fulfillment of the requirements for the award of the Post Graduate Degree in **Master of Urban and Rural Planning** in the Department of Architecture & Planning, Indian Institute of Technology, Roorkee, is the Student’s own work carried out by him under my supervision and guidance. The matter embodied in dissertation has not been submitted for the award of any degree.



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Dated: June 27th, 2009

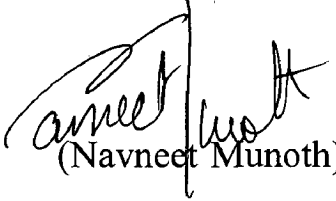
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CANDIDATE'S DECLARATION

I hereby declare that the work, which is presented in this dissertation entitled **“Planning for Public Transportation System for Ajmer City”** in partial fulfillment of the requirements for the award of degree of Master of Urban and Rural Planning, submitted in the Department of Architecture and Planning, Indian Institute of Technology, Roorkee, is an authentic record of my own work carried out for a period of about one year from June 2008 to June 2009 under the Supervision of Prof. R.K. Jain, Department of Architecture and Planning, IIT Roorkee. The matter embodied in this dissertation has not been submitted by me for award any other degree.

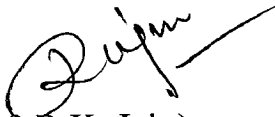
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This is to certify that the above statement made by the candidate is correct to the best of my knowledge.



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Dated: June 27th, 2009

Navneet Munoth

ABSTRACT

One of the current issues pertaining to urban traffic is the role of public transport. The recent energy crisis, the steep fall in the environment quality of roads and the sever congestion have brought this subject to the fore. With the continuous increase in population and corresponding growth of vehicle, the road network has come under heavy strain in most of the cities.

Quality of Public transport in cities is fast deteriorating in almost all countries and especially in the developing world. Indian cities of all sizes are facing the crisis of urban transport and the problem of traffic congestion, road accidents and air pollution is becoming more and more acute. In medium and small cities intermediate public transport is struggling to meet the mobility demands of the city.

In India majority of population belonging to middle income group and below poverty line and unable to afford personal vehicles and expanding urban areas leading to longer travel distance. This results into increased demand of public transport system. Therefore an appropriate public transportation system is needed.

This Dissertation deals with existing public transportation system scenario in Ajmer city, identification of problems and recommendation and proposal for public transportation system.

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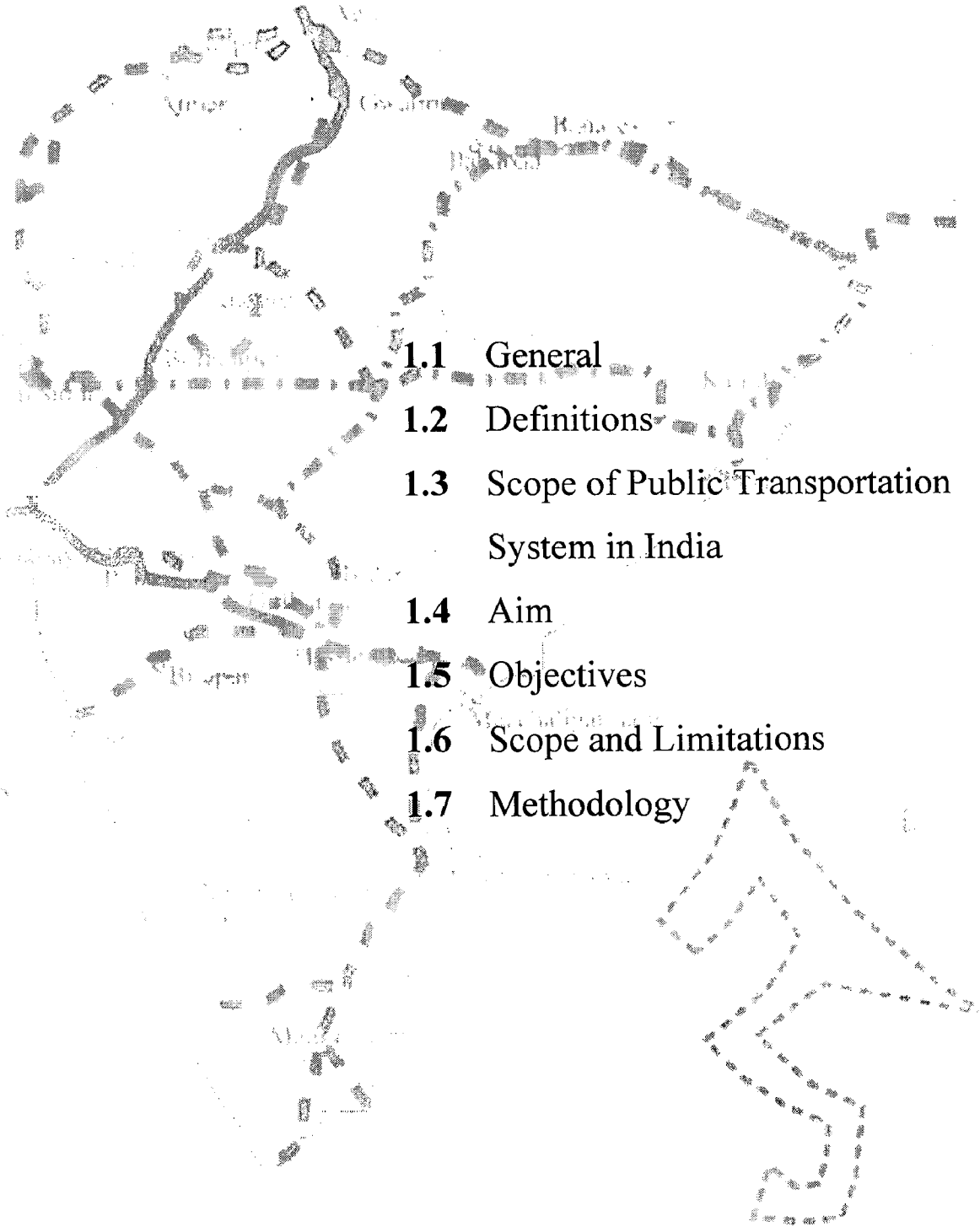
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EVOLUTION OF THE MAJOR ROAD

Chapter-1 Introduction

- 
- 1.1 General
 - 1.2 Definitions
 - 1.3 Scope of Public Transportation System in India
 - 1.4 Aim
 - 1.5 Objectives
 - 1.6 Scope and Limitations
 - 1.7 Methodology

CHAPTER – I

INTRODUCTION

1.1 General

Transportation contributes to the physical, economic, social and cultural development of any country. The economic growth and development pattern, commuting time and efficiency of people depends upon the condition of transportation system in the city. Transport infrastructure plays a critical role in the growth and development of the city and the surrounding hinterlands. Besides providing regional connectivity to the city for movement of people and goods/ commodities to and from the city, it also guides the spatial growth of the city by connecting the peripheral areas to the city centre which is generally the economic hub. Transport plays a multi faceted role in the pursuit of development objectives. The growth of city depends upon its transportation network.

In present times Indian cities are experiencing the problems of rapid urbanization and lacking in infrastructure services. These would require a large amount of capital investment to provide the services to the inhabitants. Transport network being the most crucial component of the urban community, its proper planning is essential for the optimal use of scarce resources. The problem is most critical in the old religious cities due to high population density and growth rate, old pattern of roads, increased number of vehicles and high number of pilgrim

tourists. So my study is focused on evolving the efficient transport strategy for Ajmer city, an important pilgrim center for both Hindus and Muslims pilgrims in Rajasthan.

1.2 Definitions:

Urban Public transportation system consists of facility provided by organization for the intra-city movement of people and which is available to everyone on 'Pay and Use' condition. Public transportation includes both transit and para-transit categories, since both available for use.

Transit or mass transportation is a system with fixed routes and schedules, available for use by all persons who pay the established fare. Bus and light rail are the examples.

Para-transit of for-fire urban passenger transport is service provided by an operator and available to all parties who meet the condition of a contract for carriage (i.e. pay prescribed rate), but which is adjustable in various degrees to individual user's desires. Most of the para-transit modes do not have fixed routes and schedules. Most common representatives are taxi and auto-rickshaw.

1.3 Scope of public transportation system in India

In India majority of persons are below middle income group and below poverty line. They cannot afford personal vehicles so they travel on foot or by bicycle. Therefore an appropriate public transportation system is needed.

The urban areas are expanding at a faster rate resulting into longer travel distance. This further aggravates the need of public transportation.

The use of personal vehicles should be discouraged to reduce the congestion in cities to minimize the air and sound pollution. By providing public transportation, the demand of parking spaces in the central area can be reduced. Public transportation should be considered as essential utility irrespective of economic return.

1.4 Aim

Study for formulating routes for Public Transport modes like Buses and tempos for Ajmer City to provide easy access to various parts & facilities of the City.

1.5 Objectives

Objectives of the study are to plan a safe, efficient and convenient Public transportation system for the movement of people of Ajmer city for 2023, keeping in view fiscal, physical and other constraints.

To achieve these objectives the following steps have been followed-

1. Study of existing public transportation system, demographic and other features of the city and identify the problems and deficiencies in present system.
2. To identify various traffic problems related to traffic volume, accidents prone area, travel characteristics and pedestrian movement.
3. Forecast future travel demand.
4. Plan a suitable public transportation system based on projected travel demand.

1.6 Scope and Limitation

Scope

The scope of the study is to find out the present travel demand and then to work out the problems and deficiencies in present system. Proposals have been suggested for the improvement of existing system.

Limitations

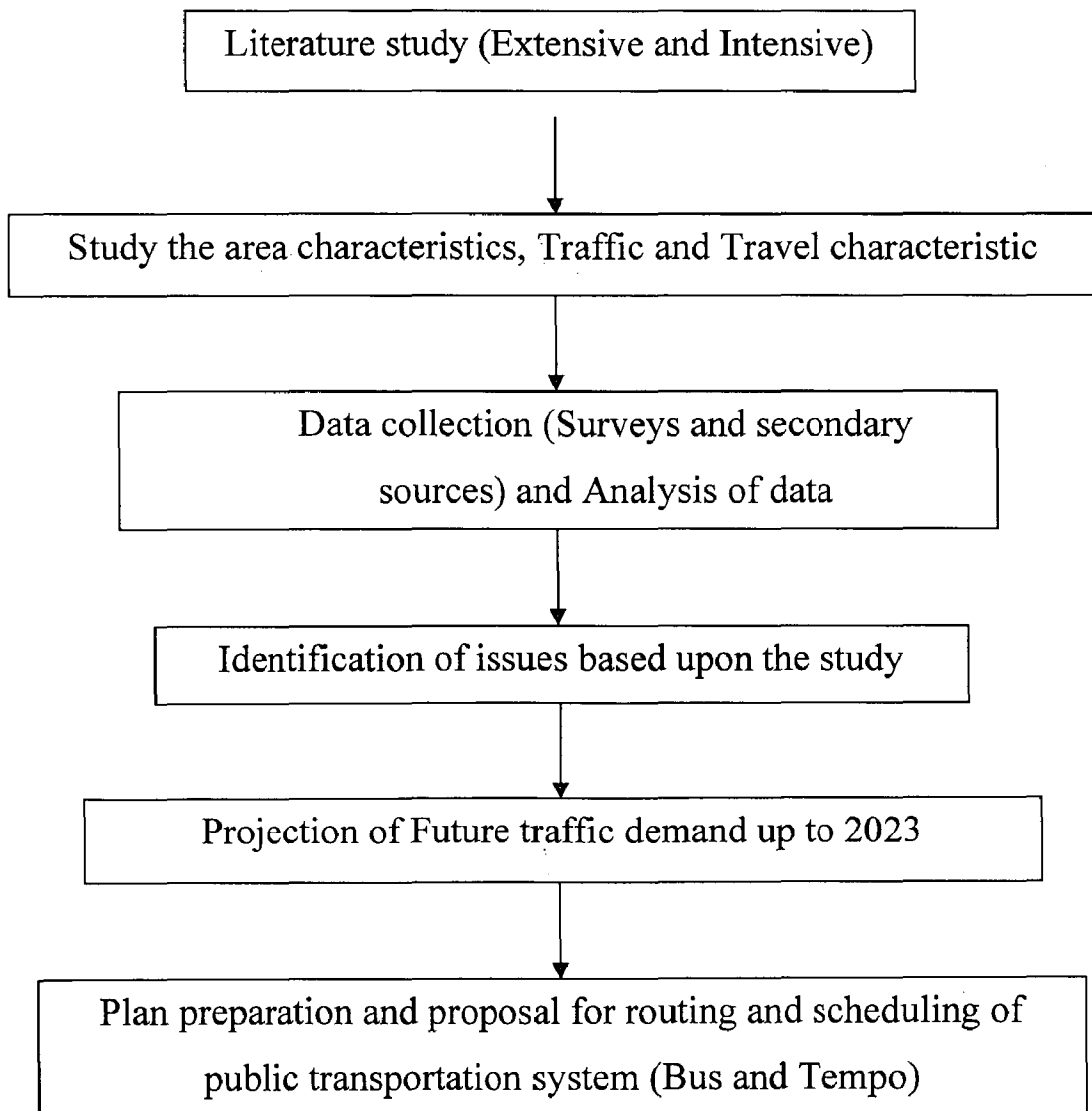
The study emphasizes on mass transportation system (Mini bus and Tempo routes) although all other aspects related to para transit modes have also been considered while planning public transportation system.

Important aspects of these para-transit modes have been studied and mentioned in the study and necessary proposals also have been made for those modes to integrate the whole system.

1.7 Methodology:

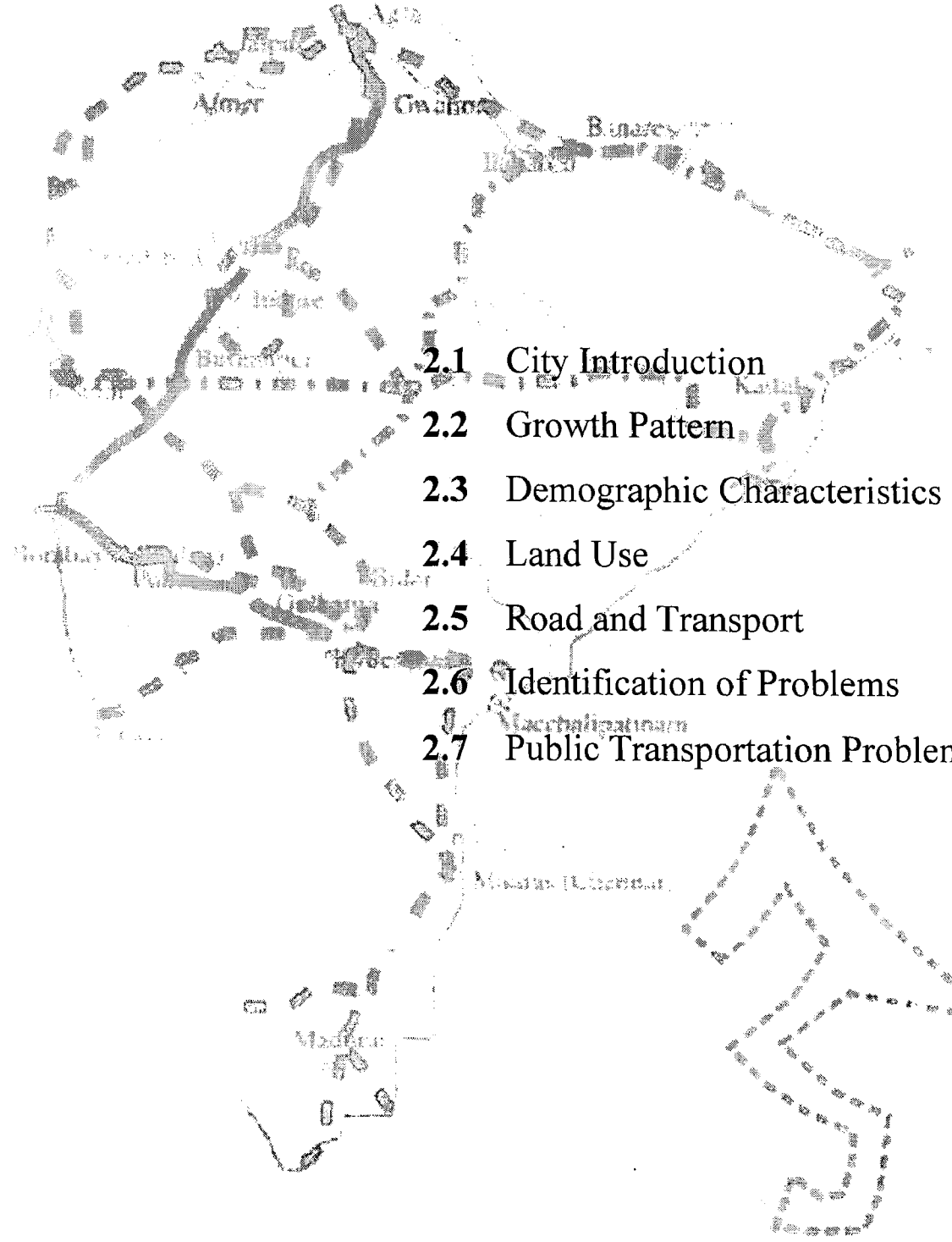
The methodology has been presented in fig. the study can be broadly divided into following parts-

1. Study of the structure of the city and movement of people.
2. Demand for the public transportation.
3. Study of techno economic characteristics of public transportation modes.



EVOLUTION OF THE MAJOR ROAD

Chapter-2 Ajmer Today.

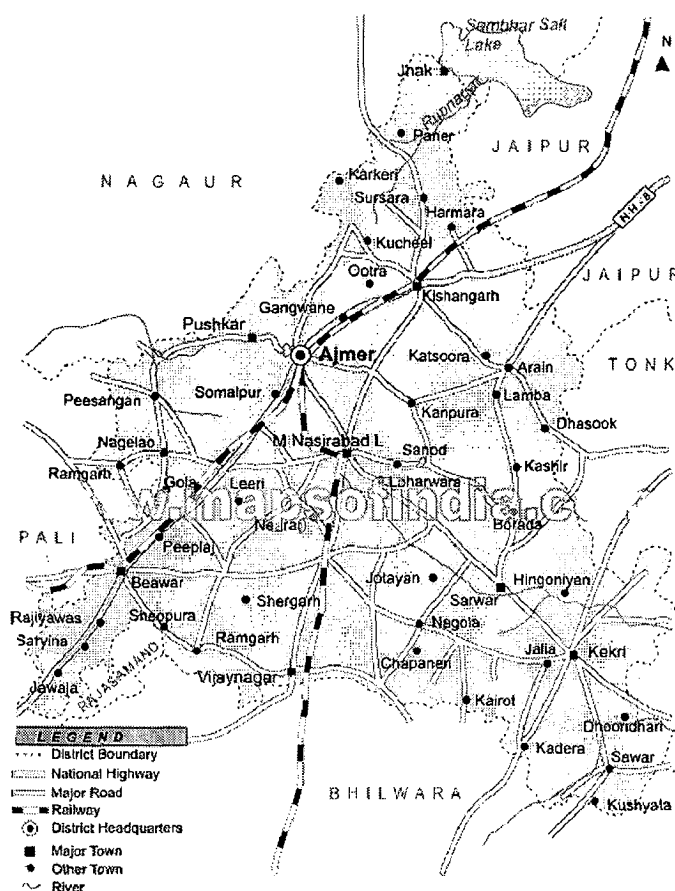
- 
- 2.1 City Introduction
 - 2.2 Growth Pattern
 - 2.3 Demographic Characteristics
 - 2.4 Land Use
 - 2.5 Road and Transport
 - 2.6 Identification of Problems
 - 2.7 Public Transportation Problem

CHAPTER – II

AJMER TODAY

2.1 City Introduction

Ajmer, an important pilgrim city of Rajasthan, situated in the Aravalli mountain ranges i.e. Nag hills, Madar hills & Taragarh hills. It is situated in 26° 27, N. Latitude and 74° 44, E. Longitude and having an height of 486.0 from MSL. It is connected to the state capital Jaipur & other important cities of the region by rail & roads.

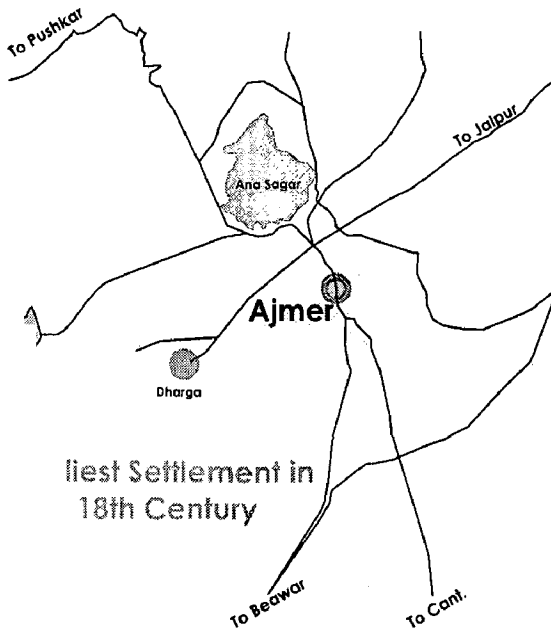


Map 1: Ajmer District Map

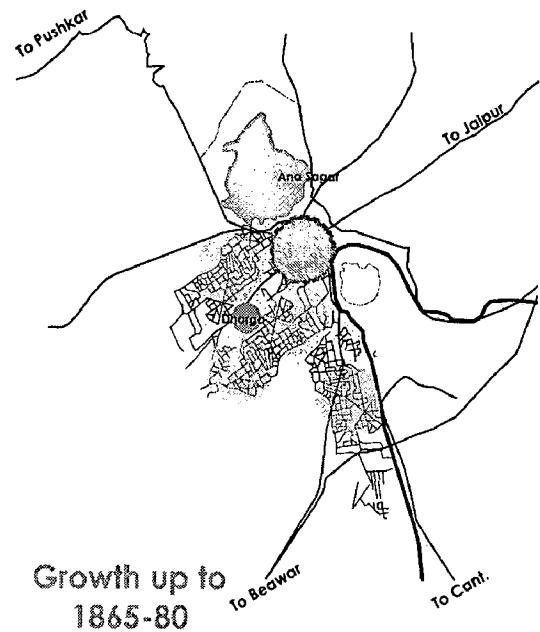
2.2 Growth Pattern

The growth of town started as main Muslim Pilgrim centre due to presence of Dargah of Khwaja Mouinuddin Chisti, south of Anasagar, in an organic manner around the Dargah. In 1818 the town came under the rule of British Empire and subsequently Ajmer Municipal Council was established in 1869. Due to British government a new colonial development started in Ajmer which is different from

the traditional, indigenous development leads to formation of two distinct areas/
pattern of development within the town.



Map 2: Ajmer in 18th Century

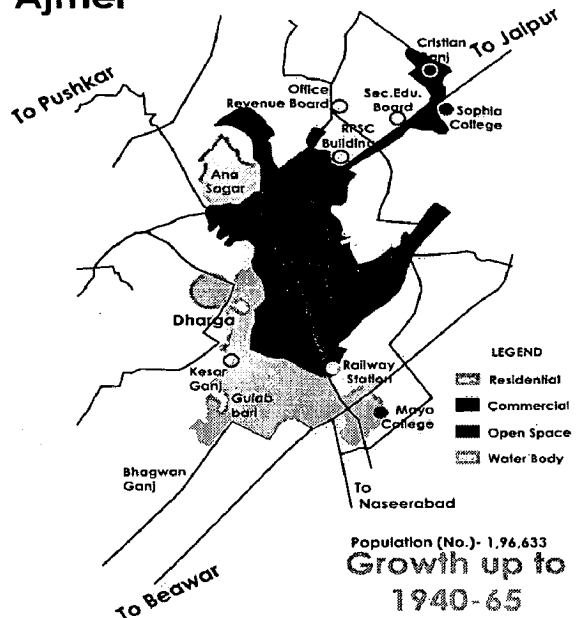


Map 3: Ajmer in 1865 - 80

Establishment of law courts, hospitals, military and railway establishment
g 1870-85 redefine the spatial structure in the expansion of old city where the
growth took place subsequently, with the establishment of Mayo collage in 1875,
Sofia School in 1919 and Govt. College etc. Ajmer has become an important
educational centre in the region. Beginning of the 20th century marked the
development of planned residential colonies such as Kesarganj (1921), Gulab Bari
(1925), Adarsh nagar (1932), Christianganj (1935) etc. with wide roads.

The influx of refugees and establishment of education and other public offices gave a new impact to the commercial activities of the town. With the growing demands, a bazaar with modern shops had come up in the Delhi gate area and a shopping street 'Nala Bazaar' had been built along the Dargah area in 1962, followed

Ajmer

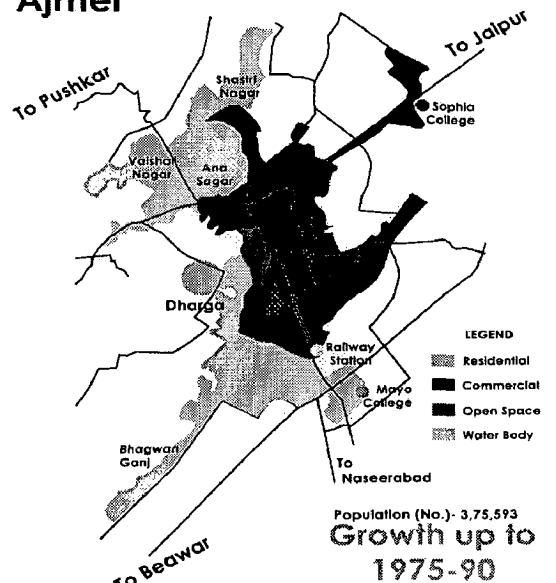


Map 4: Ajmer in 1940-65

with setting up of many arcades and other commercial activities such as wholesale market, retail bazaars, warehousing and other services etc. This gave rise to the traffic volume in the main bazaar and at the same time demand substantial space in the prime areas and attract heavy vehicles thus adding to the problem or congestion.

With further increase in population results town serves as a transit point between the important tourist destinations, Jaipur-Jodhpur and Jaipur-Udaipur. The north-south corridor carries almost the entire city traffic between Gandhi Bhawan and Government College.

Ajmer



Map 5: Ajmer in 1975-90

In today's context, Ajmer city has a population of 6.4 lakh people. This large population travels through, 75,290 vehicles which includes 20,610 cars, 20,476 two wheelers, 1,428 three wheelers 11,364 tractors, 1,552 buses and 11,007 trucks on roads which were planned and constructed in British period or in early decades after independence leads to various problems related to transport in the city.



Map 6: Ajmer in 1990-2000

2.3 Demographic characteristics

2.3.1 Population Growth

The present population of Ajmer is 6.4 lakhs (at the rate of 2% annual growth). Population of the city in the last six decades has grown more than three folds from 1.47 lakhs in 1941 to 4.85 lakhs in 2001. The projected population in 2021 will be 7, 17,609, which require a lot of infrastructure facilities including

roads, transportation system, services and public facilities. The floating population in the city is 1.25 lakh per month (4000 person/day).

Table 1: Population Growth of Ajmer

Year	Population (lakh)	Avg. Decadal Growth	Growth Rate
1941	147258	-	-
1951	196633	49375	33.5
1961	231240	34607	17.6
1971	264291	33051	14.6
1981	375593	111302	42.1
1991	402700	27107	7.2
2001	485575	82875	20.6
Projected			
2006	539321	-	-
2011	593066	107491	22.14
2021	717609	124543	21.00

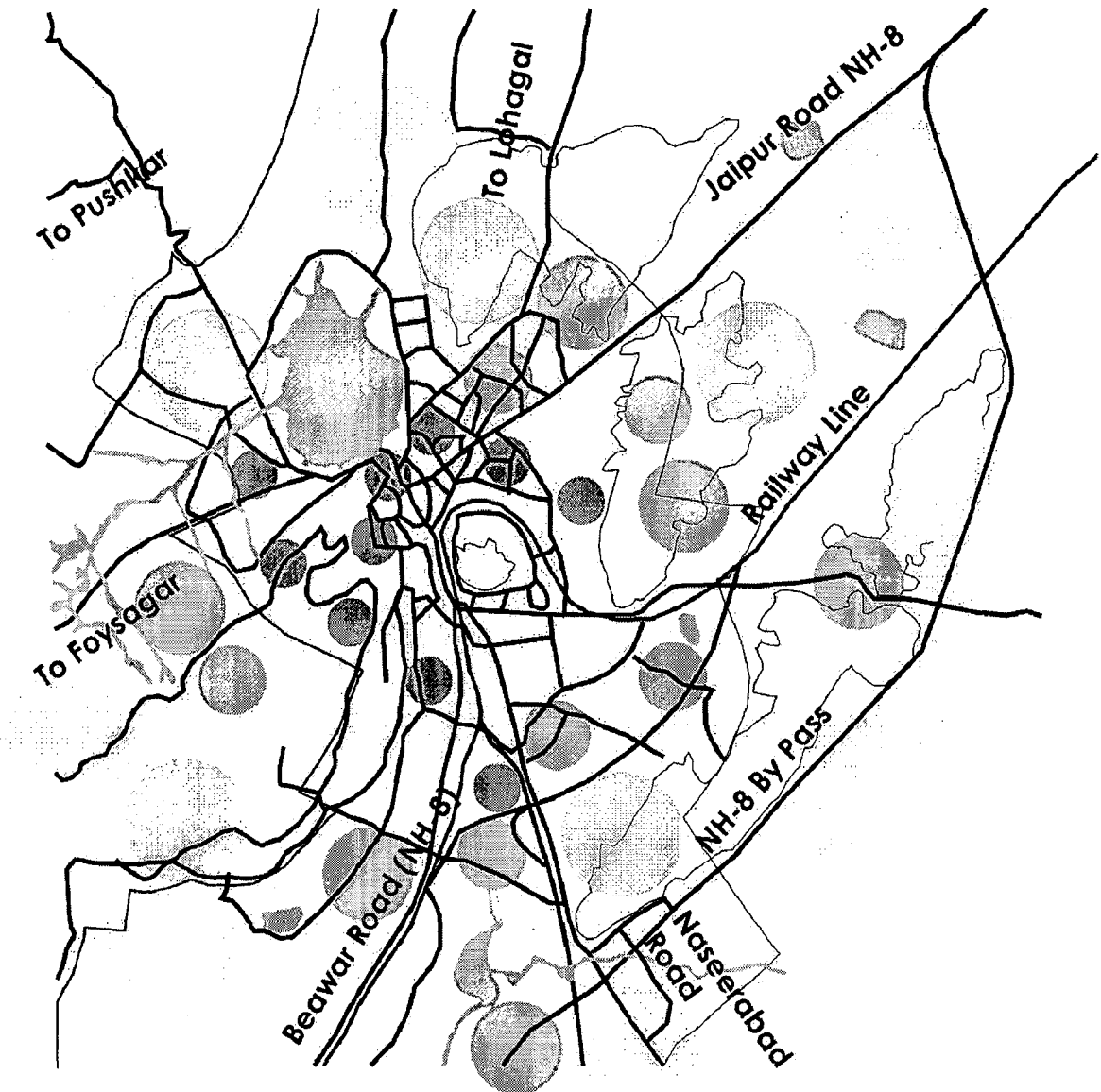
Issues

- Regular floating population from the entire district (Administrative purposes).
- During Urs, daily tourist traffic is about 50,000.
- The residential schools and College also generates transit population into the city.

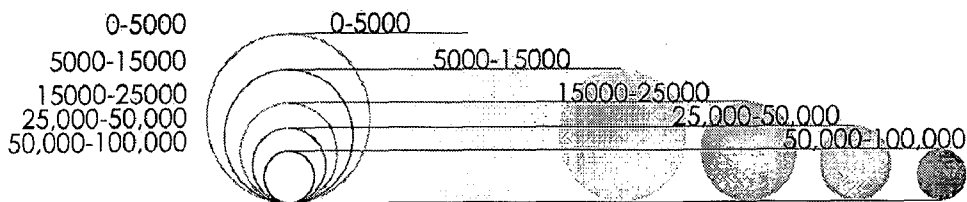
2.3.2 Density

Ajmer has a gross density of 5750 persons/sq.km (2001) whereas the inner core city area has very high population density of over 50000 persons/sq.km and the

periferial areas like Anasagar area, Vaishali Nagar and Chaurasiyawas have the low population density of less than 2000 persons/sq.km (2001).



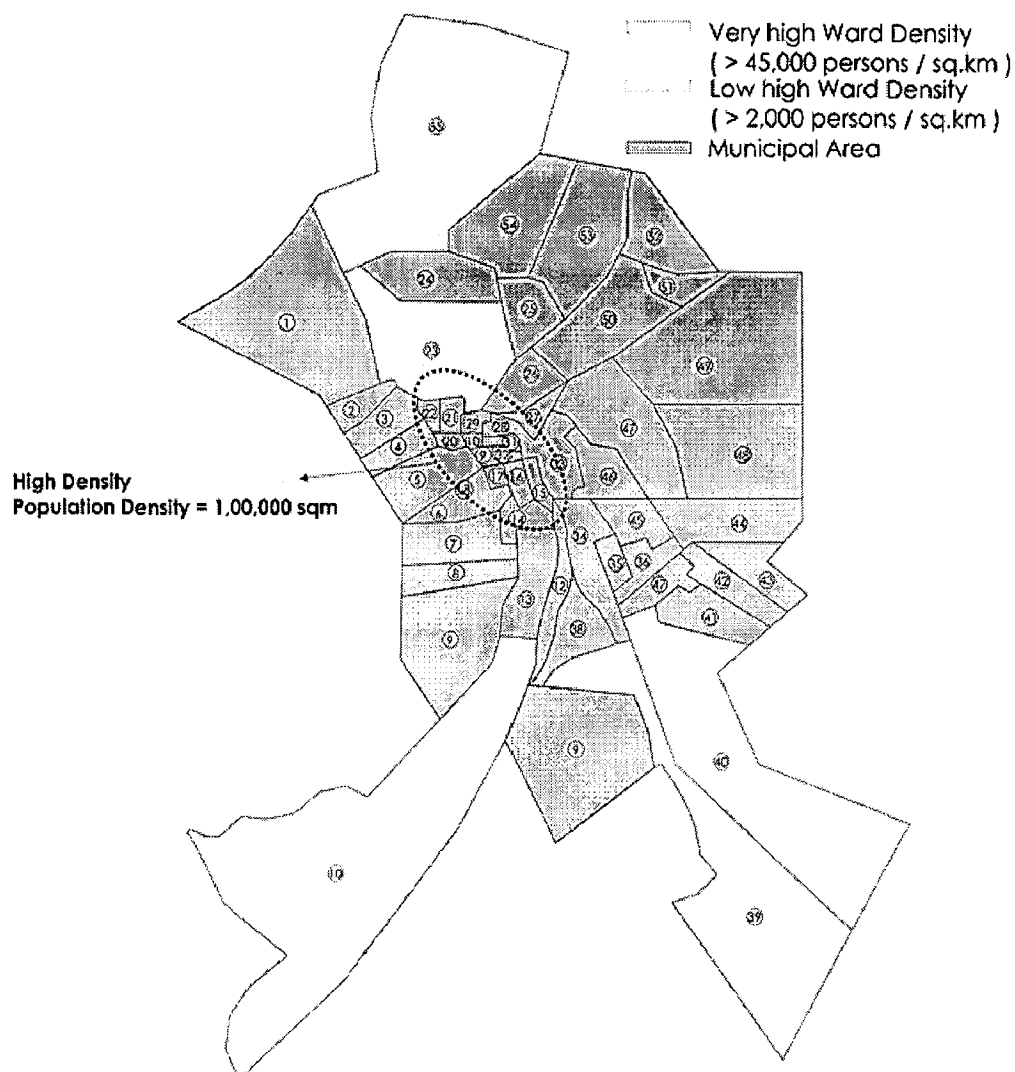
Population Density (persons/ per sqm)



Map 7: Population Density of Ajmer

2.3.3 Ajmer Population Density

In 1991 there were 45 wards in Ajmer, which were increased to 55 in 1995 having population densities (2001) as shown in the Map.



Map 8: Ward wise population distribution of

Issues

- Unhygienic living conditions and health hazard.
- The low density in the remaining part of the town has led to urban sprawl thus increasing the distribution network of the urban services.

2.4 LAND-USE

2.4.1 Existing Situation

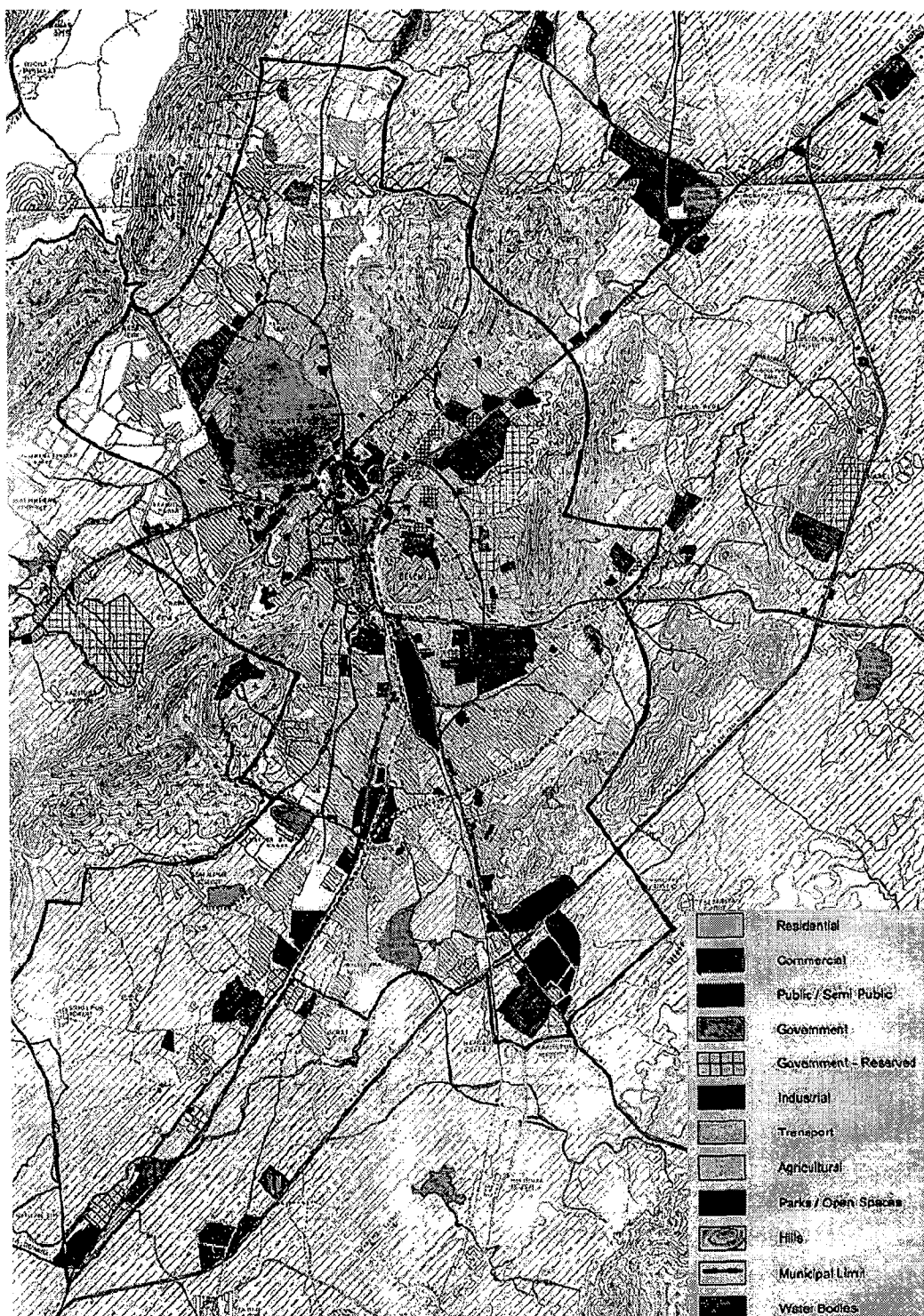
As per the existing land use plan, the total urbanized area of Ajmer is 13,444 acres (53.8 sq.km) in which 85% of the total urban area (11482 acres) is developed so far, 5% of the area is government reserved land under CRPF and Defense force and remaining 10% comprises of open spaces and water bodies. 45% of the total area is under residential use, 18% is under transport system and infrastructure 12% under public and semi public use and remaining area will be used for commercial, industrial, recreational, and green open areas. The high portion of land use (18%) under transport is because of National Highway 8 passing through the city and the newly built NH-8 by pass which connects major cities of Rajasthan to each other.

Table 2: Land Use 2001 of Ajmer

Land Use	Land Use 2001		
	Acres	Area (Sq. Km)	%
Residential	6000	24.0	44.6
Commercial	564	2.3	4.2
Industrial	586	2.3	4.4
Govt.	140	0.6	1.0
Public/Semi Public	1571	6.3	11.7
Recreation	138	0.6	1.0
Transport	2483	9.9	18.5
Green area/ open space (including dairies and poultry farms)	510	2.0	3.8

Govt. Reserved	656	2.6	4.9
Water bodies	796	3.2	5.9
Hilly area			
Total	13444	53.8	100.0

Source: Ajmer Master Plan 2001-



Map 9: Land-use Map Ajmer 2005

Issues

- The natural topography and the rail network across the city posed limitations for development thus resulting in a high density city core.
- There is excessive mixed land use in the inner city, encroachment on the streets by the shopkeepers and unabated conversion of residential to commercial use. This increases congestion in the city and also stresses the already strained infrastructure services.
- In spite of large area under circulation, the internal road network in the city is inadequate as most of the roads pass through railways property and are not being made available for public use.

2.5 ROADS AND TRANSPORT

2.5.1 Existing Situation –Road Network

The city is well connected by road to other major cities in the state. NH-8 passes through the city connecting Jaipur in the north and Ahmedabad in the south. NH-89 connects Ajmer with Pushkar in the west and Kota in the east. Municipal Council, UIT and PWD are engaged in maintaining roads. UIT maintains the roads within the schemes developed by it, PWD maintains state highways and national highways and the Municipal Council maintains the internal city roads. The road network maintained by PWD in Ajmer is about 96.7 km of which 5% (4.6km) is

intermediate lane width, 6% (5.7km) is 4-Lane divided carriageway and the remaining 89% (86.4km) is 2 lane.

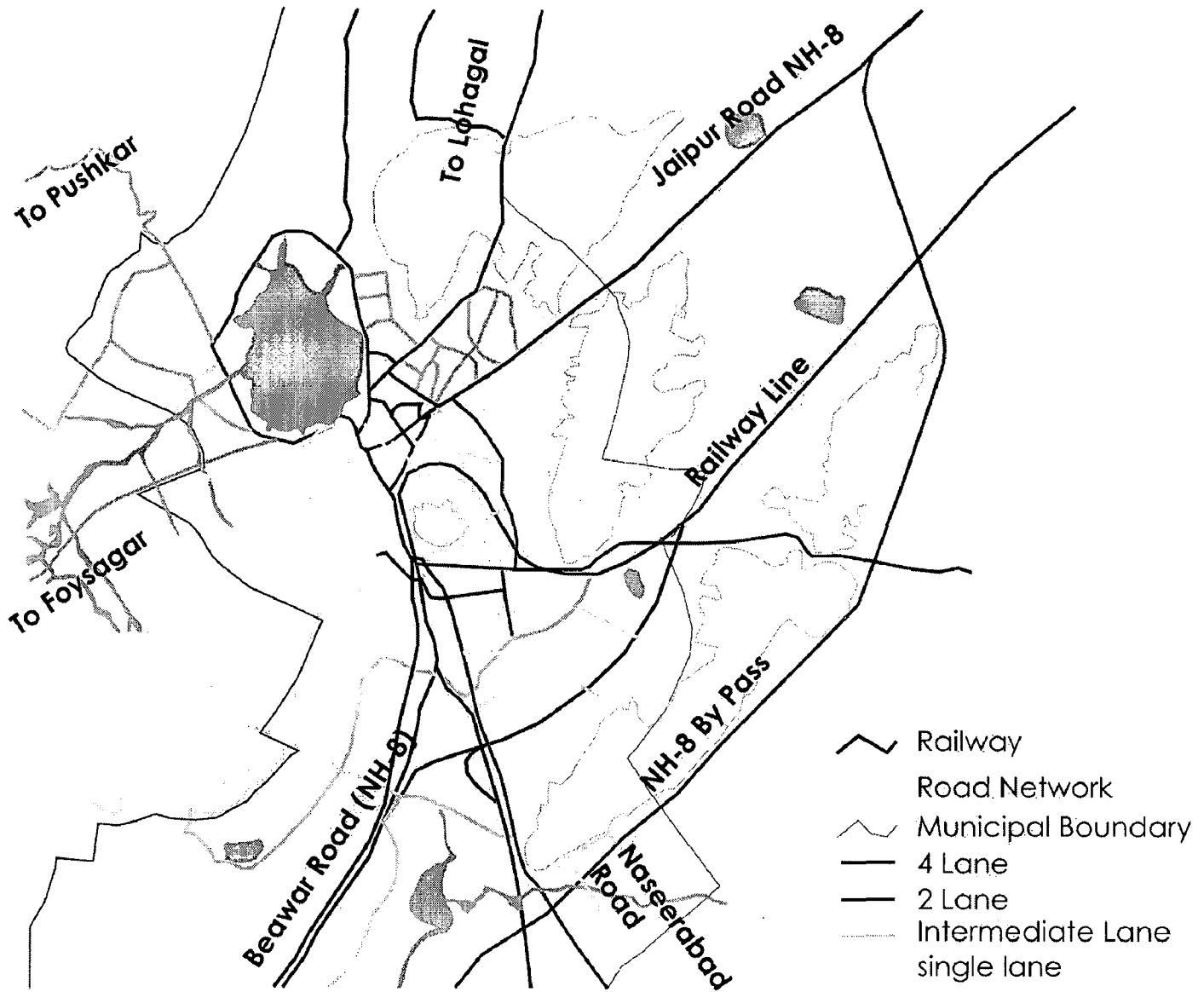
Ajmer city comprises of 455 km of roads of which 10% is cement concrete, 47% black topped, 11% WBM and the rest 32% constitutes earthen roads.

Table 3: Types of Roads of Ajmer City

Type of Road Surface	Length In Km	Distribution Percent
Surfaced Roads		
Cement Concrete Roads	46.00	10.00
Bituminous Roads	214.00	47.00
Unsurfaced Roads		
WBM	50.00	11.00
Earthen Roads	145.00	32.00
Total Roads	455.00	100.00

Source: Ajmer Municipal council

In present scenario, due to on-street parking, encroachment by informal sector, uncontrolled stoppage of intermediate public transport vehicles for long duration on the carriageway, insufficient facilities for pedestrians have aggravated the traffic problems in the city.



Map 10: 8 Radial Road of Ajmer city

The road network map shows the 8 radial roads emerging from the city, of which the major traffic corridors are Jaipur Road in the north-east, Beawar road and Naseerabad Road in the south and Pushkar Road in north-west direction.

2.5.2 PUBLIC TRANSPORT:

Public transport, public transportation, public transit or mass transit is passenger transport systems that transports the general public based on published schedules or at fixed intervals, usually charging set fares, in continuously shared vehicles. This includes rail and bus services.

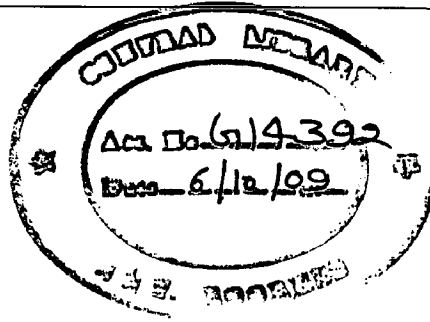
RSRTC has a fleet of 222 buses with 873 arrivals and departures in Ajmer. RSRTC buses mainly serve long distance inter-city trips and medium distance shuttle services from the bus terminus near the Collectorate on Jaipur Road.

2.5.1.1 Private buses:

These buses make long distance inter-city trips from different locations in the city. Presently they operate from Ghooghra Ghati for Jaipur side and from Ramganj for Udaipur side. The long distance private buses do not have any authorized off-street terminals so they are seen to occupy carriageways at Ramganj causing problems to traffic movement. There is also another terminal for private buses near Baradari, for making trips to the nearby villages.

2.5.1.2 Intermediate Public Transport (private vehicles) these vehicles have private ownership and operate from different parts in the city. Intermediate Public transport consists of

- 150 mini buses
- 600 Tempos
- 3500 auto rickshaws



Mini buses and tempos operate on a fixed route and fixed fare basis for short distance trips within Ajmer, while auto rickshaws operate on free route pattern without any fixed rate. Mini buses and tempos do not have proper terminal facilities or amenities for passengers. The city also lacks designated stops for public transport operation.

2.5.1.3 Types of IPT Vehicles in cities

A variety of IPT vehicles are found on the Ajmer roads. These are:

- 1. Mini Bus:** Intra city mass transit trips are mainly performed by minibuses. Mini buses are being operated since 7:30 am. To 8:00 pm. Private agencies operate mini-buses purely for profit making bases.
- 2. Tempo (Vikram):** Tempos are also being operated by private unions. The routes and headway etc. are decided by the Unions themselves not by R.T.O. Tempo are being operated purely on profit making basis and they can be stopped or started at any time.

3. **Six-seater auto-rickshaws:** There are two rows of seats with four openings. Six persons can be seated, excluding driver.
4. **Auto-rickshaws:** These are very popular in Ajmer city. Capacity is 2-seater, besides the driver. Average speed is 25 km/hr.
5. **Cycle rickshaws:** These are pedal cycle vehicle with three wheels and are found in all streets of Ajmer city. Seating capacity is two, besides the driver. Speed is about 10 km/hr.
6. **Tonga:** Horse-drawn vehicle can be seen in city. Capacity is 2 to 4 person. Speed is about 10 km/hr.

2.5.1.4 Characteristics of IPT Modes

IPT modes have a useful role to play in the city. Some of them are:

1. Low fuel consumption, as compared to individualized passenger car.
2. Point-to-point service capacity.
3. Lower cost as compared to taxis.
4. Provision of job opportunities for the weaker section of the society.

There are certain inherent disadvantages of the IPT modes. Some of them are not fully safe. The three-wheeler auto-rickshaw is unstable when turning at high speeds around sharp corners. Some vehicles are extremely noisy and pollute the

2.6 IDENTIFICATION OF PROBLEMS:

The various problems related to the transportation can be categorized into the following categories

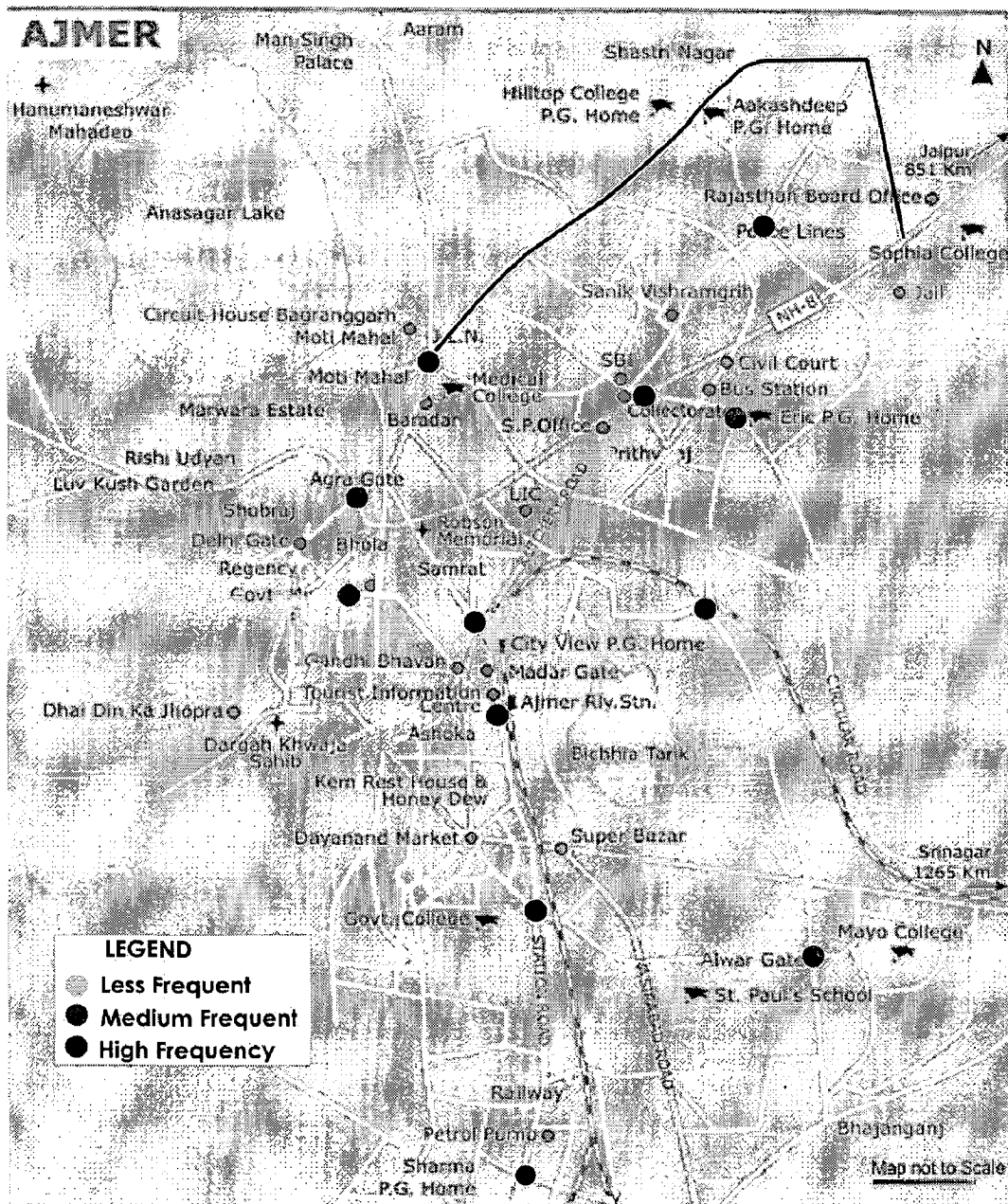
- 1. Problems related to Road**
- 2. Parking problems**
- 3. Problems related to transport system**
- 4. Problems related to encroachment and development controls**

2.6.1 Problems related to Roads

- Inadequate road width and traffic carrying corridors. Most of the internal city roads are single lane or intermediate lane.
- Improper planning in today's context, rapid urbanization and increase in vehicles have resulted in exceeding the carrying capacity on city road network.
- Rail network acts as a constraint on free flow of traffic, number of level crossings causing regular traffic congestion.
- Uncontrolled / congested junctions.
- Absence of foot paths for pedestrian.

2.6.2 Parking problems

- Higher number of vehicles in respect of lower number of parking facility
- Absence of adequate parking in the residential areas
- Inadequate parking spaces in market areas lead to On-Street parking.
- Difficulty to pedestrian movement because of On-street parking



Map 11: Identification of Accident Prone Roads/ Junctions

2.6.3 Transport system

- Absence of BRTS in the city
- Improper operation of intermediate public transport vehicles causing traffic congestion
- Heterogeneity of traffic – Animal carts are commonly used for carrying people and goods within the city. This obstructs the traffic flow and causes congestion on arterial roads.

2.6.4 Encroachment and Development Controls

- Encroachments on streets by shop owners and vendors further reduce the width of carriageway.
- Lack of implementation of Development Controls
- Extended boundary walls on the streets in residential areas
- Ineffective traffic control and management measure
- Lack of awareness among road users.

2.7 Public Transportation Problems:

1. Improper integration among bus and tempo route
2. Various stretches are not capable for buses.

3. There is no fixed schedule. Operators are found to have the tendency to wait for full load in the buses at the terminal and certain intermediate stops which is resulting in lower vehicle utilization and longer waiting travel time for the passengers.
4. Not fixed stops.
5. Problem of charging.
6. City has a high number of tempos (600), which has created the problem of the pollution in the city.
7. Due to high operating cost of tempo, the public transportation is as costly as private transportation (two wheelers).
8. The tempo operates over the routes which have small length therefore the person have to change the mode if they are travelling for long distances.

Problems with the Existing bus Transportation System (Passenger Opinion)

1. There is no proper time schedule. In the absence of which some passenger are still preferring to use the ITP modes already in operation.
2. The stoppage time of buses at few stoppages like Sawitri college, Railway station, GCA and Subhash Nagar is immensely high.

3. There is a problem of overcharging. The stage wise fare structure is not strictly being followed.
4. In the absence of any control, there is a problem over speeding in the crowded area/ main activity centers like Alwar gate, Agra gate, Delhi gate, Head Post office, Bus Stand and Railway station etc.
5. The bus stops are not fixed. This creates problems in the smooth flow of the traffic. The operators are stopping the bus at their own will.
6. The bus shelters are almost absent in the city. Even if they are existing, they are not operational due to encroachment or otherwise.
7. Operators facing from student traveling without ticket or paying less fare. There is also a demand from student and certain sections to the public for concession of free passes.

Chapter-3 Literature Survey

3.1 Introduction

3.2 Issues in Urban Transport in India

3.3 Future Scenario for Urban Transport

3.4 Strategies for Urban Transport

3.5 Improve Urban Public Transport

CONCLUSION

CHAPTER – III

LITERATURE SURVEY

3.1 INTRODUCTION

The rapidly increasing urban population of India is engaging in a variety of economic activities in rapidly expanding cities, which are encountering fast escalations in urban travel demand. A variety of transport modes, such as, walking, cycling, two-wheelers, para-transit, public transport, cars, etc. are used to meet these travel needs.

Travel demand is determined by a number of factors, the primary one being the size of the population. Other determinants include: average number of journeys performed by a resident each day (per capita trips) and the average length of each such journey (trip length). Travel demand has, thus, grown faster than the population because it is a function of both the rising number of trips undertaken by the incremental population as well as increased trip lengths necessitated by expanded city size. (RITES 1998)

3.2 ISSUES IN URBAN TRANSPORT IN INDIA

3.2.1 Congestion

Congestion is an outcome of twin factors,

(a) Growth in number of vehicles on road,

(a) Growth in number of vehicles

The increased travel demand has resulted in rapid growth in the number of motor vehicles in the cities. In the six major metropolises of India, growth in motor vehicles has outpaced population growth. On an average, while the population in India's six major metropolises increased 1.89 times during 1981 to 2001, the number of registered vehicles went up 7.75 times during the same period.

Thus the growth of motor vehicles was almost four times faster than the growth of population. (Motor Transport Statistics of India, 1999, 2002-03, Ministry of Shipping, Road Transport & Highways, GOA).

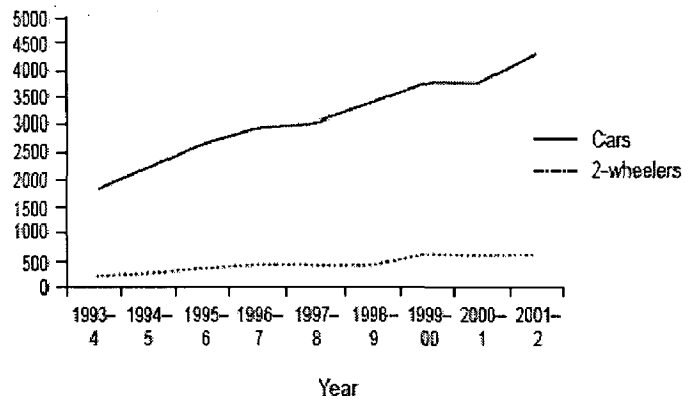


Fig 1: Sale of Cars and Two-wheelers, 1993-2001
Source: Automotive Component Manufacturers Association of India, 2001-02

The popularity of two wheelers seems to be largely due to the following factors:

- In developing economies such as India, as income levels go up, the first step away from non-motorized modes of travel, or from public transport, is usually a motorcycle or scooter.
- Two wheelers offer considerable advantages over public transport through reduction in travel time as well as flexibility in timing one's travel.
- They are economical to operate as compared to a car.
- They require very little space to park.

(b) Limitations to road expansion

Growth in the number of motor vehicles cannot be matched by a corresponding expansion in road space, as there are limits to how much road space can be provided within a city. Resource constraints have come in the way of adequate investments in increasing road capacity and even in undertaking timely repair.

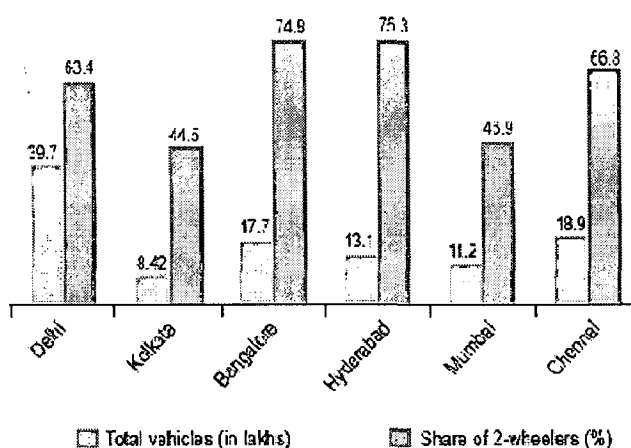


Fig 2: Share of Two-wheelers in Total Registered Vehicles as on 31 March 2003

Source: Motor Transport Statistics of India, 2002-03, Ministry of Shipping, Road Transport & Highways, Government of India.

Inefficient systems of construction coupled with poor maintenance have resulted in poor road infrastructure. Smaller towns with narrow and poorly maintained roads face this problem more acutely. The length of urban roads in India has grown by 134 per cent during 1971 to 2002 and rural roads have grown by 460 per cent during the same period.

While the road length in urban areas was only 7 per cent of the total road length in India, in 2002, the number of registered motor vehicles in the 23 largest cities alone was 30 per cent of the total registered motor vehicles in the country. Thus, urban congestion is a serious problem and has severely constrained mobility (GOI 1999).

3.2.2 Declining Reliance on Public Transport

An associated problem has been the declining reliance on public transport vehicles, with a corresponding rise in the dependence on personal motor vehicles. For example in Delhi the number of personal vehicles per 1000 population has expanded about 3 times (between 1981 and 2001).

Table 4: Personal versus Public Vehicles per 1000 population in India

	1981	2001
Cars/two-wheelers per 1000 population	81.4	245.4
Buses per 1000 population	1.4	3.24

Source: Transport Department, Government of the NCT of Delhi

The number of buses per 1000 population has increased only 2.3 times. (These figures project a higher figure of bus growth as they reflect only the number of registered buses. In actual practice the number of buses on the roads is far less as buses more than eight years old are not allowed to ply on the city roads. There is no such limitation on personal motor vehicles) **Transport Department, Government of the NCT of Delhi.**

3.2.3 Declining Importance of Non-motorized Modes

Non-motorized transport seems to have lost its earlier importance in the larger metropolises. Statistics show that the share of bicycle trips out of the total trips in Delhi has declined from 17 per cent in 1981 to 7 per cent in 1994. This is perhaps due to increasing trip lengths and the increasing affordability of motorized personal vehicles. Yet another factor is that non-motorized modes are exposed to greater risk of accidents as they share a common right of way with motorized vehicles. Studies show that 56 per cent of the road accident fatalities in Delhi involve cyclists and pedestrians. (Mohan and Tiwari 1999)

3.2.4 Motor Vehicles Act, 1988

Major changes are necessary in the Motor Vehicles Act, 1988 as it is not adequately equipped to deal with the problems of urban congestion and pollution. This is perhaps because such rapid urbanization and consequent growth in the number of motor vehicles had not been visualized at the time the current Act was enacted. Similarly, changes are called for in the constitutional provisions relating to the responsibilities of the central government and state governments in dealing with urban transport issues. DTP (2001)

3.3 FUTURE SCENARIO FOR URBAN TRANSPORT

The current problems of urban transport, are major challenges in themselves, they become even more alarming as projections indicate continued growth. The share of urban population in 2001 was only 28 per cent of the total population and is expected to reach 48 per cent by 2051. While there may be differences in the projections made by various experts, urban population is likely to more than double in the next 30 years.

Table 5: Projections of Urban Population in India

Year	Population (million)	Growth rate (per cent)	Urban popln (million)	Growth rate (per cent)	Share of total popln (million)
2001	1027	21.7	285	31.3	27.8
2011	1220	18.8	372	30.5	30.5
2021	1390	13.9	437	27.2	34.0
2031	1534	10.4	583	23.3	38.0
2041	1648	7.4	700	20.1	42.5
2051	1732	5.1	820	17.1	47.5

Source: Ribeiro (2003)

RITES (1998) estimated that although the population in A class cities and above is estimated to grow 2.5 times during 1991–2021, the corresponding intra-city travel demand would grow by 3.5 times during this period. Intra-city travel demand in 1994 was 759 million person km (pkm) per day.

3.4 STRATEGIES FOR URBAN TRANSPORT

Strategies to meet the urban travel demand cannot succeed without the fullest cooperation of the general public. Such cooperation is best secured if the objective of any initiative is made clearly known to them so that they are able to appreciate the likely benefits of certain travel choices or sacrifices that they may have to make. Mechanisms for greater public participation in the city specific initiatives, such as the **Bhagidari scheme** in Delhi, would help bring about greater public cooperation and support. Intensive awareness campaigns that educate people on the ill effects of urban traffic congestion, especially on their health and well being could be useful. Such campaigns could also build in modules to encourage individuals, families and communities to adopt '**Green Travel Habits**' that would go a long way in making travel less polluting and damaging. (India Infrastructure report 2006)

3.4.1 Contain Travel Demand

The first step towards meeting future travel demand is obviously to aim at reducing the travel demand itself through innovative means without compromising economic growth. Travel demand is a function of the population, the per capita trip rate and the average trip length. In a progressively urbanizing developing economy such as India, there is little possibility of reduction in the per capita trip rate. This

is because a larger share of the population would be securing employment (especially women) and a larger share of children would be attending schools. Efforts at reducing travel demand have, therefore, to focus on reducing the average trip length.

It is essential that the transport network guide the urban form, rather than the urban form guiding the transport system. Land use planning would therefore require that transport corridors be developed early so that new settlements come up around these corridors and not in a haphazard manner. The success of this strategy would, however, depend on the ease with which people can shift residences or employment.

3.4.2 Promoting the Use of Non-motorized Modes

Yet another strategy to reduce personal motor vehicle use is to promote the use of non-motorized modes as they are 'greener' modes of travel. This can be done by investing in a segregated right of way for bicycles and pedestrians, converting crowded areas like market places into no vehicle zones, bringing about improvements in bicycle technology and providing safer parking facilities for bicycles at work places and finally promoting cycling and walking as healthy and exciting activities. Because cyclists and pedestrians are, on most roads, required to share the same right of way with motorized modes, they are exposed to grave risks of accident (Tiwari 1999).

Unlike in the developed countries, non-motorized mode users are still a significant number in India and need to be cared for. Unfortunately, most roads do not provide segregated lanes for them. It has been seen that providing separate bicycle tracks has significant advantages, including a more optimal use of the road space. Energy consumption and pollution also decrease because the motor vehicles have a smoother flow. Estimations show that there is a 28 per cent reduction in fuel consumption and 29 per cent reduction in the health-related externalities of air pollution (Tota 1999).

3.5 IMPROVE URBAN PUBLIC TRANSPORT

Several measures are necessary to bring about the required improvements in public transport. To begin with a public transport system design, which can be developed within city constraints given the city's topography, time taken to develop the systems and improve accessibility to people would be an ideal system.

3.5.1 System design

The design of an efficient and cost-effective public transport system is a complex task and several system design parameters need to be kept in mind. A well-designed system is one that meets the demand in a cost effective manner, without too much spare capacity or without too much crowding. (GOI 2005)

The following indicators can summarize optimality of a system:

- ✓ Least space consumption per passenger-km
- ✓ Least energy consumption per passenger-km
- ✓ Least emission per passenger-km
- ✓ Least accidents per passenger-km

The critical design parameters that need to be taken into account are:

- ✓ Line capacity, which is the number of people who can be transported per hour
- ✓ Speed, that is, the average speed of the system
- ✓ Cost, both capital and annual
- ✓ Construction time
- ✓ Ease of access
- ✓ Load factor, which is defined as the ratio of the number of actual users to available capacity.

3.5.2 Accessibility

For a public transport system to be attractive, it is essential to improve access to its services. Safe access is critical for those who have no other travel choices and safe as well as convenient access is an important choice variable for those who do have other travel options and need to be influenced to use public

transport. It is useful to lay down standards for accessibility in terms of the distance within which public transport access points should be available. Typically such distances should be in the range of 0.5 to 1 km in central areas and 1 to 2 km in outlying areas. Such standards are useful for the design of public networks and routes.

A cluster approach in urban planning also makes it easier to provide better public transport coverage, as connecting cluster centers is often adequate to meet public transport needs. Short, intra-cluster trips can usually be performed by walking, cycling or para-transit. Hence, large and sprawling cities like Delhi could be developed as a series of strategically located hubs, which are interconnected by high capacity transport systems. Intra-hub trips could be made by other modes. One idea that is becoming popular in several countries is that of transit villages. Transit villages are essentially high-density residential or commercial centers close to or on transit stations.

3.5.3 Governance and Regulatory Reforms

Clearly, urgent reforms are inevitable for sustainable solutions to India's challenge of urban transport services. The central government of India has formulated a draft **National Urban Transport Policy** with the following objectives:

- To bring about better integration of land use and transport planning so as to improve access to jobs, education, etc.
- To encourage public transport and non-motorized transport so that the dependence on personal motor vehicles is reduced;
- To offer central government support for investments in cycle tracks and pedestrian paths;
- To offer central government support for investments in mass transit systems;
- To have a more coordinated approach to urban transport management through Unified Metropolitan Transport Authorities;
- To offer support for capacity building at the state level;
- To design parking facilities in a manner that encourages greater use of public transport and non motorized modes as also financial support for construction of parking complexes;
- To provide concessions for the adoption of cleaner fuel and vehicle technologies so that the pollution caused by motor vehicles gets reduced.

This policy points in the right direction for meeting the challenges of urban mobility in the years to come and should be brought into operation quickly. It should, however, be reviewed after about 3 years of implementation so that any elements that may have been overlooked earlier could be accommodated at a reasonably early stage.

Public transport has positive externalities that no single user would be willing to subsidize. Similarly, the infrastructure created for urban transport needs is virtually a public good and no one can be prevented from using, the roads that have been built. Finally, many of the services cannot be provided in a highly competitive market and tend to be monopolistic in nature. Hence, there are important regulatory responsibilities that the government or a public agency has to discharge. (GOI 2005)

CONCLUSION

Urban public transport in India is underdeveloped resulting in congestion on roads due to mixed traffic. Unreliable and rudimentary public transport systems have led to increased dependence on small, motorised vehicles among urban population. This coupled with the decline in non-motorized modes of transport, either due to demonstration effect or affordability of a motorized vehicle has given rise to air pollution and high level of road accidents.

Currently, public transport in India, barring a couple of metropolitan cities, is underdeveloped. Urban transport in most cities suffers from lack of planning as well as amorphous nature of responsibilities assigned to various central, state and local government agencies. Demand for urban transport is expected to double by 2030, hence, there is an urgent need to develop strategies, which will reduce demand for public transport without constraining growth and provide a healthy environment to urban dwellers.

Chapter-4 Case Study

(Public Transportation System of Jaipur City)

4.1 City Introduction

4.2 Growth Pattern

4.3 Demographic Characteristics

4.4 Urban Transport in Jaipur

4.5 Traffic Characteristics

4.6 Findings/ Inferences from Case Study

CONCLUSION

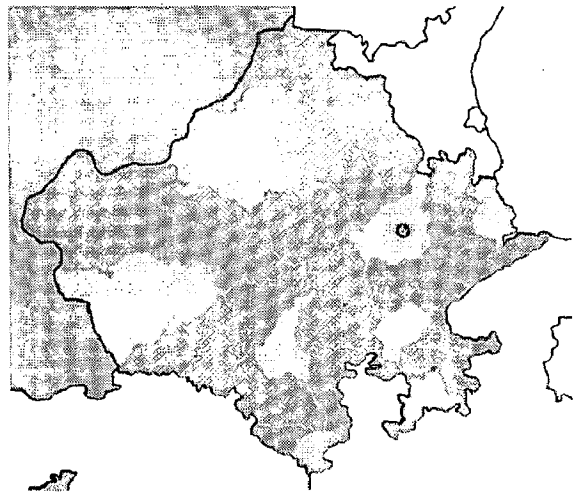
CHAPTER – IV

CASE STUDY

PUBLIC TRANSPORTATION SYSTEM OF JAIPUR CITY

4.1 City Introduction:

City of Jaipur, the world renowned “Pink City” of India is located in western part of India at $76^{\circ} 82'$ E latitude and $26^{\circ} 92'$ N Longitude. Jaipur is famous for its traditional architecture. It is the capital of Rajasthan state, District head-quarter, and the most important urban centre in Rajasthan state.



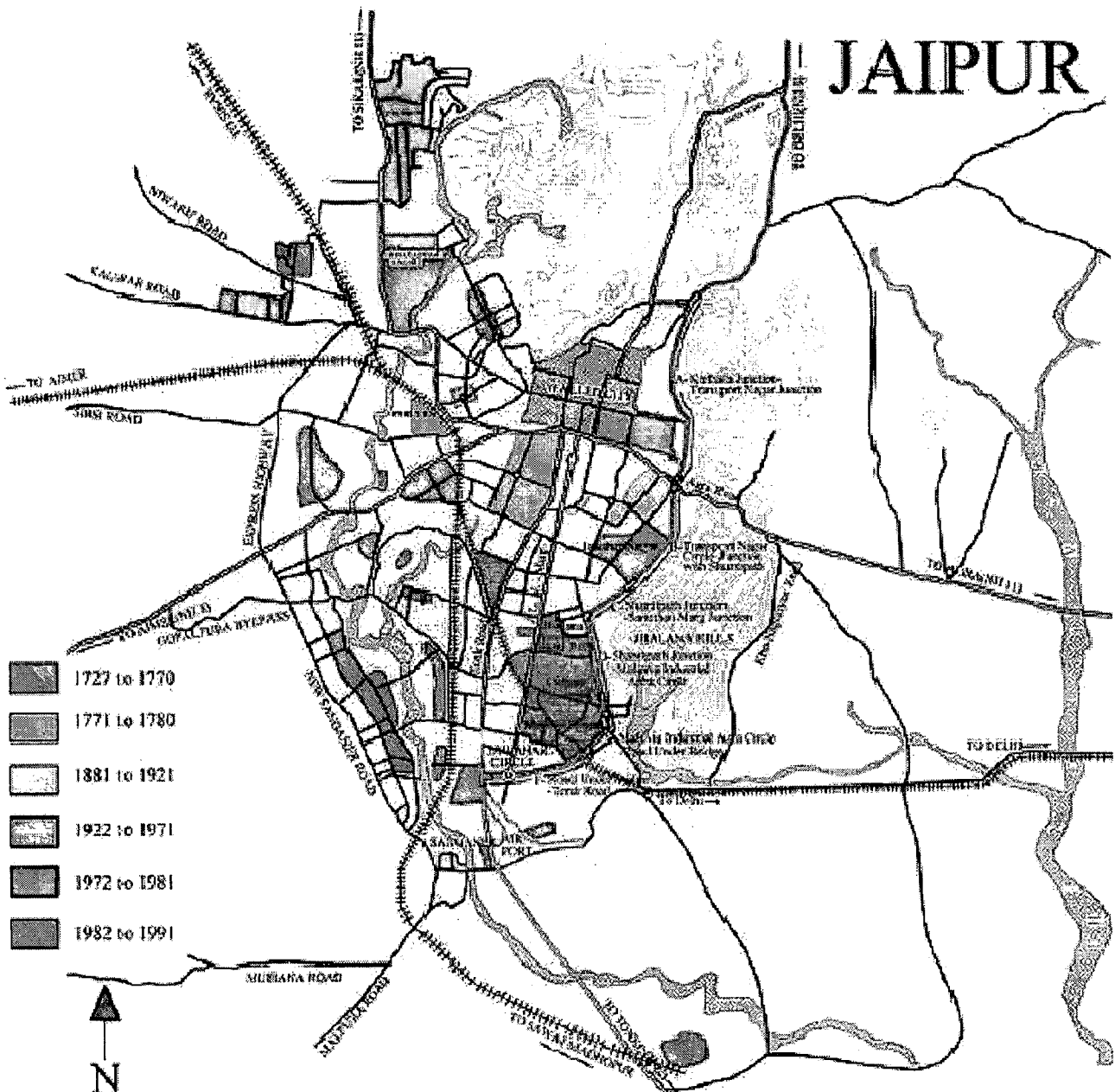
Map 12: Location of Jaipur

Important business and marketing centre for north-west region of India, well linked with other district head quarters of Rajasthan state and other parts of India by Rail, Road, Airways are the important features of Jaipur city.

4.2 GROWTH PATTERN

The walled city of Jaipur was founded in 1727 A.D. by the Maharaja Sawai Jaising II and planned by Vidhyadhar Bhattacharya. The planner evolved a grid iron plan, with the main road running east to west along the ridge in the centre and

placing the palace complex as the core of the city plan. The development was confined to city walls till the beginning of 20th century. The city started growing out wards the incoming of the railway line and other economic factors.



Map 13: Jaipur Growth Pattern, 1727 to 2008

During post-independence period jaipur experienced a phenomenal growth due to immigration from Pakistan and it also being made the capital of the new state of Rajasthan. After 1948 Bapu Nagar and Gandhi Nagar residential areas towards south were came into picture. The south-eastern area was developed during the fifties when Rajasthan University was established. The NorthWest area started developing in early sixties with the establishment of Jhotwara Industrial Area.

Jaipur which had mainly about 2000 acres (8.1 sq.km.) within fortification covered more than 14000 acres (56.7 sq.km.) in 1971 municipal limits, however in compass about 46,000 acres (186.2 sq.km.), in 1981 the area figure reached to 44782 acres (181.23 sq.km.) and in 2005 area is 49519.9 acres (200.4 sq.km.)

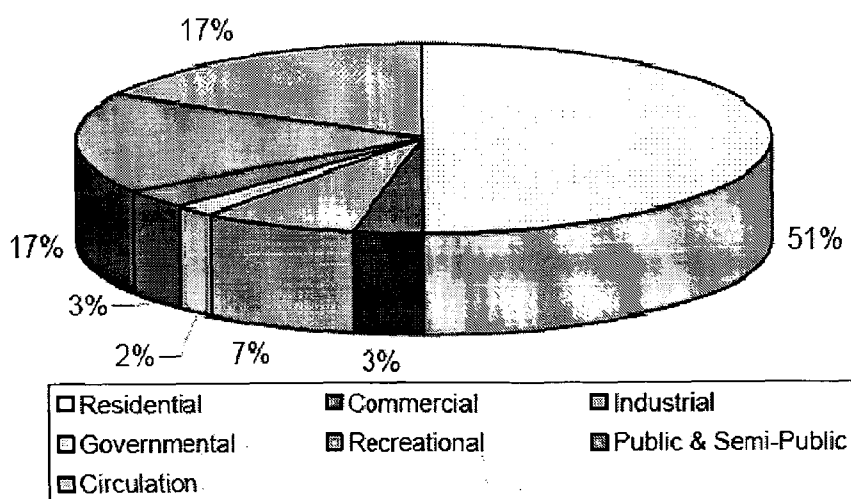
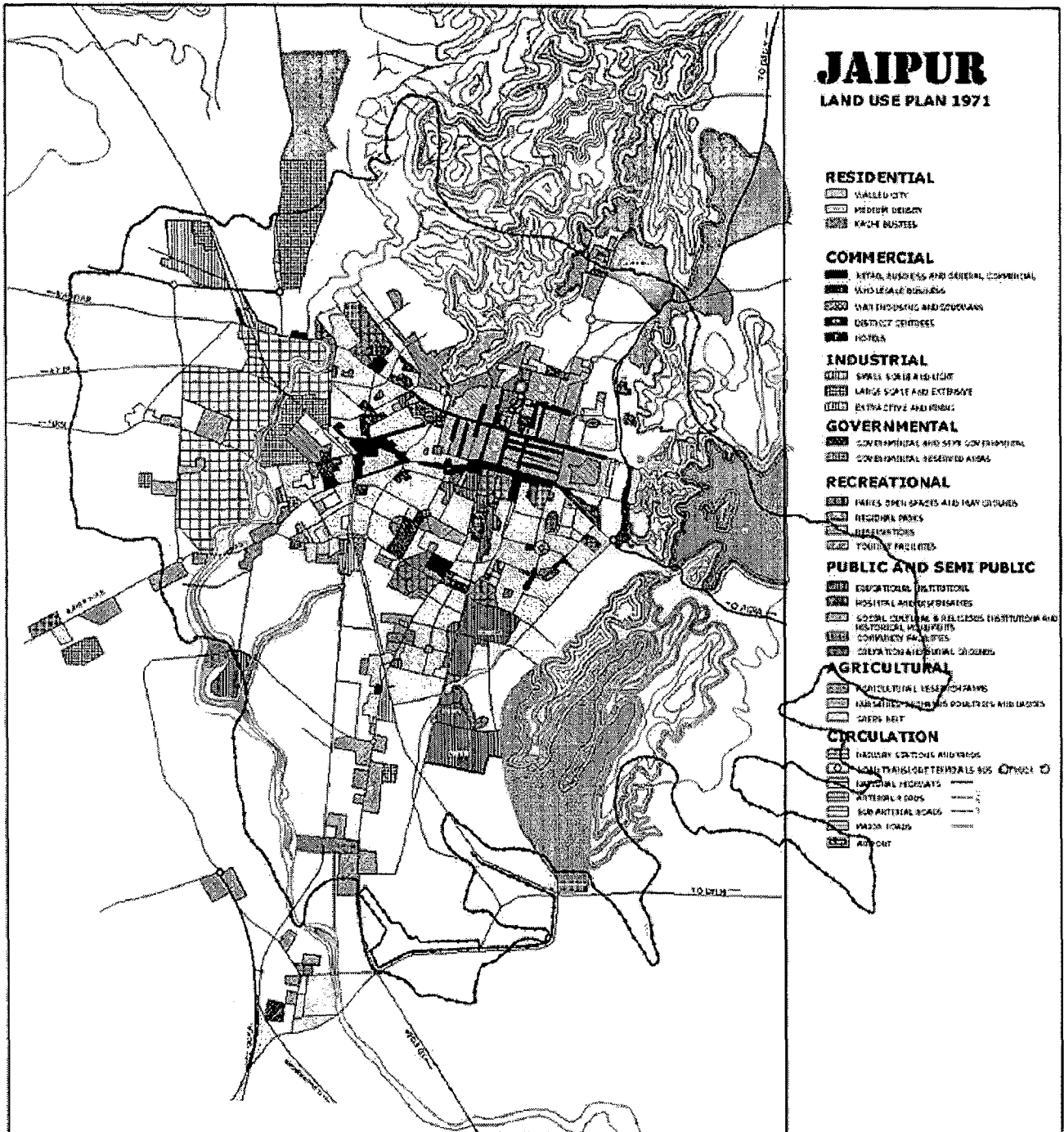
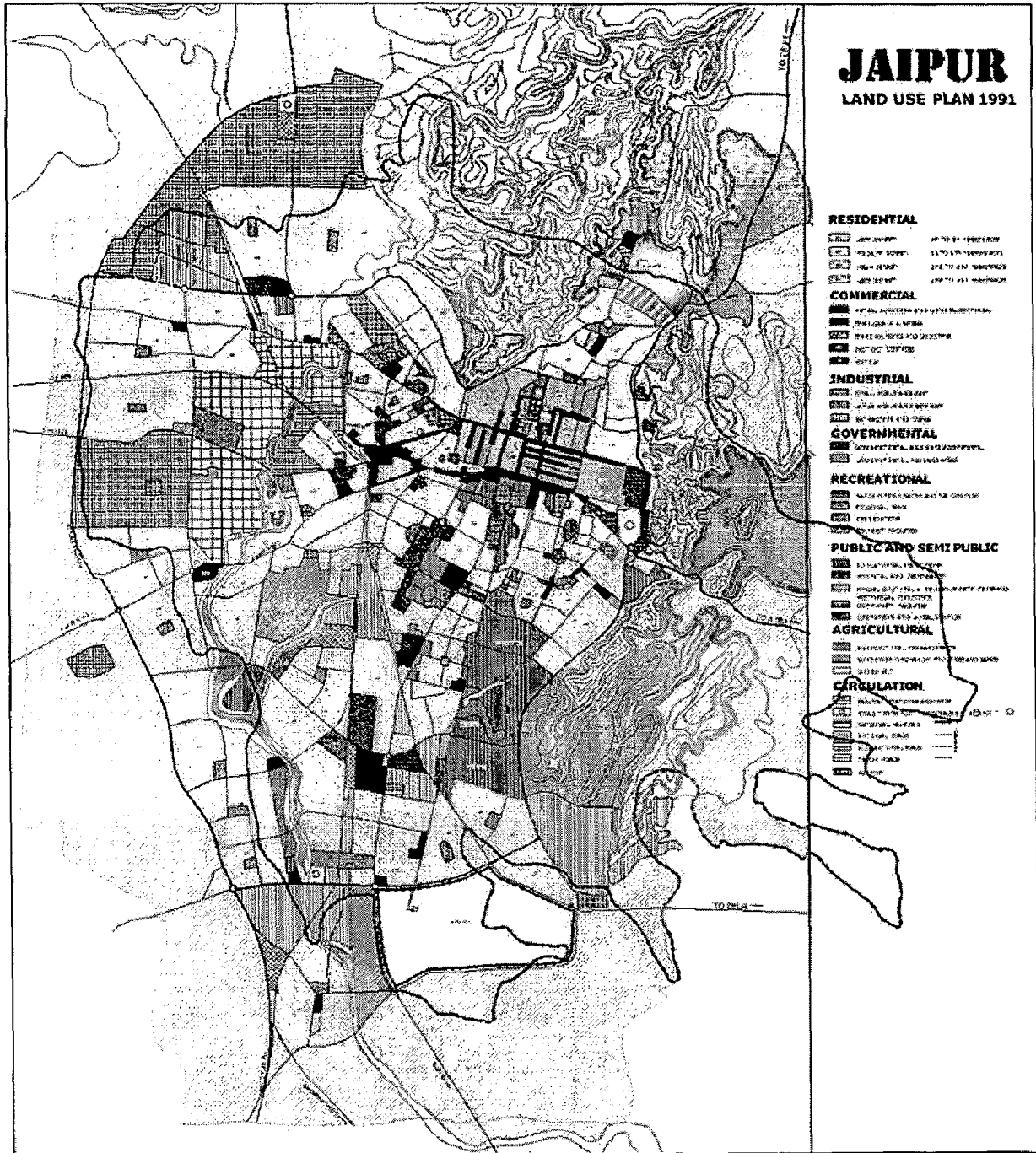


Fig 3: Landuse-1971



Map 14: Land-use Map-1971



Map 15: Land-use Map -1991

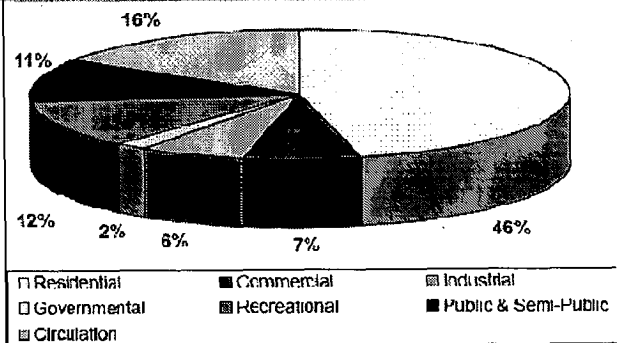
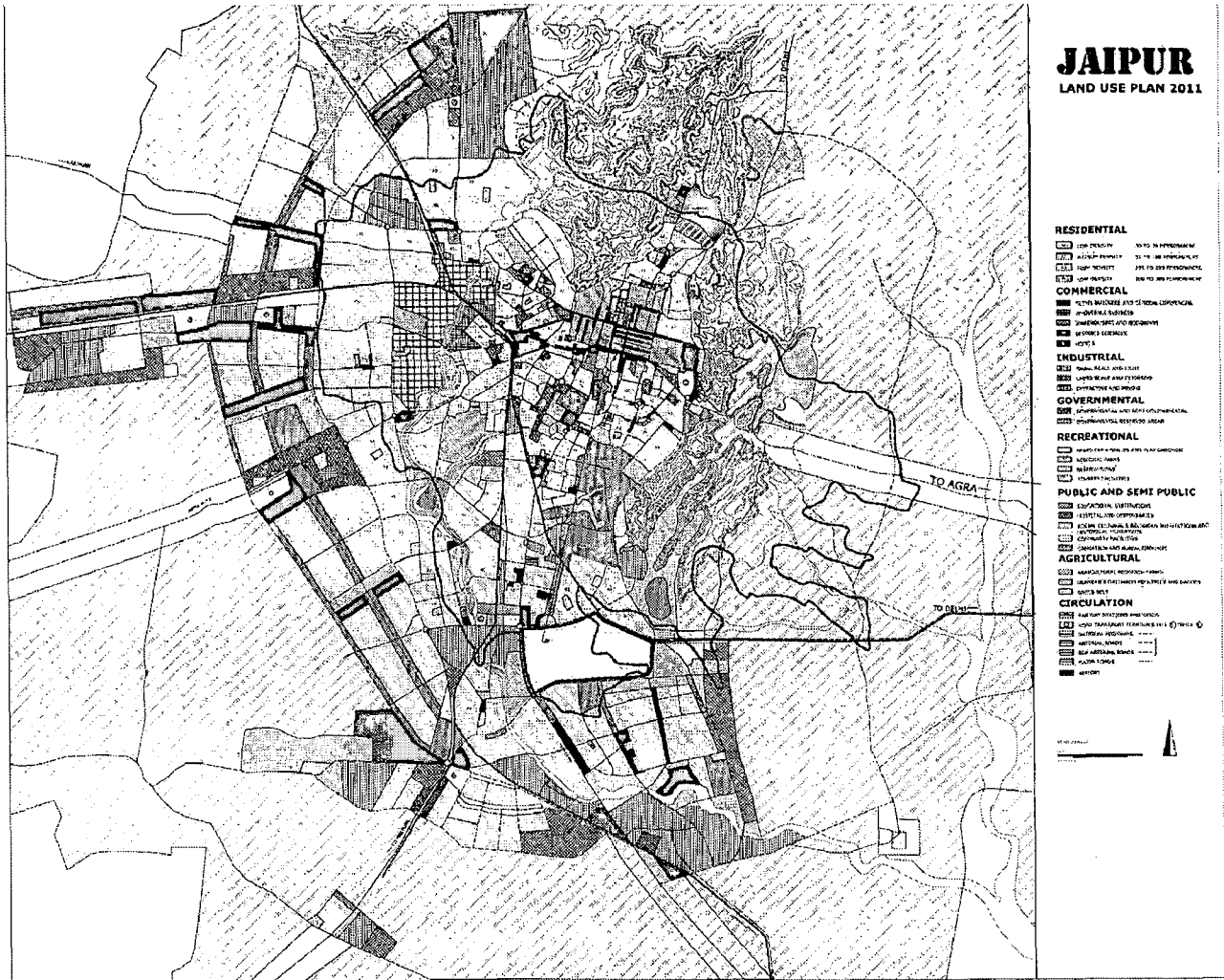


Fig 4: Land-use 1991



Map 16: Land-use Map -2011

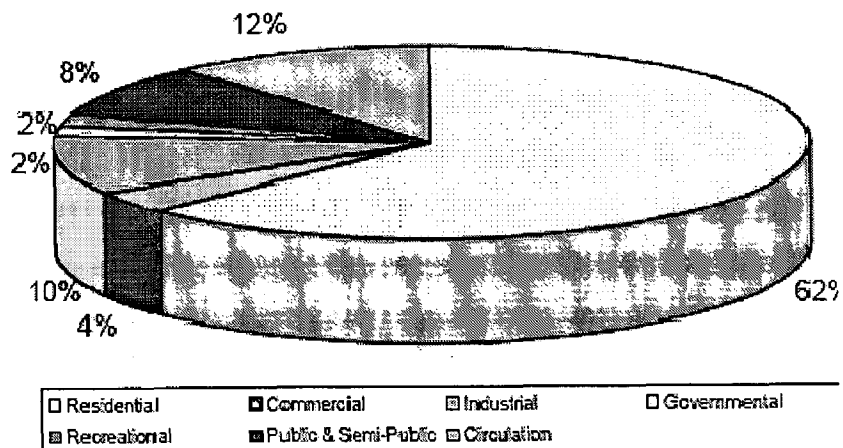


Fig 5: Land-use -2011

4.3 DEMOGRAPHIC CHARACTERISTICS

4.3.1 Population growth

The growth of population in Jaipur city has been phenomenal.

Table 6: Decadal population growth in Jaipur

Year	Population	Decadal Growth	% age Decadal Growth
1901	1,60,167	-	-
1911	1,37,098	-23,069	-14.40
1921	1,20,207	-16,891	-12.32
1931	1,44,179	+23,972	+19.94
1941	1,75,810	+31,972	+21.04
1951	2,91,130	+1,15,320	+65.50
1961	4,03,444	+1,12,314	+38.58
1971	6,15,258	+2,11,814	+52.50
1981	9,27,400	+3,61,907	+58.82
1991	1,551,953	+6,24,553	+67.34
2001	2,324,319	+7,72,366	+52.50
*2011	42.16 lakh	-	-

4.3.2 Population Density

The walled city has the highest population density in the city at 58207 persons/sq km. This is despite the fact that the density has declined from 1991 (74,000 persons per sq.km).

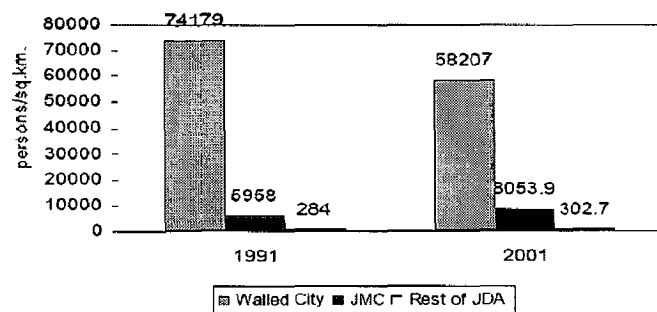
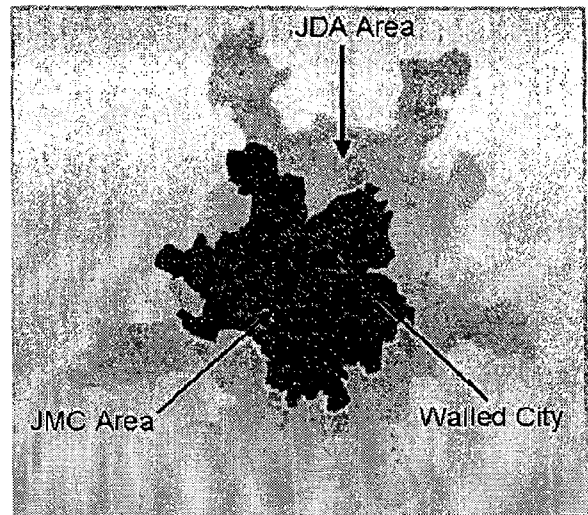


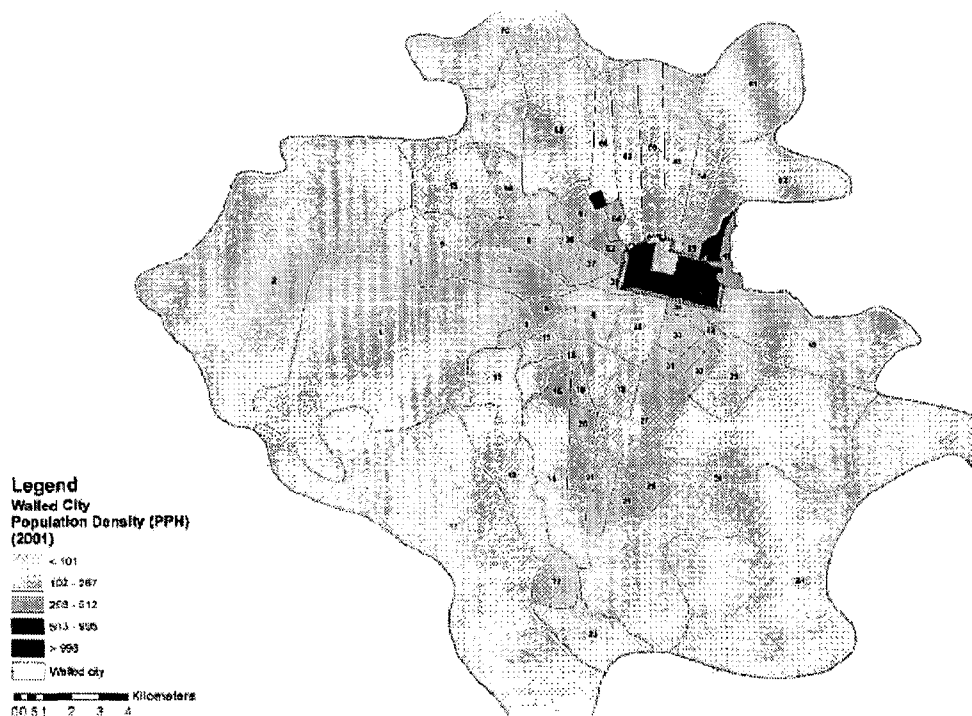
Fig 6: Population Density

The population density of JMC is higher in 2001 than 1991 and has increased by nearly 3000 persons sq. km in spite of expansion of municipal boundary. It is evident that the JDA has the lowest density with JMC at the second place and the walled city with maximum concentration of population.



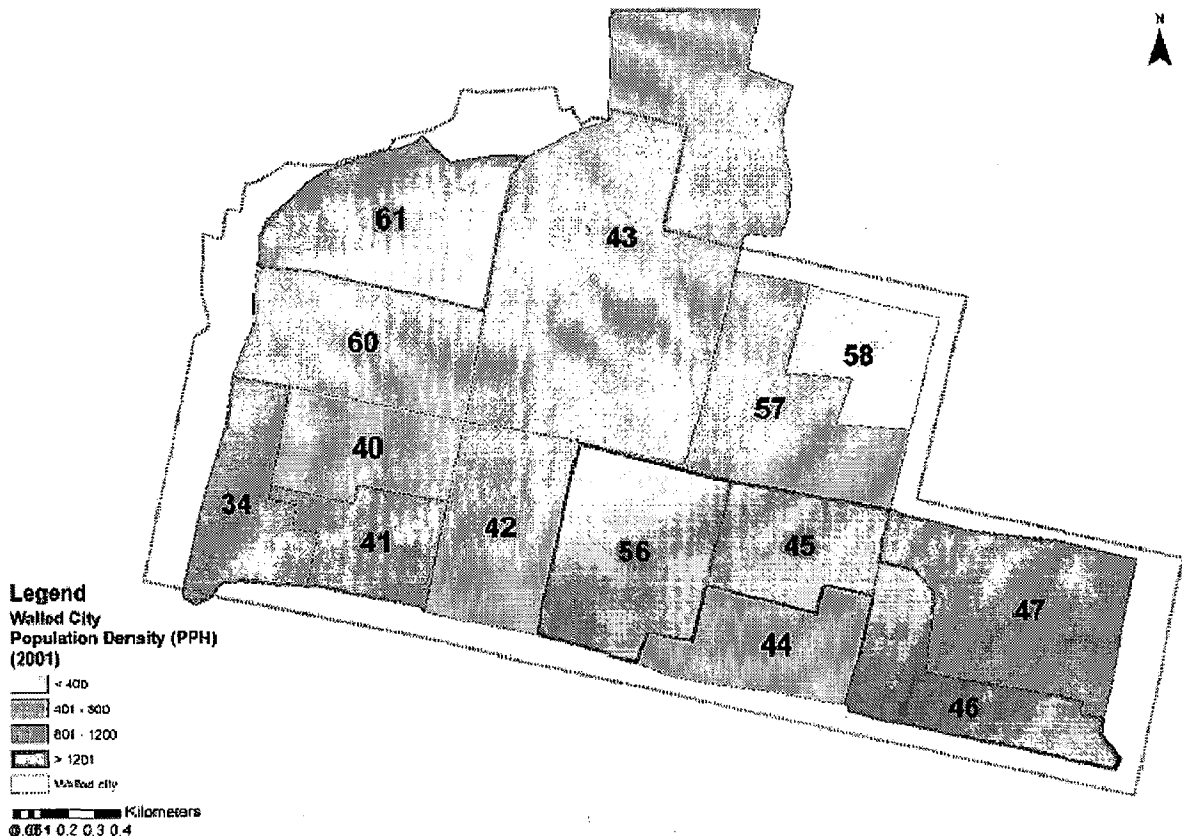
Map 17: Density of Population- Jaipur

The densities in the JMC area range from 100 PPH to nearly 1000 PPH. However, the density is high only in the walled city. In the rest of JMC area, the densities range from 100 PPH to 550 PPH.



Map 18: Density of Population 2001-JMC Area

The population density in Walled City has also been analyzed. Map 19 shows that wards 45, 46 and 56 have relatively higher density of population (more than 1200 PPH) than others.



Map 19: Population Density of 2001- Walled City

4.4 URBAN TRANSPORT IN JAIPUR

Transport infrastructure forms the backbone of an economy. It plays a very significant role in the growth and development of the city. It is also responsible, besides other factors, for the spatial growth of the city by increasing the accessibility of sites on the periphery of the city. **The objective of studying the**

transport sector is to analyze the role of transport in the present scenario and to identify its strengths and weaknesses.

The road and the rail sector play a very significant role in Jaipur and the surrounding region. **This has been divided into the following sections:** Regional linkages, city level road network, traffic characteristics, parking, public transportation system.

- The section on **Regional linkages** describes the connectivity of Jaipur city to the other cities.
- **City level road network** identifies the main arterial roads inside the city and features related to it.
- **Traffic characteristics** details out the traffic volume, flow characteristics, modal split and vehicle growth in Jaipur city.
- The section on **Parking** deals with the present parking scenario in the city mainly in commercial areas.
- **Public transportation system** section talks about the modes of public transport and other details associated with it.

4.4.1 REGIONAL LINKAGES

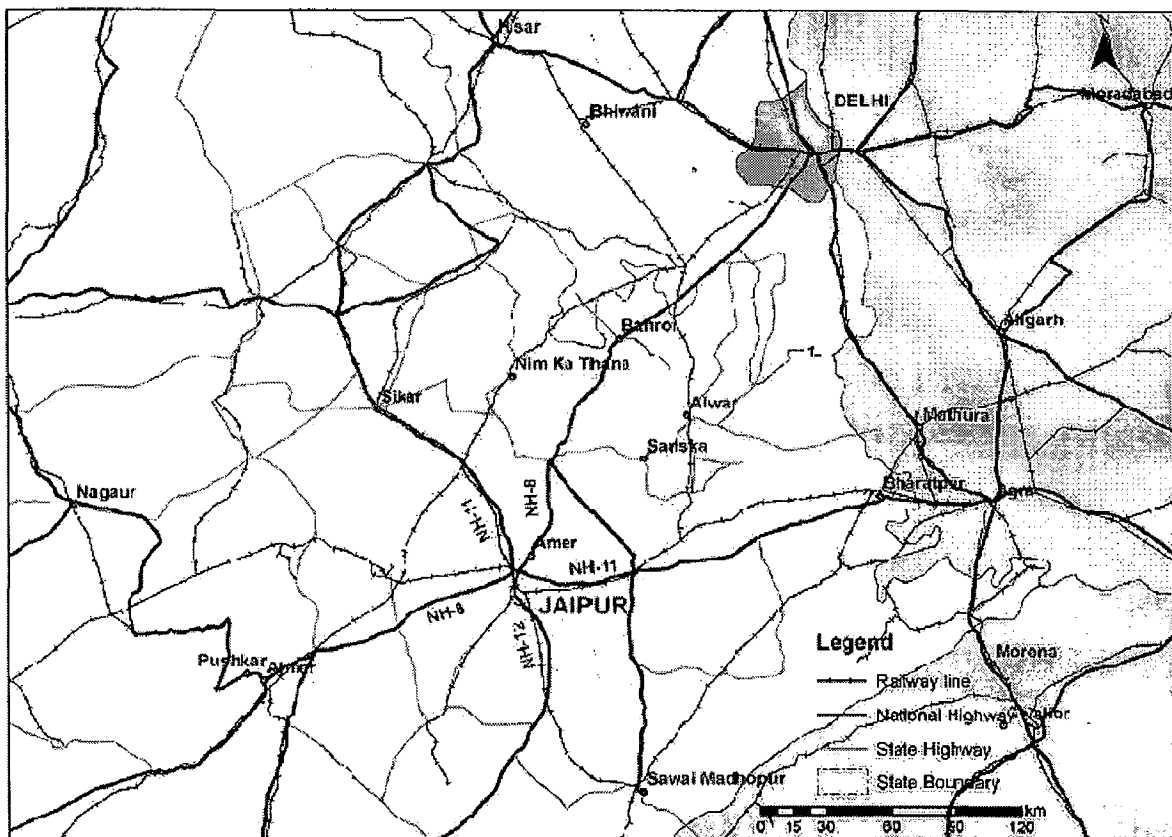
Jaipur is well linked to the rest of the country by **roads, rail and air.**

- NH-8 connects Bombay and Delhi

- NH 12 leading to Jabalpur starts from Jaipur.
- NH-11 connects Agra and Bikaner.

National highway 8 and National highway 11 intersect at Jaipur. NH-8 transects the city in North-South direction and NH-11 does so in an East-West direction. An estimated 38% of the vehicles enter the city from Ajmer Road, 18% from Delhi Road, 17% from Agra Road, 14% from Tonk road and the remaining 13% from Bikaner and Kalwar Roads.

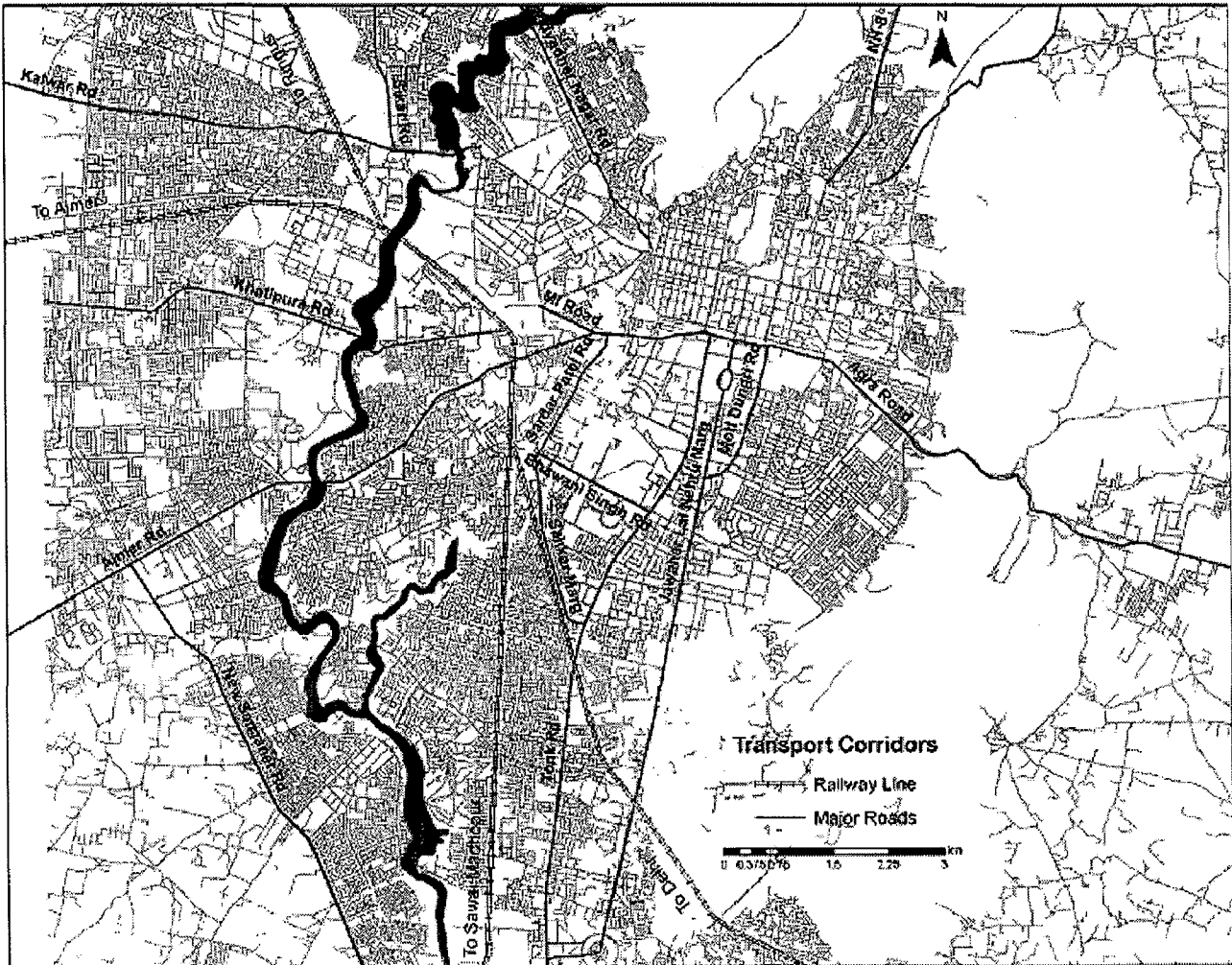
The following section involves the study of the city level road network and it has been dealt in the light of different road characteristics inside the walled city and outside.



Map 20: Regional linkages in Jaipur

4.4.2 CITY LEVEL ROAD NETWORK

The transport of Jaipur is mainly road based in the absence of an MRTS. The road network characteristics are very different for the walled city and the areas outside.



Map 21: The road network for the city along with major roads

a) Walled city:

The walled city has a grid pattern of roads and most of the wholesale and retail trade activities are located in the walled city. The road network follows a hierarchy. **The major East-West, Surajpol-Chandpol road and North-South**

Roads which form the sector boundaries measure 33m wide. Following this there is a network of 16.5m wide roads which run North-South in each sector linking internal areas of the sectors to the major activity spine formed by the major roads. **The road condition is not good inside the walled city except the main roads.** The by-lanes are very narrow and pedestrian vehicle conflict chances are extremely high.

b) Outside the walled city:

Jaipur city has around 10 major arterial spines which criss-cross the entire city.

- Tonk road is a major arterial road that connects some of the major employment centers like Sanganer, Durgapura and Lal Kothi. The section of the Tonk road from Gandhi Nagar to Ramniwas garden is known as Sawai Ramsingh Road.
- MI road runs from Ghat Gate to Railway Station Road connecting high employment areas like Bani Park, Sindhi Camp and Transport Nagar.
- JLN marg runs straight from Jaipur circle to Ramniwas Garden and has many important sites like the Laxmi Narayan temple, Albert Hall, Rajasthan University and other institutions on its either side.
- Ajmer road connects Ajmer and Jaipur. It terminates in Jaipur at the intersection of MI Road and Sansar Chandra Road.
- Agra Road terminates at the beginning of MI Road.

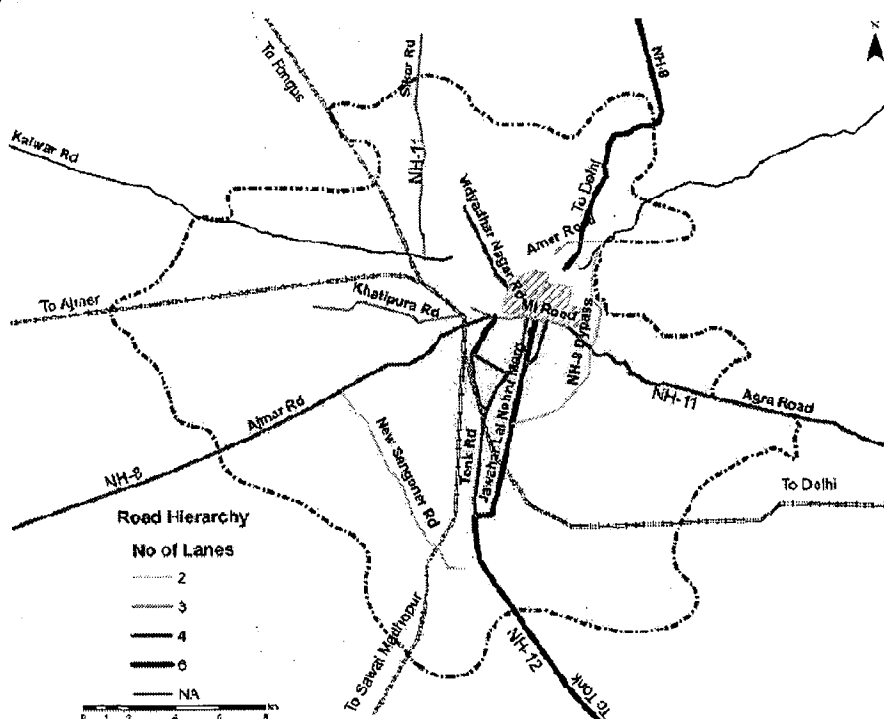
- Khatipura Road starts from the railway station and runs towards Khatipura lying to the West of the city.

Table 7: Roads and Their features

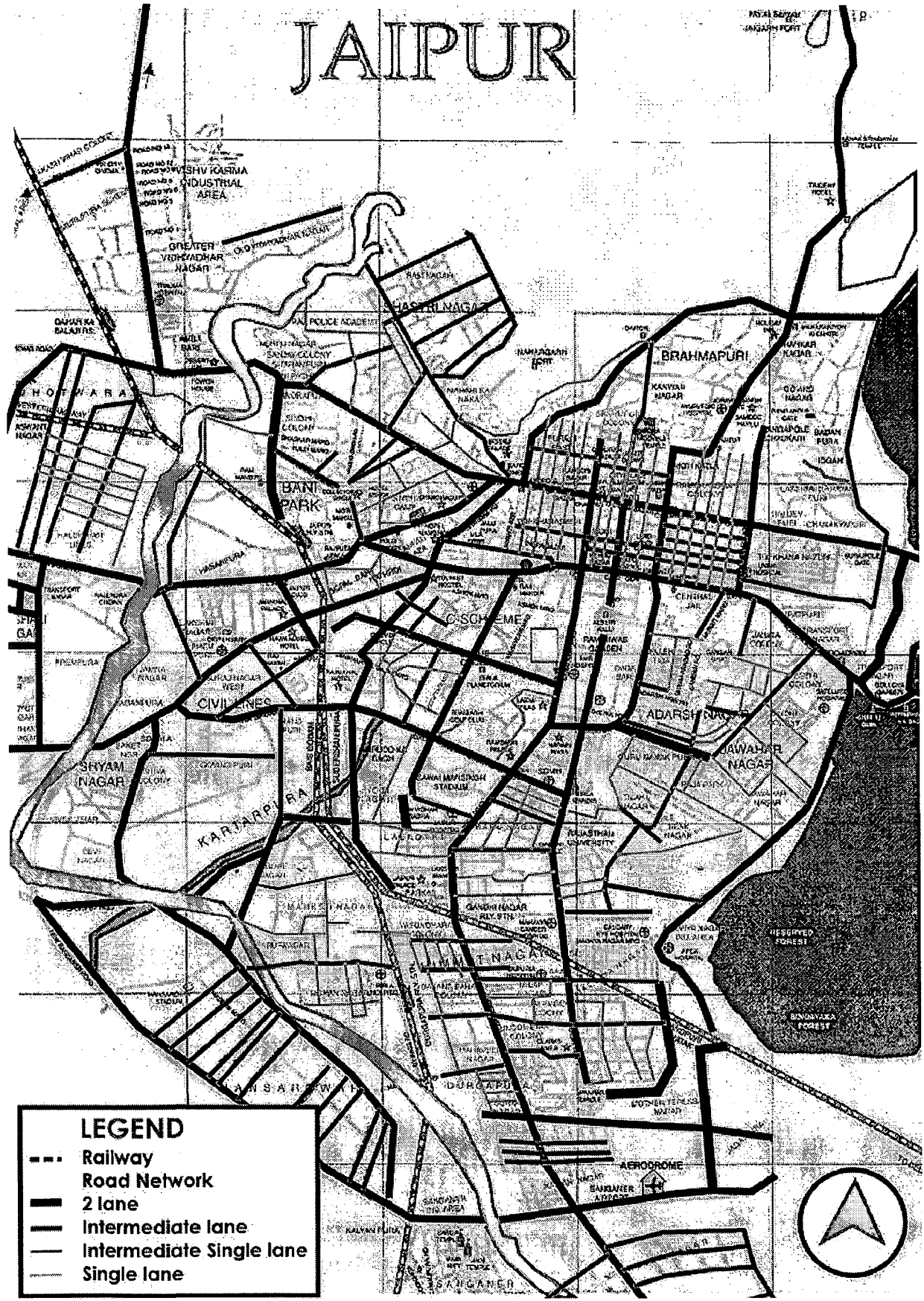
S.No.	Name of Road	No. of Lanes	Divided/undivided
1.	Tonk road	4	Divided
2.	Jawaharlal Nehru Marg	6	Divided
3.	Moti Doongri Road	4	Divided
4.	Sawai Mansingh Road	4	Undivided
5.	Ajmer Road	4	Divided
6.	MI Road	3 to 6	Undivided
7.	Agra Road	4 to 6	Divided
8.	Sardar Patel road	6	Divided
9.	Khatipura Road	3	Undivided
10.	Vidyadhar Nagar Road	2 to 4	Divided
11.	Sikar Road	3	Undivided

Source: Jaipur Municipal Corporation

A notable feature of the road network is that all the major roads have been provided with parallel roads. They are connected at an interval of 800m to 2km.



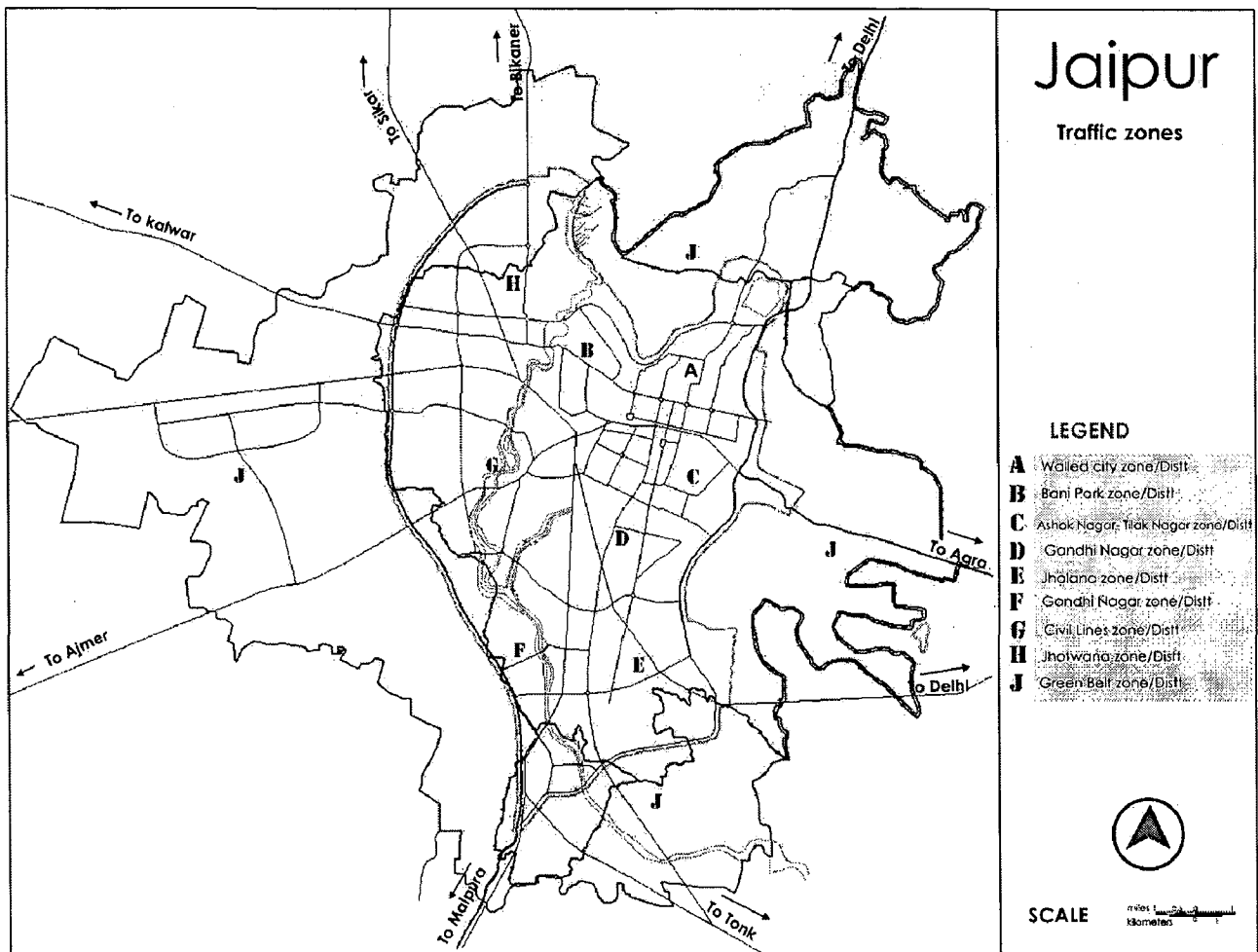
Map 22: Jaipur Intercity Traffic



Map 23: Road Hierarchy in the City

4.5 TRAFFIC CHARACTERISTICS

The land use of Jaipur is rather imbalanced presently with the major **work centers concentrated in the walled city or within 10 km radius of the walled city** while the residential areas are coming up in the far flung areas of the city. This would have a significant effect on the future traffic characteristics.

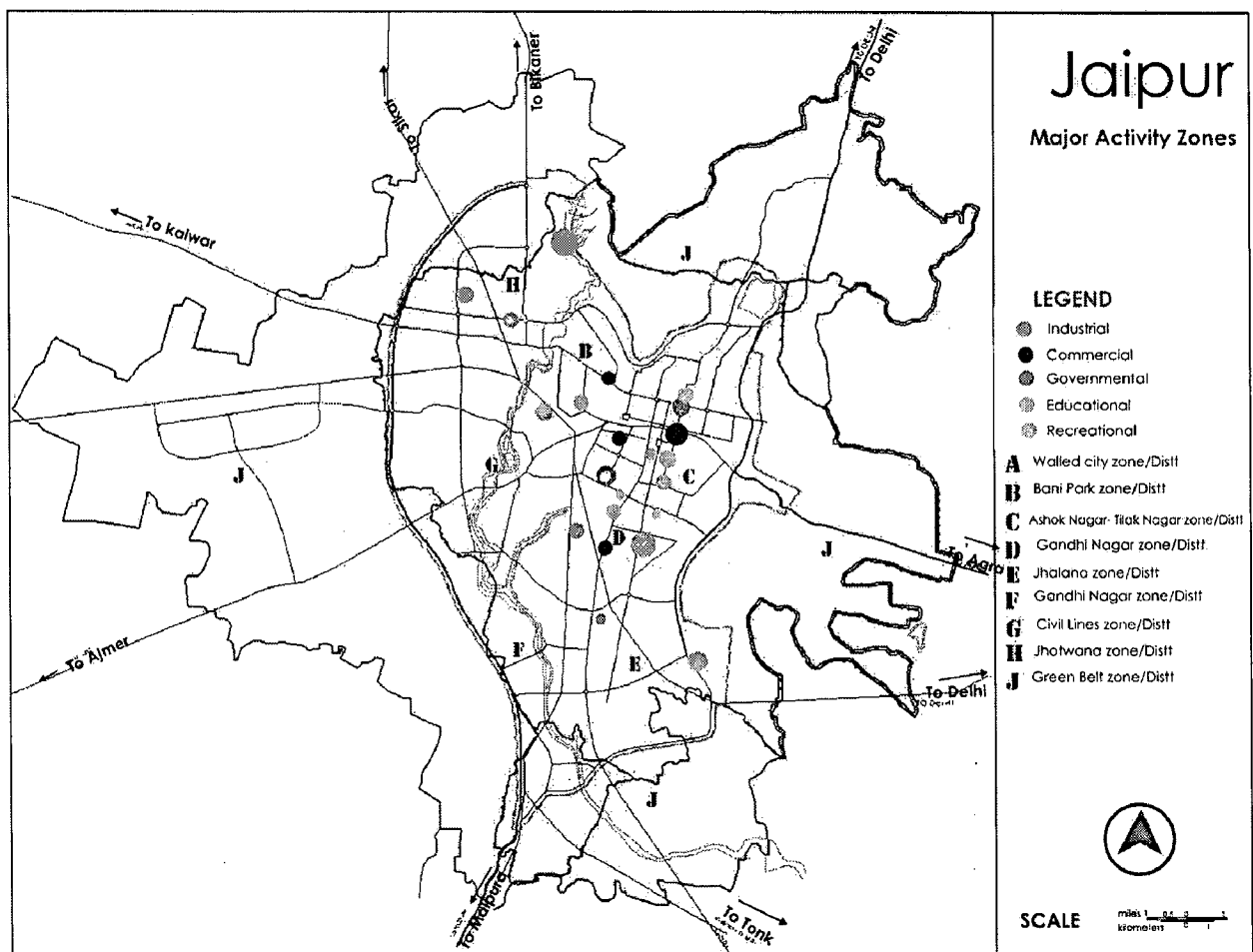


Map 24: Different Traffic Zone in Jaipur city

a) Walled city:

The walled city accounts for **54% of the total commercial area of the city and 32% of the total workforce of the city.**

During the consultations, it emerged that the shopkeepers in the walled city preferred traveling to their workplace in their two-wheelers. The main reason for this was given as the lack of parking space. Moreover vehicles are allowed to be parked at one location at a stretch for only 2 hours. It is more convenient to change the parking location of a two-wheeler than a car. The vehicle composition inside the walled city is heavily biased towards two wheelers.



Map 25: Major Activity Zones in Jaipur city

60% of the total wholesale units of the city lie in the walled city. The presence of wholesale units is closely interlinked with goods handling in terms of loading, unloading, storage etc. Since adequate space is not available within the

walled city for all these activities, it spills onto the roads increasing congestion. Informal activities are substantially large involving migrant population to a large extent.

Nearly 80% of these activities are being conducted along the road. The space occupied by them is meant for traffic and transportation purposes. This is generating stress for the walled city environment. Most of the people involved in informal sector activities walk to their place of work, about 20% use cycles and the rest use public transport.

The walled city is also home to many tourist attractions like the Hawa Mahal and Palace. These attract large number of tourists to the area which add onto the high travel and parking demand. **Roads in the walled city have less pronounced peaks which may be attributed to variety of activities starting at different hours of the day.**

) Outside the walled city:

The city is growing towards the west and south. Good road network is also supporting the growth and development. The maximum distance between residence and work place is about 12kms in Jaipur. But this is likely to grow in the future with the expansion of the city. Shopping and other trips are getting localized for the residents since almost all residential areas have developed their local shopping centers catering to daily needs.

Table 8: Travel to work distance characteristics

category	Distance Travelled						Average
	<1 Km	1-3 Km	4-6 Km	7-9 km	1-25 Km	>25 km	
Slum	14.3	16.8	2.4	22.9	18.9	6.7	8.7
Private Colony	8.6	5.6	26.2	34.1	22.8	2.2	9.2
Housing Board	5.8	10.5	19.6	27.6	33.5	2.9	10.4
Walled City	31.9	18.3	20.3	14.3	9.9	4.8	6.1
Outskirts	18.6	13.1	13.9	19.3	23.5	11.7	10
Others	15.6	13.5	20.3	23.5	21.3	5.8	8.8

As evident from Table , Maximum percentage of people residing in Housing Board Colonies travel the maximum distance to go to work followed closely by people living in the outskirts. Some of the colonies developed by Housing Board are Mansarovar, Nari ka Naka, Malviya Nagar, Pratap Nagar, Jawahar Nagar, Shastri Nagar etc. **Since the average distance to be traveled by most people is around 8-10 km and travel takes place along the main arterial roads of the city. These roads have to face the brunt of excess traffic.**

4.5.1 Vehicle Growth

The travel needs in the city are catered by a variety of modes of transport in the form of buses operated by RSRTC, mini buses run by Private operators, auto rickshaws, tempos, cycle rickshaws and private vehicles such as cars, 2-wheelers and cycles. Improving socio-economic status, easy availability of vehicles,

increase in population and lack of good public transport is resulting in steep growth of vehicles.

Table 9: Vehicles in Jaipur

Type	Auto Rickshaw	Bus	Mini Bus	Car	Van	Jeep	Tractor	2-wheeler	Other	Total
00-01	350	129	83	7454	626	796	890	36414	119	47573
01-02	353	125	166	8615	510	709	784	38761	210	51386
02-03	403	133	283	9343	630	775	633	46238	913	60894
03-04	1142	394	166	13323	1	1130	865	55287	1995	78331
04-05	935	80	277	9391	929	977	827	55122	1253	72248

4.5.2 Traffic Volume

Daily traffic volume varied from 34000 to 1,20,000 vehicles on the roads in the East-West direction. The Chandpole Bazaar road with a total of 1,20,000 vehicles followed by Mirza Ismail road with 40,000 vehicles carried maximum traffic amongst East-West corridors. The traffic volume varied between 35,000 and 62,000 on the roads in the North-South direction. The highest volume in the North-South corridors is observed on Sawai Ram Singh Road followed by Tonk Road.

4.5.3 Parking:

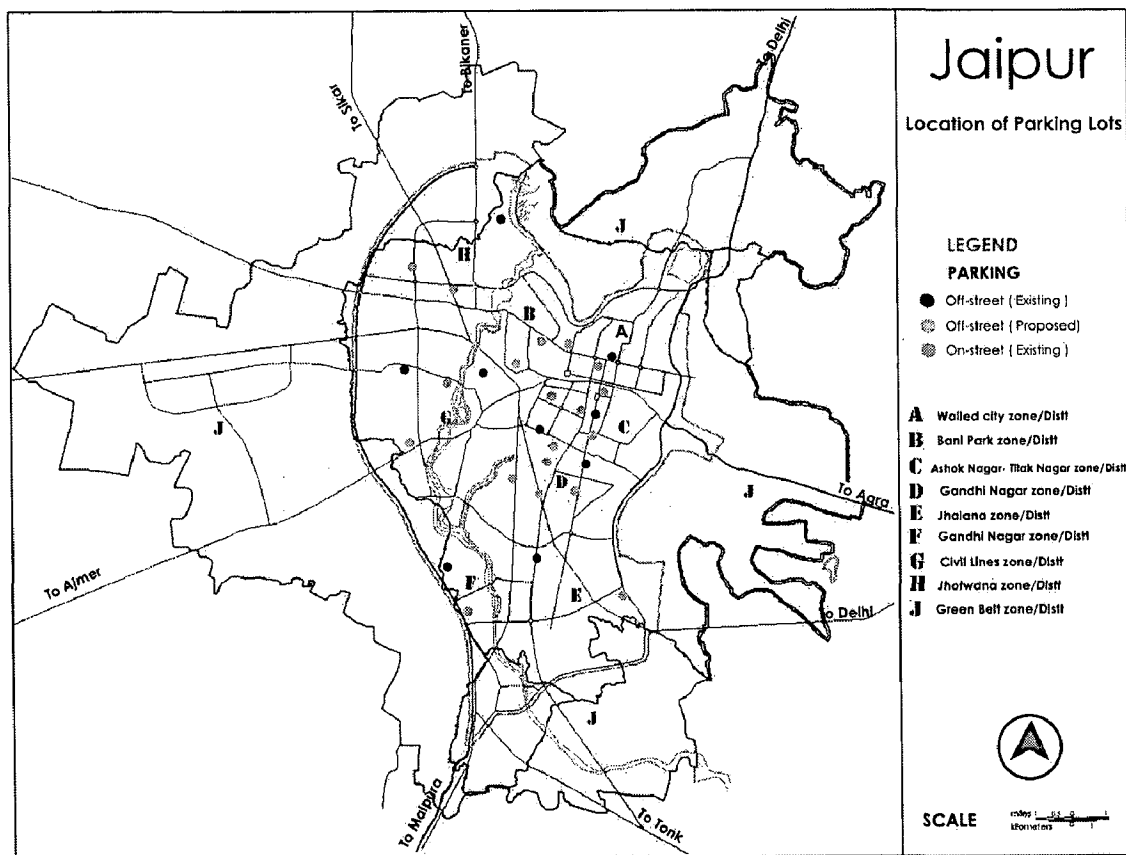
Parking is a major issue in the walled city area and an emergent issue in the rest of the city. The tendency in Jaipur is of commercialization along the main roads. Initially, the plots along these roads were residential in nature but with increasing land value and traffic on these roads, they got commercialized. The

commercialization led to an increase in parking demand along these roads which in turn reduced the effective carriage way.

a) Walled city

The existing parking system of Walled city of Jaipur is decentralized, unmanaged and largely dysfunctional. The parking is dominated by a large number of small parking lots. Many of these facilities are generally poorly maintained and lack basic infrastructure. Haphazard street parking in major markets reduces the traffic carrying capacity of the roads. This results in traffic bottlenecks especially in peak hours causing economic loss.

b) Parking Accumulation



Map 26: Existing and Proposed Parking Lots

- c) **Off Street Parking:** The peak parking accumulation in individual lots located off street has been shown in Table.

Table 10: Peak Parking Accumulation in Individual Lots- Off Street

S.No.	Location	Total Vehicles		Total ECS
		Cars	Two-wheelers	
1.	Sanjay Market	169	27	176
2.	Snganer gate	38	28	46
3.	Bapu Bazar	0	161	41
4.	Ramleela Ground	82	8	84
5.	Ajmeri Gate	29	0	41
6.	Ramniwas Bagh	319	37	329
7.	RCCI	143	14	147
8.	Mahila Chikitsalaya	81	139	116
9.	Kiran Kafe	9	26	16

Source: Proposed Parking Project at Ramniwas Bagh, CES, 2006.

Ramniwas Bagh, Sanjay Market, RCCI and Ramleela Ground parking lots are predominantly used for car parking. Parking lots in Bapu Bazar and Mahila Chikitsalaya are mainly used as two-wheeler parking lots.

A total parking demand of 2,596 cars and 13,327 two – wheelers was estimated for the year 2016. To meet this high growth in the parking demand, the study recommended to develop the multi – level off-street parking facilities and identified seven locations to develop such facilities (underground and/ or multi - storied).

Table 11: Identified Multi – level Off-street Parking Facilities

S.No	Location of Facility	Area (m ²)	No. of Vehicles	
			Cars	Scooters
1.	Ramniwas Bagh	17,000	700	-
2.	Ramleela Ground	7000	266	400
3.	Bari Chaupar	8000	180	350
4.	Choti Chaupar	8000	180	350
5.	Sanjay Market	-	204	425
6.	Old Pension Office	4160	140	-
7.	Raj. Chamber of commerce & Industry off	-	370	80
8.	Ajmeri Gate (Old Subji Mandi)	-	50	130

i) **On Street Parking:**

Table 12: Peak Parking Accumulation in Individual Lots- On Street

S. No.	Location	Total vehicles		Total ECS
		Cars	2 wheeler	
1.	Jauhari Bazar (South)	82	348	169
2.	Kishanpole Bazar (South)	79	246	140
3.	Chaura Rasta (South)	89	258	153
4.	Bapu Bazar	26	737	210
5.	Nehru Bazar	58	463	174
6.	Nehru Bazar Bylane (towards Kishanpole)	-	69	17
7.	Nehru Bazar Bylane (towards Chaura rasta)	-	48	12
8.	M.I.Road	34	-	34

On-street parking in Jauhari Bazar, Kishanpole Market, Chaura Rasta, Bapu Bazar and Nehru Bazar is very high. The figures also show that these parking areas are used mainly by two-wheelers.

4.5.4 PUBLIC TRANSPORT SYSTEM:

The public transports that are available for the general public in the Jaipur city are buses operated by **Rajasthan State Road Transport Corporation (RSRTC)**, mini buses (25 seater) run by private operators, auto – rickshaws (2 seater), Vikram (Tempo 12 seater), and cycle rickshaws in the form of **Intermediate Public Transport and personalized modes such as cars, two-wheelers and cycles.**

Around 40 mini bus routes operate now. There are 4 government bus depots namely, Vaishali, Sanganer, Jhalana and Vidhyadhar Nagar. At present there are 150 bus routes operating in the city. The bus routes mainly cater to the main arterial roads of the city. Autorickshaws mainly run within the urbanizable area of Jaipur. They are not reliable in terms of the fare they quote. Rickshwallahs ply mainly inside the walled city to cover short distances.

Modes which are used for public transportation are described below in detail:

1.) Buses

Rajasthan State road Transport Corporation does not operate any bus within municipal limits. R.S.R.T.C. is operating buses to sub-urban areas i.e. Amber, Kanota, Sanganer, Bhankrota etc. these buses takes care very little % age of total mass transit trips.

2.) **Mini-buses**

Intra city mass transit trips are mainly performed by minibuses. Mini buses are being operated since 7:30 am. To 8:00 pm. Having a frequency of 10 to 25 minutes. Private agencies operate mini-buses purely for profit making bases. The existing routes with no. of vehicles in operation are listed in table and existing routes are shown on map.

3.) **Tempos:**

Tempos are also being operated by private unions. The routes and headway etc. are decided by the Unions themselves not by R.T.O. Tempo are being operated purely on profit making basis and they can be stopped or started at any time. People prefer less to tempos in standing, its slow speed, noise making problems. Registration of new tempos is not being done, so scope of tempo as mass transportation made in Jaipur is reducing day by day. Existing tempo routes are listed in table and map also represents existing tempo routs (from route no. 16 to 25).

4.) **Taxies (Taxi Car):**

Most of the taxies in Jaipur are being operated for intercity traffic i.e. from Jaipur to Ajmer, Udipur, Agra, Delhi etc. Hardly 50 Taxies are in use for intra-city public transportation.

5.) Auto rickshaws:

More than 3400 auto-rickshaws are being operated by 4 private agencies throughout Jaipur for 24 hours. Most of the auto-rickshaws are 2 seater, but some 4 seater and six seaters auto-rickshaws also operating by agencies. These are very few in number.

6.) Tongas:

Tongas are not so popular in jaipur and are operated only on limited roads. These are mostly in use within walled city area and walled city to Railway Station and central bus stand. These are nearly 50 tongas in operation.

7.) Cycle Rickshaws:

These are most popular in Jaipur for short distance trips. The terrain of Jaipur city (except few fringes areas) is plain, which makes easy for rickshaw puller to drive on roads. There is hardly any street where cycle rickshaw cannot be found. The exact no. of cycle rickshaws running the Jaipur are not quantified figure given by local authority seems very low.

Jaipur

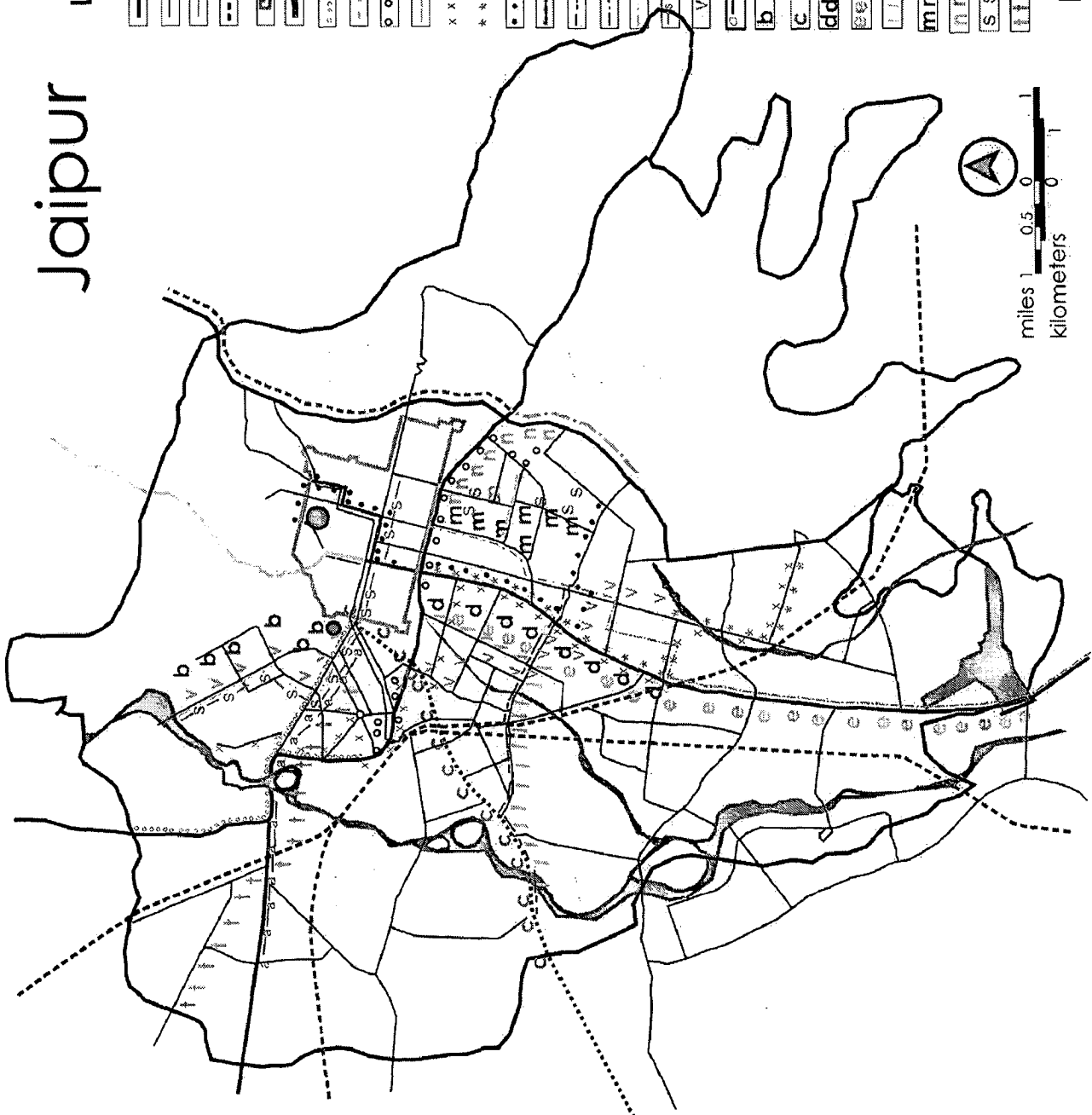
LEGEND

	National Highway
	Arterial Road
	Sub arterial Road
	Rail Route
	Walled City
	Water body
	Route no. 1
	Route no. 2
	Route no. 3
	Route no. 4
	Route no. 5
	Route no. 6
	Route no. 7
	Route no. 8
	Route no. 9
	Route no. 10
	Route no. 11
	Route no. 12
	Route no. 13
	Route no. 14
	Route no. 15
	Route no. 16
	Route no. 17
	Route no. 18
	Route no. 19
	Route no. 20
	Route no. 21
	Route no. 22
	Route no. 23

mini bus route

tempo route

Existing Routes



Map 27: Existing Bus and Tempo routes

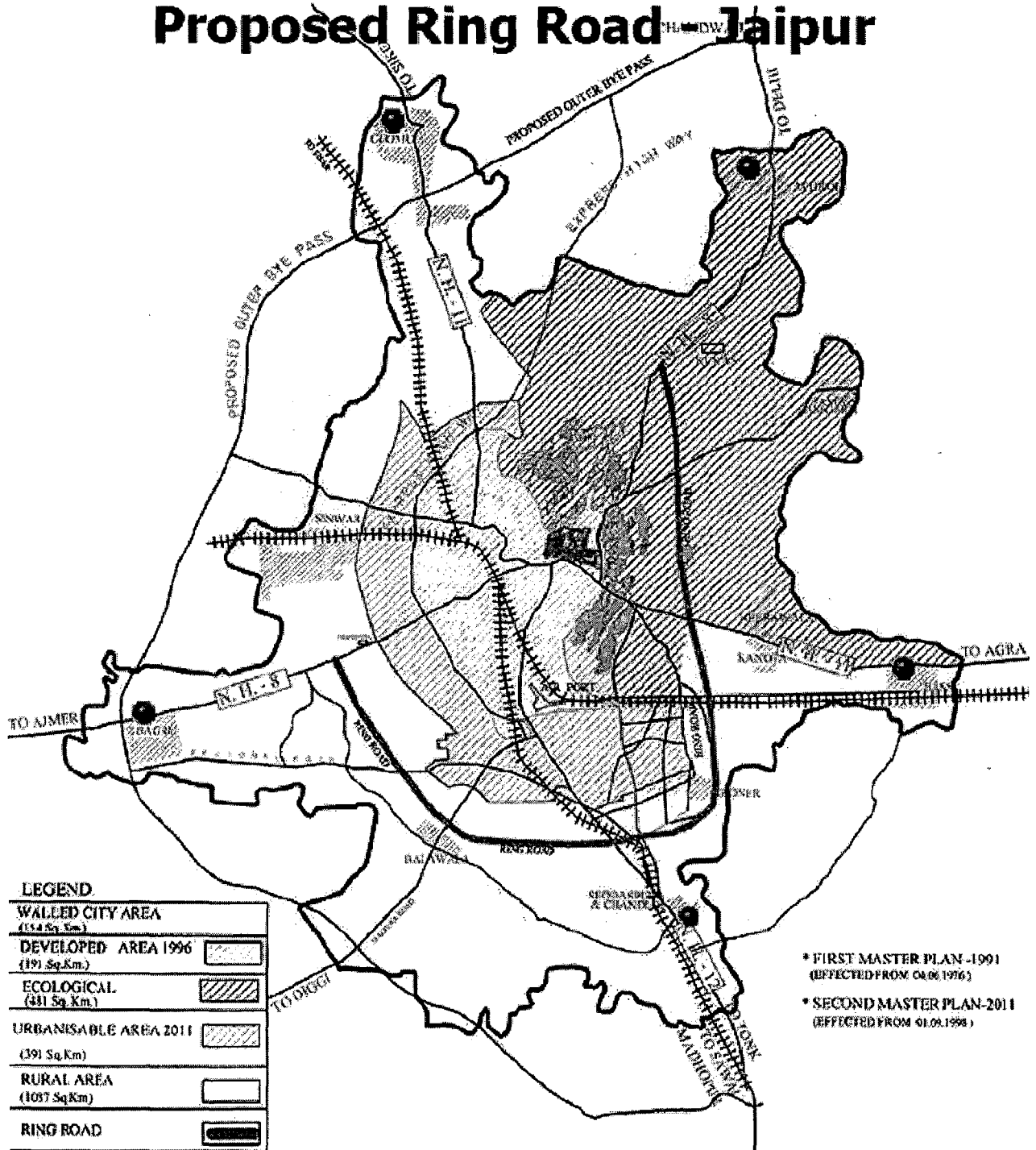
Table 13: Mini Bus Route Details

Route No.	From	Route To	No. of buses in operation
1.	Katipura	Galta Darwaja	46
2.	Railway Station	Transport Nagar	26
3.	Railway Station	Chandpole	18
4.	Railway Station	Jawahar Nagar	12
5.	Railway Station	Jawahar Nagar	10
6.	Railway Station	Jawahar Nagar	14
7.	Ambabadi	Malviya Nagar	30
8.	Ajmerigate	Malviya Nagar	14
9.	Brahmpuri	Jawahar Nagar	24
10.	Brahmpuri	Anita Colony	18
11.	Jorawar Singh Gate	22 Godown	14
12.	Sanganeri gate	Sanganer house	20
13.	Char Darwaja	Vidhya Dhar Nagar	28
14.	Ramganj Chaupar	Shastri Nagar	34
15.	Gandi Nagar Rly. Station	Shastri Nagar	28
Total			336

Table 14: Tempo Route Detail

S. No.	Route No.	From	Route To	No. of Tempos
1.	16	Chandpole	Jhotwara	10
2.	17	Chandpole	Housing Board	10
3.	18	Chandpole	Sodala	21
4.	19	Brahmpuri	Sodala	7
5.	20	Ajmeri gate	Sanganer	16
6.	21	Subhash chowk	Sodala	18
7.	22	Sanganeri Gate	Tilak Nagar	10
8.	23	Sanganeri Gate	Kachchi Basti bye pass	10
9.	24	Sanganeri Gate	Jawahar Nagar	10
10.	25	Chandpole	Champapura	10
Total				122

Proposed Ring Road - Jaipur



Map 28: Existing Ring Road and Proposed Outer Bye Pass

4.6 FINDINGS/ INFERENCES FROM CASE STUDY

Findings from this case study are as described as follows-

a.) Congestion and delays:

- The main cause of congestion can be attributed to inadequate capacity of roads, heterogeneous traffic, and encroachments by vehicles and commercial activities. Increased congestion leads to low operating speeds, delays and environmental pollution.
- Heavy congestion is observed in the walled city throughout the day. Nearly 80-85% of the vehicles plying on the walled city roads are rickshaws and two wheelers.

b.) Parking:

- This is one of the most critical problems especially in the walled city area. On-street parking is done inside the walled city area. The parked vehicles take up a large amount of space resulting in decreased effective carriageway. This leads to congestion and slows down the movement of traffic.
- The parking problem is very serious in Johri Bazaar, Chaura Rasta, Tripolia Bazaar, Kishanpole Bazaar, Chhoti and Bari Chaupad in the walled city.

- Many of the new commercial complexes that have sprouted in the city do not have adequate parking space leading to spilling out of the vehicles onto the road.

c.) Encroachment:

- Encroachment of roads by shops and street vendors is a significant problem in the walled city. This decreases the available road width and capacity resulting in congestion

d.) Public transportation:

- There is a lack of good and reliable public transport system in Jaipur. Mainly 4 modes namely bus (public and private), auto rickshaws and rickshaws cater to the needs of the residents.
- The public buses run by RSRTC are known to run on schedule but do not cover a large part of the city area and also have a low frequency. Mini buses run by private operators do not have any fixed schedule and are not reliable.
- Most auto rickshaws don't run by meter and charge any amount at their whim and fancy. It becomes easy for them to con tourists since they don't know the correct price. Rickshaws mainly ply for short distances within the walled city.

- Mini buses and tempos can normally be found over crowded. The reason behind this, that there is no fixed schedule. The vehicles do not start from a given origin till it gets over crowded. Negligence of people's comfort and convenience is common phenomenon.
- During peak hours there is uncertainty of getting a place inside the vehicle. People can be seen standing on one leg on the gates of tempos and mini buses. Similarly the commuter goes not know how long he has to wait for minibus or tempo and when he will be able to reach his/her destination. This uncertainty and delay diverts the attention of people towards their personal vehicle even though they are unable to maintain the vehicle.
- There are very few well defined and pre planned stops for mass transportation vehicles. Driver can stop the vehicle at any place at any time. This create inconvenience for long distance travelers and increase travel time too. More no of stop in short distance cause wear and tear on vehicles and the life of vehicle reduces. Sometimes the driver also does the job of conductor and delays the vehicle unnecessarily.
- In walled city the travel speed is less than 10 km/h especially at Chandpole, because of traffic Jam and overcrowding.

- Most of terminal points are on the road itself. There are very few separate space for parking the public transportation modes.

g.) Pedestrian system:

- There is an absence of a safe and comprehensive system of pathways exposing pedestrians to risks. It also creates pedestrian-vehicular conflict zones in almost all stretches of major arterial and sub-arterial roads.

CONCLUSION:

As a whole the present public transportation scenario in Jaipur is not good. The existing system is not even capable to fulfill the present travel demand. On the other hand growth in no. of workers is increasing. In addition literacy rate is on the rise. All these factors indicate greater demand of mobility. The average no. of trips per capita in Jaipur will increase with passage of time and travel demand will consequently increase.

This increase in travel demand again emphasizes for a better and efficient transportation system. So there is urgency of well organized and integrated public transportation system to tackle the present and future travel demands.



Chapter-5 Traffic Characteristics of Ajmer Town

5.1 Analysis of Traffic Characteristics of Ajmer Town

CHAPTER –V

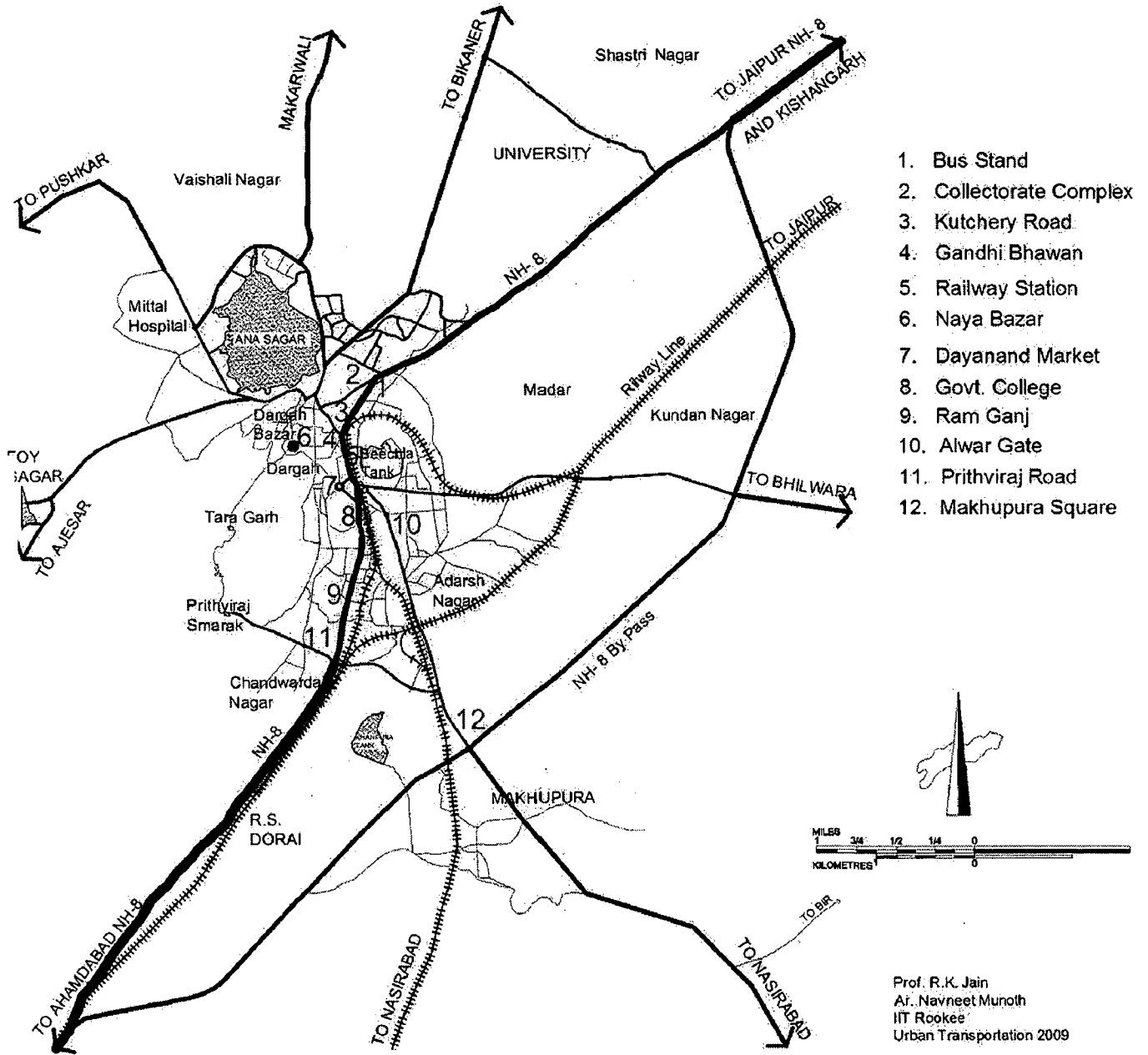
TRAFFIC CHARACTERISTICS OF AJMER TOWN

5.1 ANALYSIS OF TRAFFIC CHARACTERISTICS OF AJMER TOWN

The town in addition to its own traffic cater to the traffic load of many other settlements like Pushkar, Kishngarh, Rajgarh, Naseerabad cantonment and Beawar etc. which passes through the town where market is located on both side of the road (Fig.). The town serves as a transit point between the important tourist destinations, Jaipur-Jodhpur and Jaipur-Udaipur. The north-south corridor carries almost the entire city traffic between Gandhi Bhawan and Government College.

Being a medium size town, cycle is a common mode of transport. Before 1947 'tongas' (horse cart) were a common means of transport and thereafter cycle-rickshaws have replaced tongas which are still used to transport goods and to people to the nearby places. This slow moving mode of transportation has been replaced by scooters and rickshaw, a medium speed mode of transport, which resulted into multi modal transport system.

The condition of roads in 'Purani Mandi' is quite bad. These were used by pedestrians when built, but with the increase in traffic volume due to change in land use of various areas, the roads have become inadequate to cater this increased traffic.

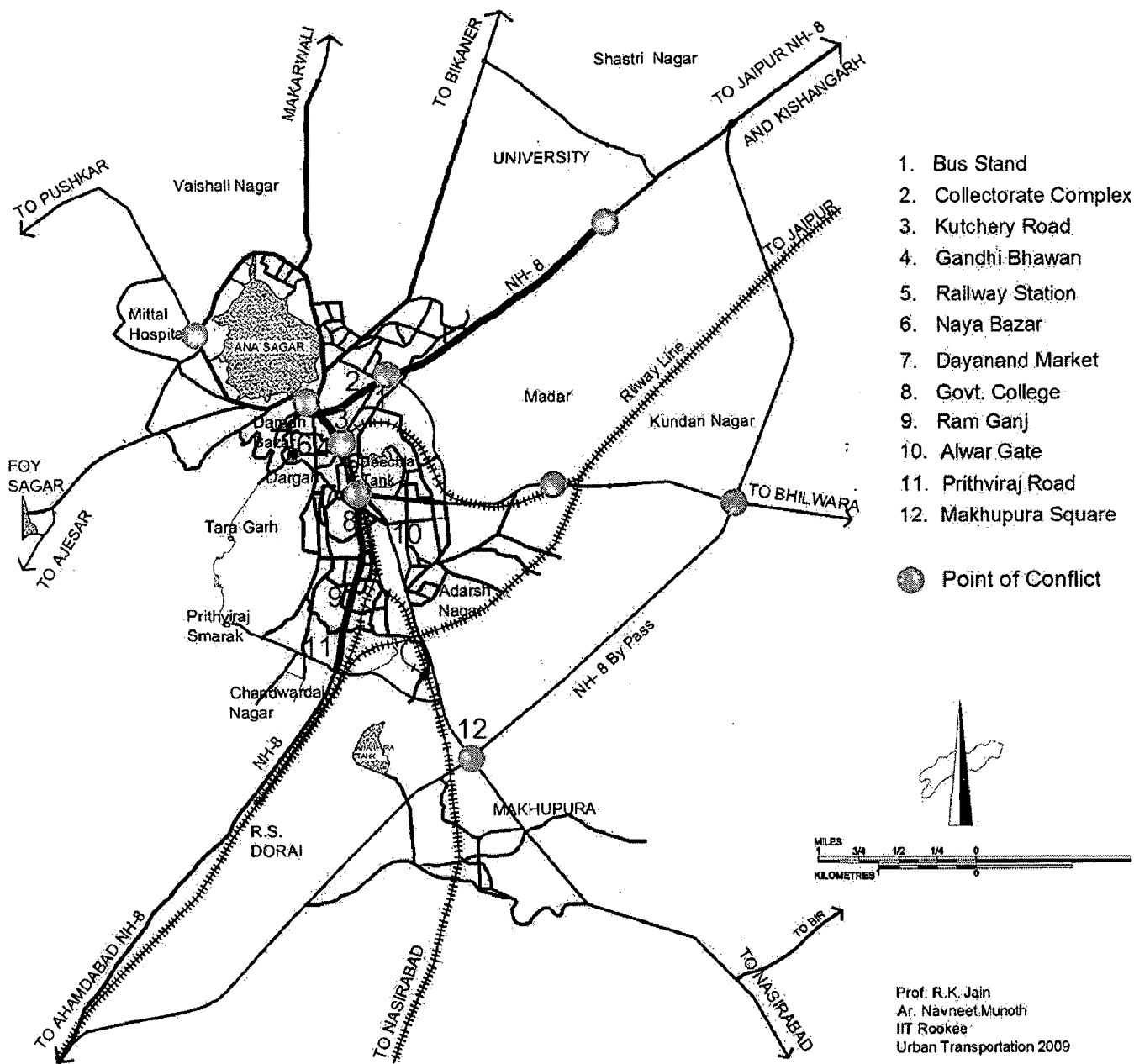


Map 29: Plan of Ajmer Town: Inter City Traffic

Width in Dargah Bazaar, Naya Bazaar and Nala Bazaar varies from 5 to 7 mts. Problem of parking of rickshaws at the junctions, cycle parking in front of the shops is faced in this area, also result in reduction of effective road width. In Kesar Ganj area, Kutchery road and station road, Ramganj area, though the width of roads varies from 15 to 30 mts. yet again due to rickshaw, cycles, scooters, auto/tempos and car parking on the side the effective road width is reduced, creating problem for fast moving vehicles and danger for pedestrians.

The increase in the number of automobiles is quite recent. Taxis, mini buses, (150) and tempos (600), auto rickshaws (3500) have come up on the scene. Mini buses and tempos operate on a fixed route for short distance trips within Ajmer and they do not have proper terminal facilities, whereas the auto rickshaw operates on free route pattern.

Along with 222 roadways buses with 873 trips (up and down), 150 mini buses are operating from Ghooghra Ghati for Jaipur and from Ramganj for Udaipur side. These private buses do not have any authorised off- street terminals and they occupy carriageways at Ramganj causing problem to traffic movement. This has added to the traffic hazards and therefore transportation and communication facilities need to be suitably tackled. (Map 30)



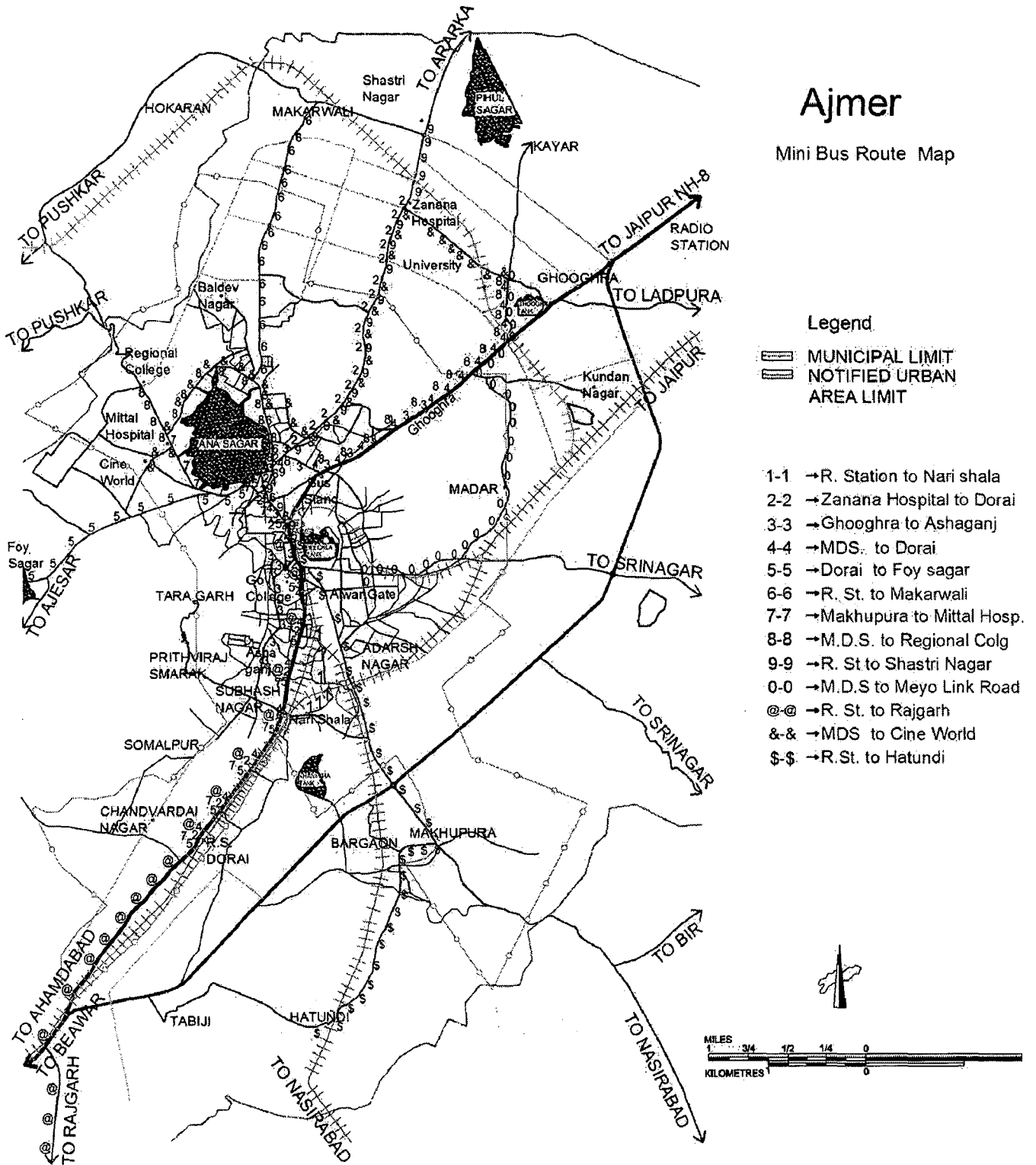
Prof. R.K. Jain
 Ar. Navneet Munoth
 IIT Roorkee
 Urban Transportation 2009

Map 30: Plan of Ajmer Town: Local City Traffic & Point of Conflict

Table 15: Existing Mini Bus Route

S. No.	Route No.	From	Route To	No. of Tempos
1.	1	Railway Station	Narishala	10
2.	2	Zanana Hospital	Dorai	12
3.	3	Ghooghra	Ashaganj	12
4.	4	MDS	Dorai	12
5.	5	Dorai	Foy Sagar	10
6.	6	Railway Station	Makarwali	07
7.	7	Makhupura	Mittal Hospital	15
8.	8	M.D.S.	Regional College	14
9.	9	Railway Station	Shastri Nagar	12
10.	10	M.D.S.	Meyo Link Road	16
11.	11	Railway Station	Hatundi	12
12.	12	Railway Station	Rajgarh	08
13.	13	MDS	Cine world	10
Total				150

Source: Department of Transport Ajmer



Map 31: Plan of Ajmer Town: Mini Bus Route

Table 16: Existing Mini Bus Route Details

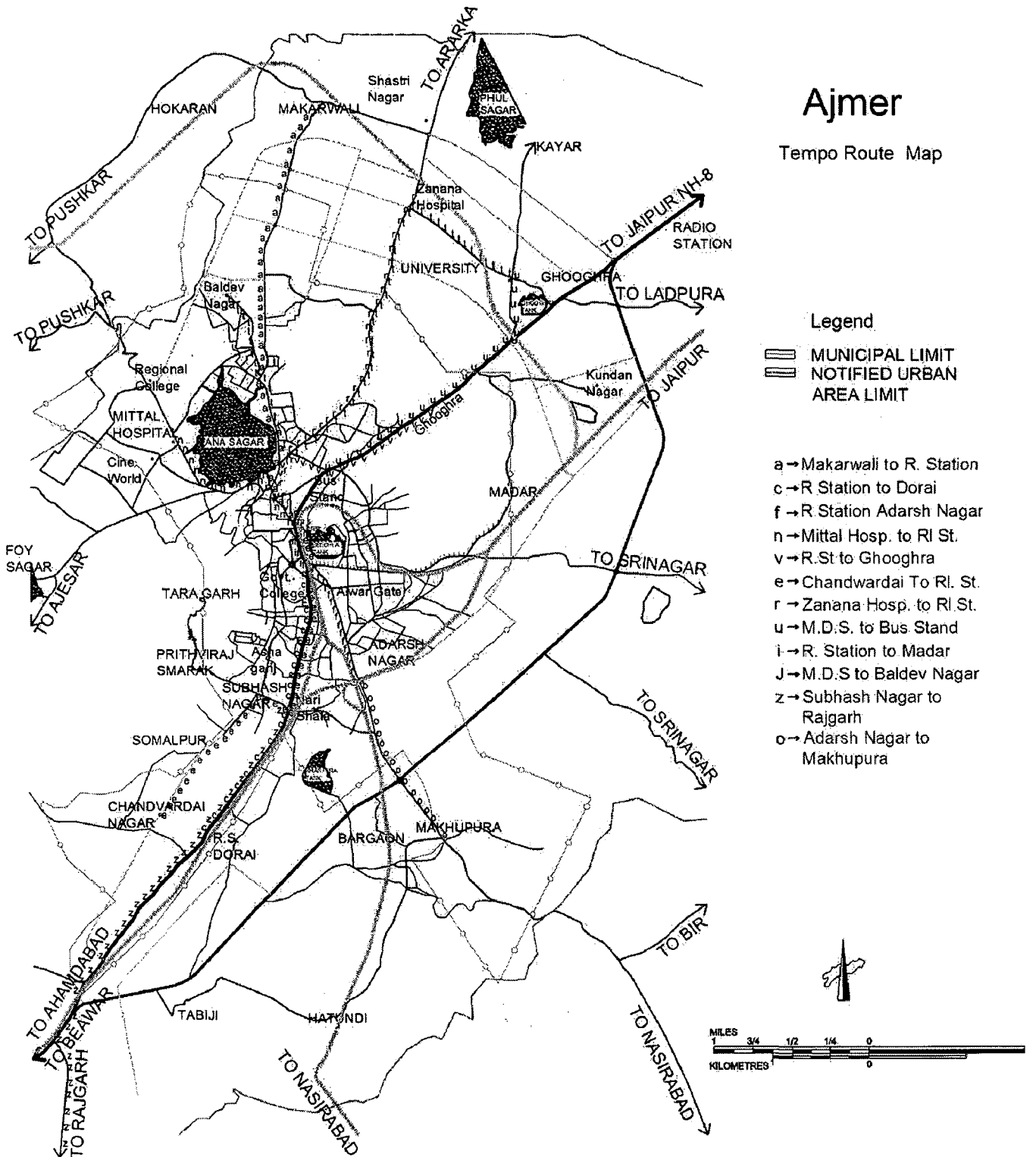
Name Of Route	Route Length (Km)	Major Purpose	Average Travel Time (Mins.)
Railway Station - Narishala	8.8	Work Trip	28
Zanana Hospital - Dorai	16.9	Work & Education	55
Ghooghra - Ashaganj	13.8	Business, Work & Education	45
MDS - Dorai	20.8	Business, Work , Shopping & Education	78
Dorai - Foy Sagar	22.3	Recreational & Work	80
Railway Station - Makarwali	9.5	Business, Work & Education	35
Makhupura - Mittal Hospital	19.8	Medical, Educational & Work	75
M.D.S. - Regional College	15.5	Work & Education	50
Railway Station - Shastri Nagar	11.5	Work & Social Trip	40
M.D.S. - Meyo Link Road	14.8	Business, Work & Education	45
Railway Station - Hatundi	20.5	Business, Work , Shopping & Education	72
Railway Station - Rajgarh	14.8	Medical, Educational & Work	50
MDS - Cine world	12.8	Business, Work & Education	45

Source: Department of Transport Ajmer

Table 17: Existing Tempo Route

S. No.	Route No.	From	Route To	No. of Tempos
1.	1	Railway Station	Dorai	30
2.	2	Railway Station	Chandar Vardai Nagar	25
3.	3	Railway Station	Aadarsh Nagar	40
4.	4	Railway Station	Madar	33
5.	5	Subhash Nagar	Rajgarh	20
6.	6	Railway Station	Makarwali	27
7.	7	Railway Station	Mittal Hospital	35
8.	8	M.D.S.	Bus-Stand	34
9.	9	Railway Station	Ghooghra	26
10.	10	M.D.S.	Baldev Nagar	28
11.	11	Aadarsh Nagar	Makhupura	42
12.	12	Railway Station	Zanana Hospital	18
13.	13	Railway Station	Nagara	22
Total				370

Source: Department of Transport Ajmer

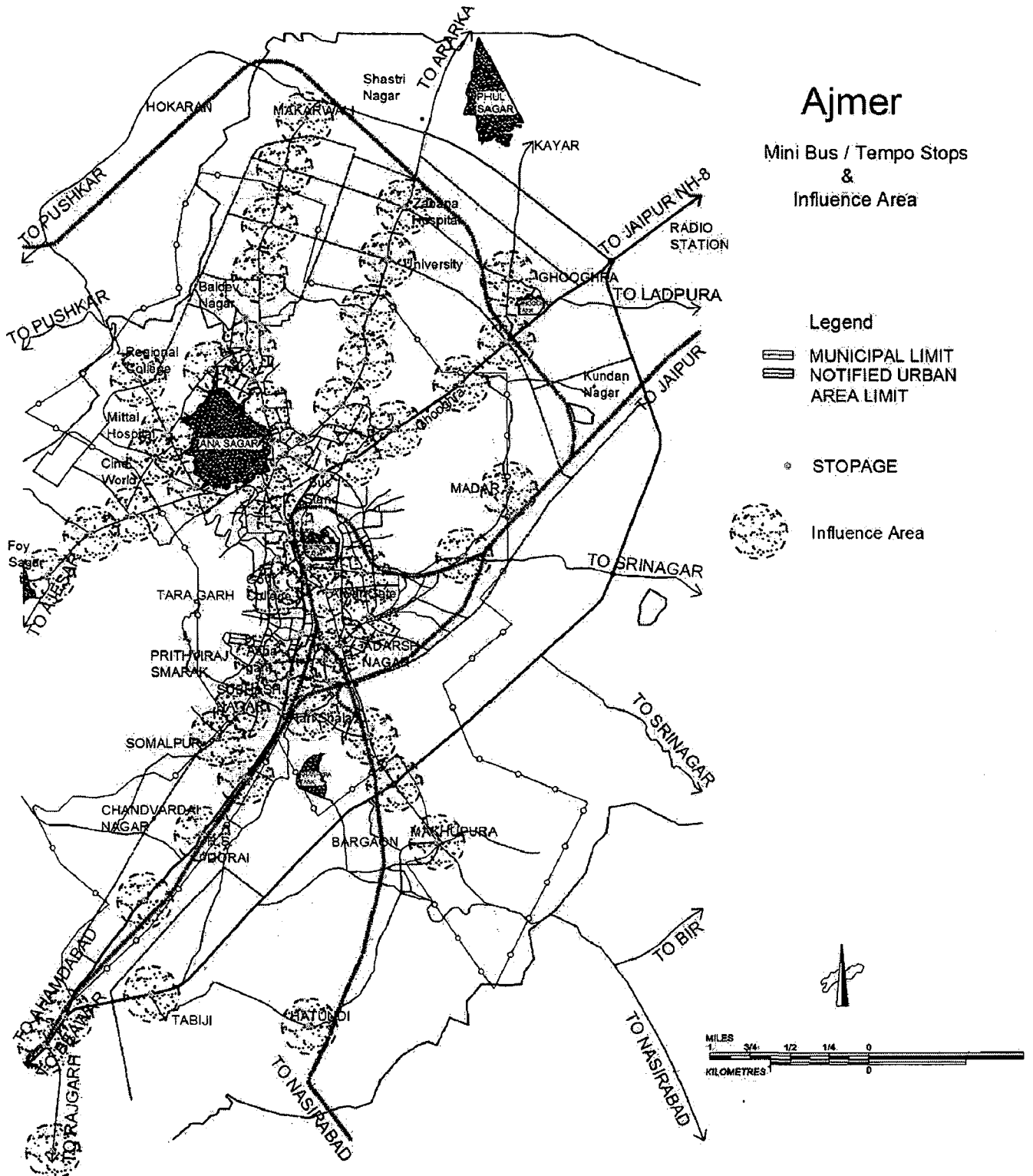


Map 32: Plan of Ajmer Town: Tempo Route

Table 18: Existing Tempo Route Details

Name Of Route	Route Length (Km)	Major Purpose	Average Travel Time (Mins.)
Railway Station - Dorai	8.8	Work Trip	28
Railway Station - Chandar Vardai Nagar	6.8	Work & Education	25
Railway Station - Aadarsh Nagar	6.8	Business, Work & Education	34
Railway Station - Madar	7.8	Business, Work , Shopping & Education	25
Subhash Nagar - Rajgarh	12	Religious & Work	68
Railway Station - Makarwali	9.5	Business, Work, Recreational & Education	45
Railway Station - Mittal Hospital	7.8	Medical, Educational & Work	34
M.D.S. - Bus-Stand	5.5	Work & Education	15
Railway Station - Ghoghra	4.5	Work & Social Trip	18
M.D.S. - Baldev Nagar	7.8	Business, Work & Education	34
Aadarsh Nagar - Makhupura	4.5	Business, Work , Shopping & Education	15
Railway Station - Zanana Hospital	9.8	Medical, Educational & Work	50
Railway Station - Nagara	8.8	Business, Work & Education	30

Source: Department of Transport Ajmer



Map 33: Mini Bus / Tempo stops and Influence area

EVOLUTION OF THE MAJOR ROAD

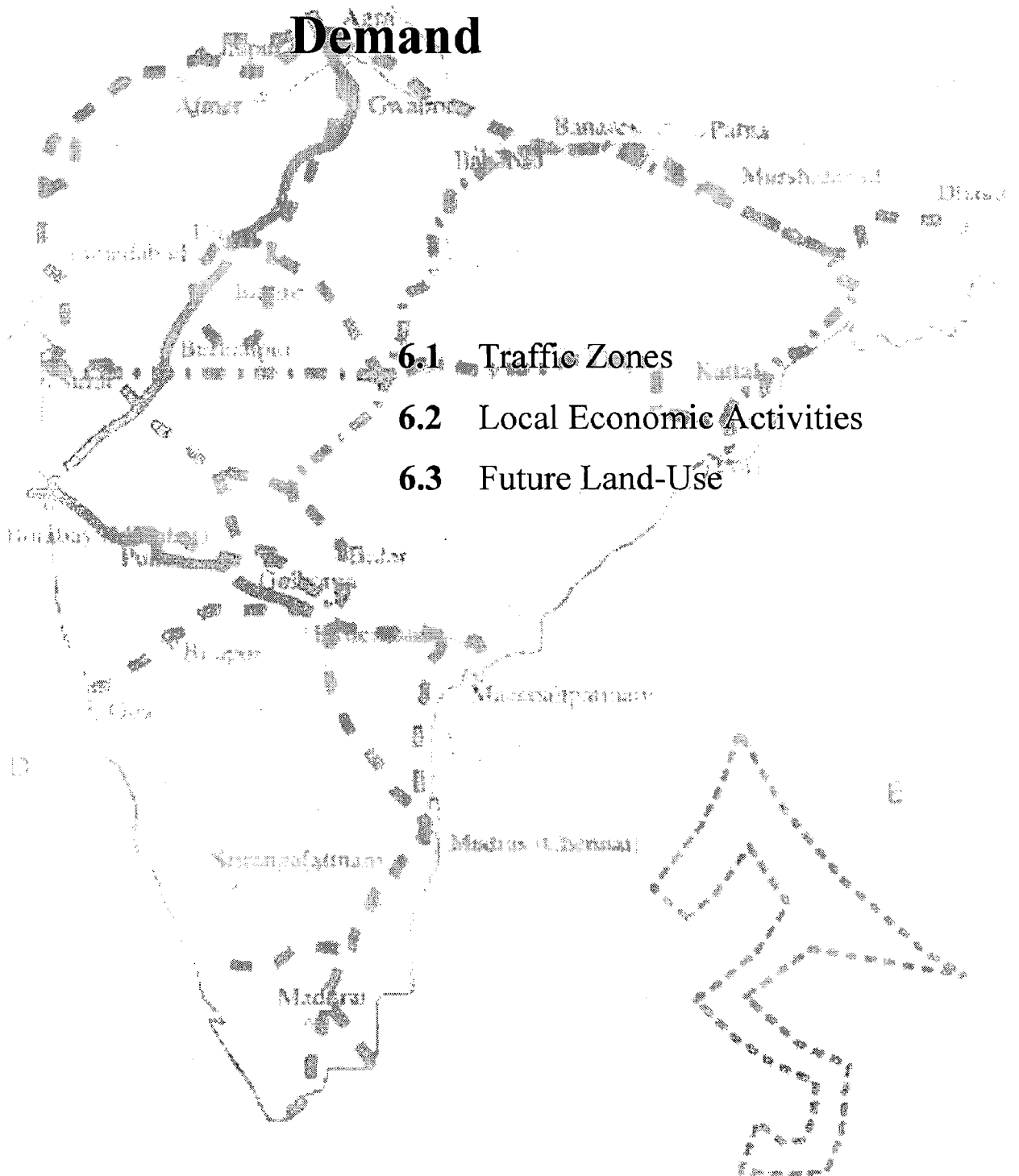
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Chapter-6 Estimation of Future Travel Demand

6.1 Traffic Zones

6.2 Local Economic Activities

6.3 Future Land-Use



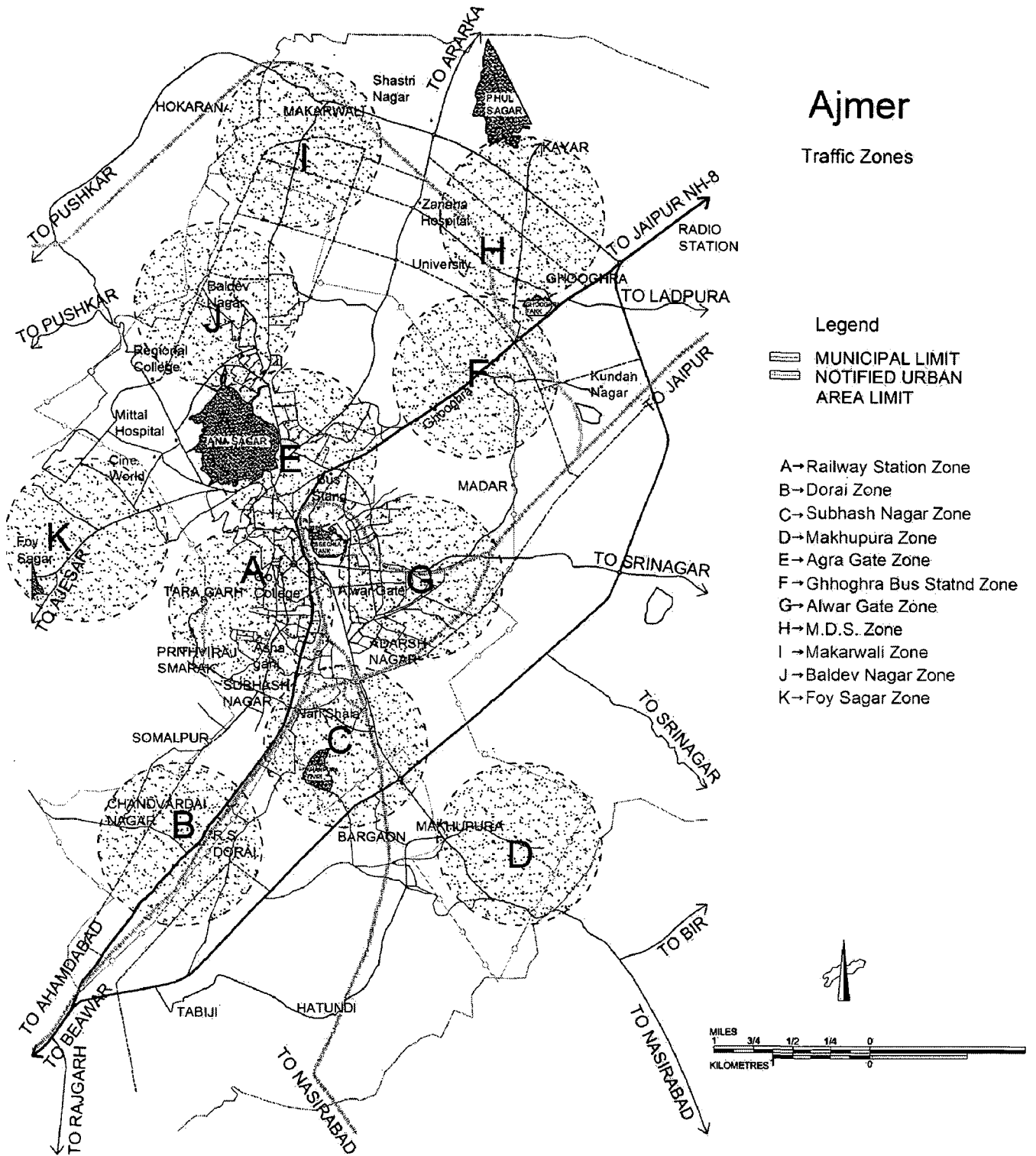
CHAPTER –VI

ESTIMATION OF FUTURE TRAVEL DEMAND

6.1 Traffic Zones

The city of Ajmer will continue to expand in the north and south-west directions but the pattern of growth is a ring and radial pattern with a central nucleus. For the purpose of public transportation planning, the defined study area is sub-Divided into 11 smaller areas called 'Traffic Zones'. Map indicates traffic zones for 2023.

The purpose of such sub-divisions is to facilitate the spatial quantification of land use and economic factor which influence Travel Pattern. Subdivision into zones further helps in geographically associating the origins and destination of travel.



Map 34: Plan of Ajmer Town: Traffic

6.2 LOCAL ECONOMIC ACTIVITIES

6.2.1 Economic Base:

The working population of Ajmer comprises 28% of the total population of the city, of which 90% population constitutes main workers whereas the rest 10% fall under marginal workers category.

6.2.2 Occupational Pattern:

Traditionally, Ajmer has been an important commercial, administrative, transportation and education centre of the region. With the presence of the famous Dargah of the Sufi saint Khwaja Mouinuddin Chisti in the city and close proximity to Pushkar (the religious town); tourism is also a major contributor to the city's economy.

Table 19: Occupational Distribution, Census 2001

Occupation category	No. Of workers	%
Primary sector	9,330	7.0
Industry	33,384	24.9
Trade & Commerce	28,311	21.2
Construction	8,246	6.2
Transport, Storage & Communication	14,938	11.2
Others	39,648	29.6
Total	133,857	100

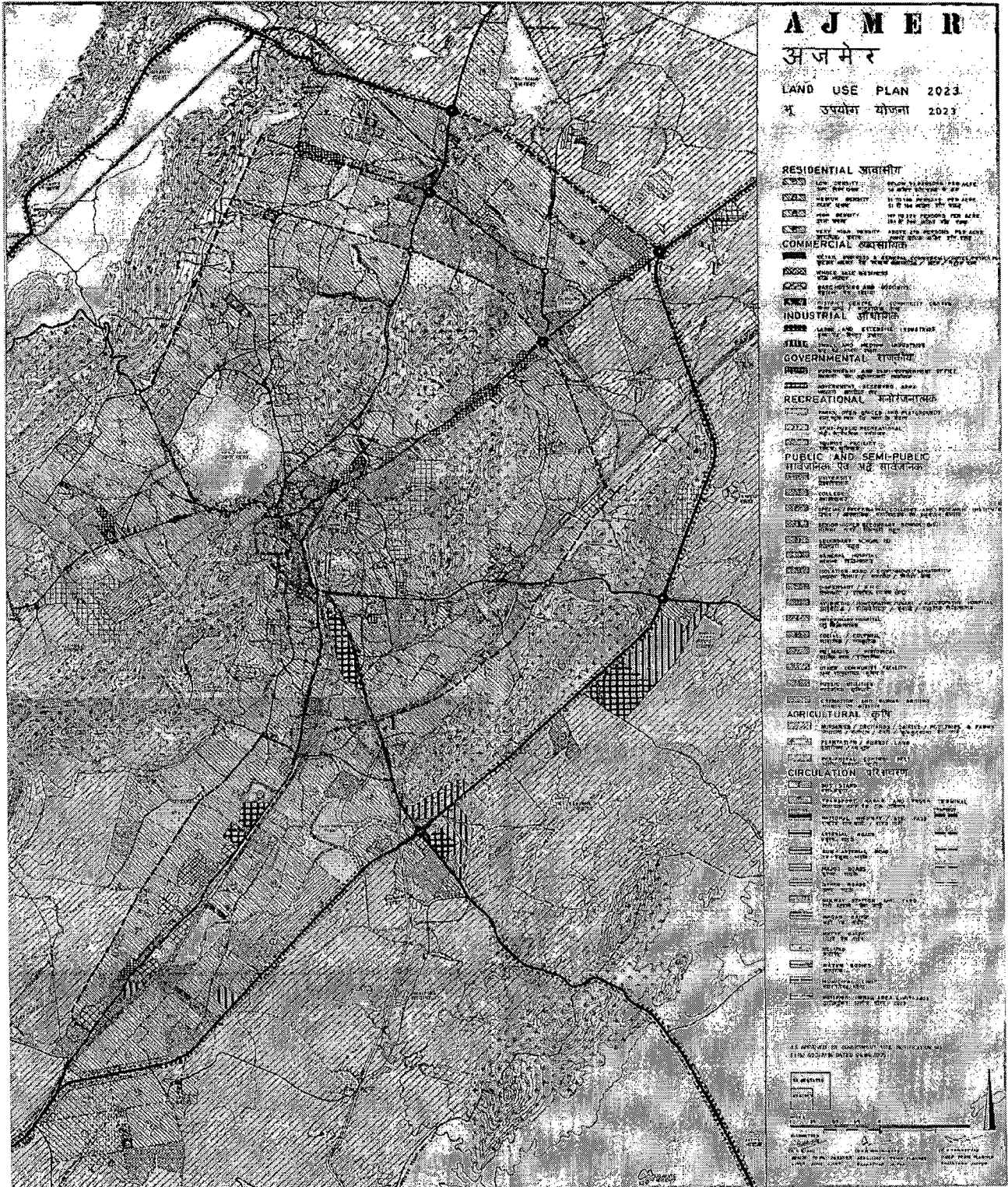
Source: Ajmer Master Plan 2001-2003

Table 20: Employment in the Government Offices

Office	No. Of Office	Employees
Central Govt.	45	30,573
State Govt.	167	15,902
Quasi Govt.	59	5,085
Local Govt.	5	2,047
Others	61	1,965
Total	337	55,572

Source: Ajmer Master Plan 2001-2003

As the production will increase the storage and distribution facilities for finished products and raw materials will also increase. Therefore commercial activities shall also expand during the plan period. New business centres, warehousing and godowns are likely to be established at different places as shown in the proposed land use plan map.



Map 35: Ajmer Master Plan 2001-2023

6.3 FUTURE LAND-USE

Table 21: Land Use Classification

Land use Classification	Land use 2001			Land use 2023		
	Acres	Sq.km	Percent	Acres	Sq.km	Percent
Developed Areas						
Residential	6,000	24.0	50.00	15,423	61.7	51.25
Commercial	564	2.3	4.79	1,155	4.6	3.82
Industrial	586	2.3	4.79	1,044	4.2	3.49
Government	140	0.6	1.25	355	1.4	1.16
Public/Semi Public	1,571	6.3	13.13	4,135	16.5	13.70
Recreation	138	0.6	1.25	3,078	12.3	10.22
Transport	2,483	9.9	20.63	3,688	14.8	12.29
Green area/Open space (including dairies and poultry farms)	510	2.0	4.17	1,233	4.9	4.07
Sub Total (Developed Area)	11,992	48.00	100	30,111	120.40	100
Undeveloped Area						
Govt. Reserved	656	2.6		574	2.3	
Water Bodies	796	3.2		902	3.6	
Hilly area				1,704	6.8	
Sub Total (Undeveloped Area)	1,452	5.80		3,180	12.70	
Total	13,444	53.80		33,291	133.20	

Source: Ajmer Master Plan 2001-2023

6.3.1 Residential

The residential development is currently spread over 24 sq. kms. High density of residential development is found in the inner city area around the Dargah. The densities are low in the peripheral areas developed the UIT, Ajmer. Proposed master plan earmarks additional 38 sq.kms for residential development, primarily along Beawar Road and along Jaipur Road.

6.3.2 Commercial

The commercial activities are still concentrated in and around the inner city in the form of traditional bazaars e.g. Naya Bazaar, Dargah bazaar. The retail trade is concentrated along Kutchery road, Station Road, Prithviraj Road. Most of the wholesale business and warehousing activities still continue in the inner city. These activities demand substantial space in the prime areas and attract heavy vehicles thus adding to the problem of congestion.

The Master plan has proposed to shift these wholesale activities out of the inner city towards Jaipur Road and Beawar Road. Beawar Road seems an appropriate location for Wholesale activities because of good connectivity (NH-8) and the presence of the newly developed Transport Nagar in the area. In view of the high density and congestion, existing in the City, the proposed area earmarked under commercial is confined to sustainable levels only. Majority of areas proposed are in newly developing areas and along the Transport Corridors.

6.3.3 Industrial

The area under industrial use is 2.3 sq. km. HMT is the only major industrial unit in Ajmer. The major industrial areas are Parbatpura and Makhupura, on Naseerabad Road developed by RIICO for promoting industrial activity in the city.

6.3.4 Government

Ajmer being a district and divisional head-quarters has a large number of State and Central Government offices, which account for 1% of the total land use. Some of the important offices are the Collectorate complex, Zilla Parishad, Sessions court, RPSC, State Education Board etc. Most of the offices are located near the Collectorate and also along Jaipur Road.

6.3.5 Public-Semi Public

The present land under public-semi public use is spread over 6.3 sq. km i.e. 11.7% of the total area clearly signifying the historic and religious character of the city. This land use includes religious and historic places, educational institutes, community centers, Dharamshalas, vishram sthalis etc.

6.3.6 Recreation

Anasagar Lake and the Baradari is the most prominent recreation centre of the town which also attracts large number of tourists. Presently Patel Maidan is the only stadium in the city where district level tournaments are held.

6.3.7 Transport

The high portion of land use under transport is because of the railway establishments and National Highway 8 and the newly built NH-8 bye-pass, passing through the city outskirts. Provision has been made for construction of over-bridges at railway crossing.



Chapter-7 Proposed Public Transportation Systems

- 7.1 Route Selection
 - 7.2 Route Analysis
 - 7.3 Improvement Proposals
 - 7.4 Development Objectives
 - 7.5 Strategies
 - 7.6 Major Initiatives
 - 7.7 Traffic improvement of Dargah Area
- Conclusions and Recommendations**

CHAPTER –VII

PROPOSED PUBLIC TRANSPORTATION SYSTEM

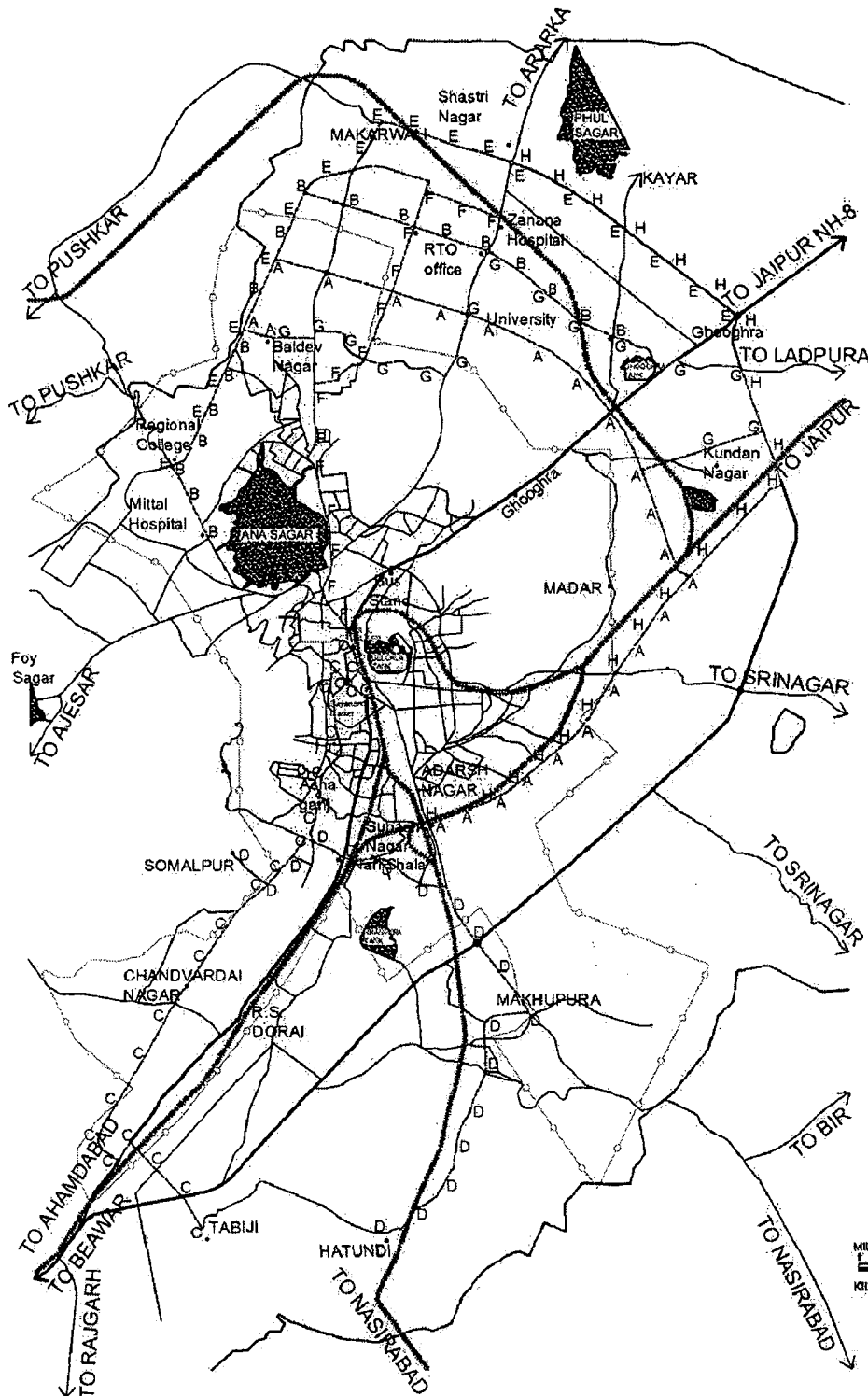
7.1 Route Selection

The following points were considered while selecting feasible routes for public transportation system-

1. The roads on which the proposed routes are assigned are wide enough to accommodate the public transportation modes.
2. Land use is one of the important factors in selecting of routes.
3. It is tried to links as many trip generation points to trip destination points as can be done to provide access so that change of mode is minimised. It is very difficult to provide direct access from all zones to all other zones.
4. Walking distance from the place of origin to bus stop is kept at less than 1 km.

Table 22: Proposed Mini Bus / tempo Route

Route No.	Route detail		Via	Route length (Kms)
	From	To		
1.	Adarsh Nagar	Baldev Nagar	Madar and MDS Square	20
2.	Railway Station	Tabiji	Asha Ganj and Chawardai	15
3.	MDS University	Mittal Hospital	RTO, Baldev Nagar and Regional college	17
4.	Somalpur	Hatundi	Nari Shala, Ashok Nagar and Makhupura	16
5.	Ghooghra Square	Regional College	Makarwali and Baldev Nagar.	17
6.	Zanana Hospital	Bus Stand	RTO office	12
7.	Baldev Nagar	Kundan Nagar	Ghooghra	12
8.	Shastri Nagar	Adarsh Nagar	Ghooghra, Kundan Nagar and Madar	15



Ajmer

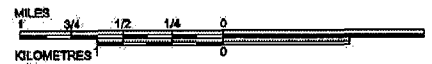
Proposed
Mini Bus / Tempo Routes

Mini Bus Routes

- A → Adarsh Nagar to Baldev Nagar
- B → MDS to Mittal Hospital
- C → Railway St. to Tabiji
- D → Somalpur to Hatundi
- E → Ghoghra Sq. to Regional Coll.

Tempo Routes

- F → Zanana Hospital to Bus Stand
- G → Baldev Nagar to Kundan Nagar
- H → Shastri Nagar to Adarsh Nagar



Map 36: Proposed Mini Bus / tempo Route

7.2 ROUTE ANALYSIS:

All the selected routes have been analysed for mini- buses then the feasible mode on each route has selected. Tempos are not considered suitable mode of public transportation on major corridors because of its low capacity, higher operating cost, slow speed, noise and inconvenience backs.

7.3 IMPROVEMENT PROPOSALS:

Proposals are made to improve the existing network and infrastructure facilities to meet present and future travel demand.

Increase the road network, to achieve an average cover to cater to 100 percent of the population. Given the high density of population within the municipal area, and constraints for development, it is proposed to emphasize on clearing of traffic bottleneck, strengthening and widening measures and lying of incomplete network, to improve the surface quality of roads and addressing the issues of congestion. Citing the City's regional and religious significance it is commended to improve transport facilities, like parking areas, truck terminal, bus and, etc.

The City is densely populated and is an important tourist destination, although the city's road system has many ill-designed road intersections which lack in characteristics such as road geometric features, channelling islands, parking

lanes for turning vehicles, acceleration and deceleration lanes etc. It is also recommended to introduce bus-based public transport system for easy movement of daily pedestrian traffic and reduce two-wheeler traffic.

2. Improve the facilities for Pedestrians, it is recommended to Provision of Pavements and Footpaths, along major roads and junctions. It has been observed that, in most of the major roads in the City pedestrians are forced to use the carriageway in absence of / poorly maintained footpaths. To improve safety of pedestrians, it is recommended to provide/rehabilitate Pavement and Footpath, upto 1.5 m wide, along major roads where heavy pedestrian movements are observed. The measure shall also improve the roads carrying capacity.
3. Improvement of Parking Facilities and Pedestrian facilities in the City. In the absence of inadequate parking lots, haphazard parking of tourist and local vehicles causes traffic congestion. In addition to this, loading / un-loading of goods by traders causes traffic congestion and parking problems.
4. De-congestion of Inner Areas and Diversion of regional traffic - Citing the regional significance and tourist significance, the town is expected to receive commercial through traffic and destined traffic. It is recommended to streamline commercial activities, by shifting of major commercial activities outside

congested areas. This will eventually result in reduction of pollution and traffic congestion in the congested areas of the City.

5. Up-gradation, Widening and Strengthening of Roads - Upgrading should be undertaken to extend, refurbish and enhance the roads, for all arterial and city roads.

7.4 DEVELOPMENT OBJECTIVES:

To design a transport system commensurate with the spatial structure of the city in order to provide improved access, safety and high mobility across the city.

7.5 STRATEGIES:

To provide alternate routes for decongesting the traffic on the major traffic corridors in the city. Ensure free flow of traffic through junction improvement and traffic control and management measures.

7.6 MAJOR INITIATIVES:

7.6.1 DECONGEST THE TRAFFIC ON STATION ROAD:

This is currently the only access for north-south traffic movement. It is necessary to decongest the station Road by an alternate road along Pal Beechla side. The road leading to the proposed second entry on Pal Beechala side needs to be widened from 3.5m to 9.0m to cater to future traffic requirement. This road

would ensure reduction of traffic on Station Road as well as on the Railway station.

7.6.2 JUNCTION IMPROVEMENT

- Railway Station
- Gandhi Bhawan
- Agra Gate
- Collectorate Circle
- Mahavir Circle

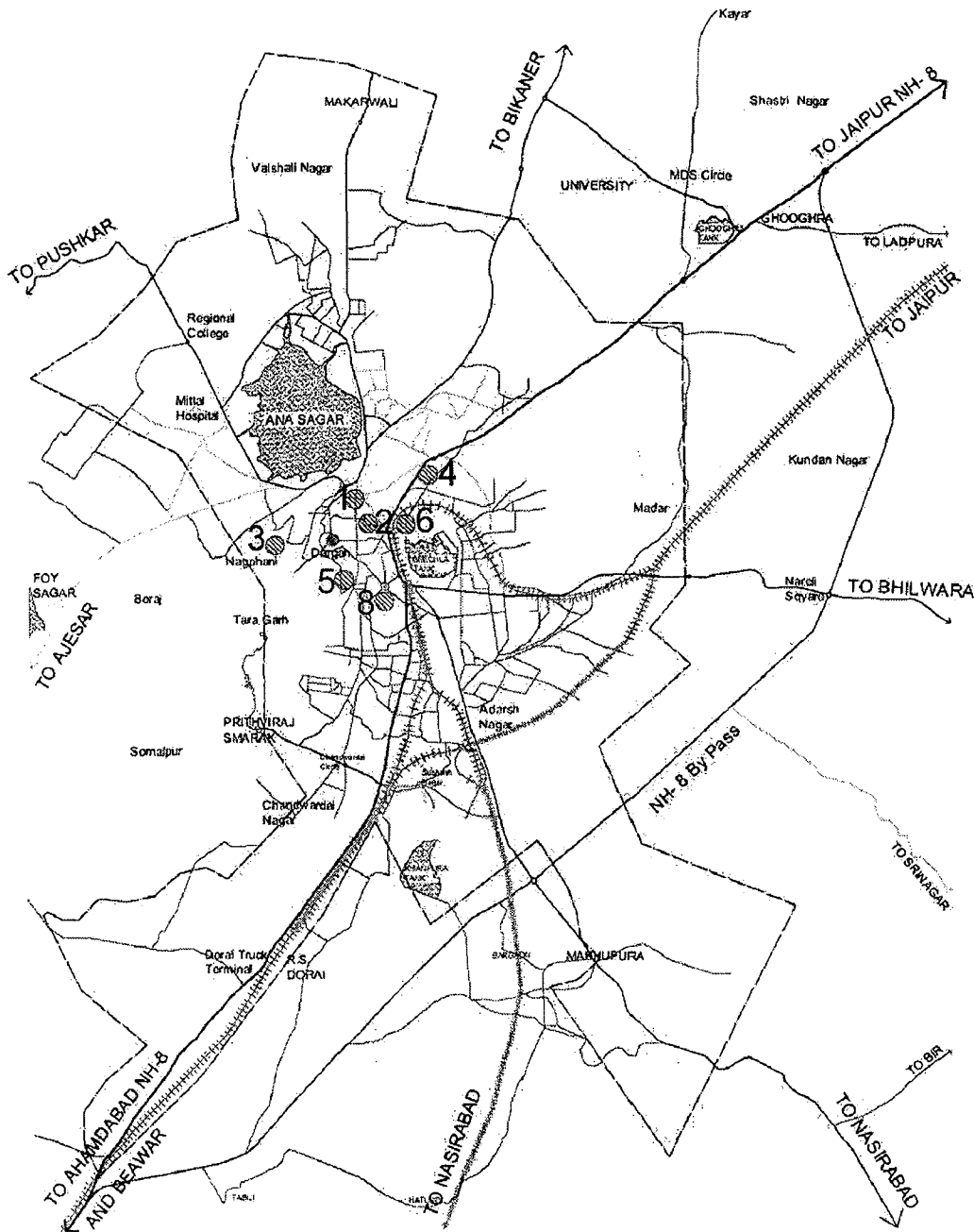
7.6.3 WIDENING AND STRENGTHENING OF VARIOUS ROADS of various internal roads and arterial roads

- Dargah to Tripolia gate and from Adhai Din ka Jhonpara to Inderkot upto new road from Nagphani hill.
- Ajmer Lohagal road from circuit house to Zanana Hospital.
- Ram ganj Police station to Beawar Road.
- Mayo Circular Road.
- Agra gate to Martindal Bridge.

- Agra Gate to Mahaveer Circle.
- Government College to Diggi Chowk

7.6.4 Construction of ROB/RUB at various Railway level Crossing

- Topdara
- Lalphatak
- Jones ganj
- Gulab bari
- Subhash Nagar Road



PLAN OF AJMER TOWN

Proposed Parking Lots:

Map 37: Plan of Ajmer Town: Proposed Parking Lots

7.6.5 **Parking lots:**

- Kutchery Road.
- Railway station
- Naya Bazar
- Kesar Ganj
- Dargah Area
- Ganj area (6355 sq,km)
- Veterinary Hospital (6800 sq,km)
- Kotwali area (1632 sq,km)
- Nagphani area near Adhai Din ka Jhonpara (2000 sq.km)

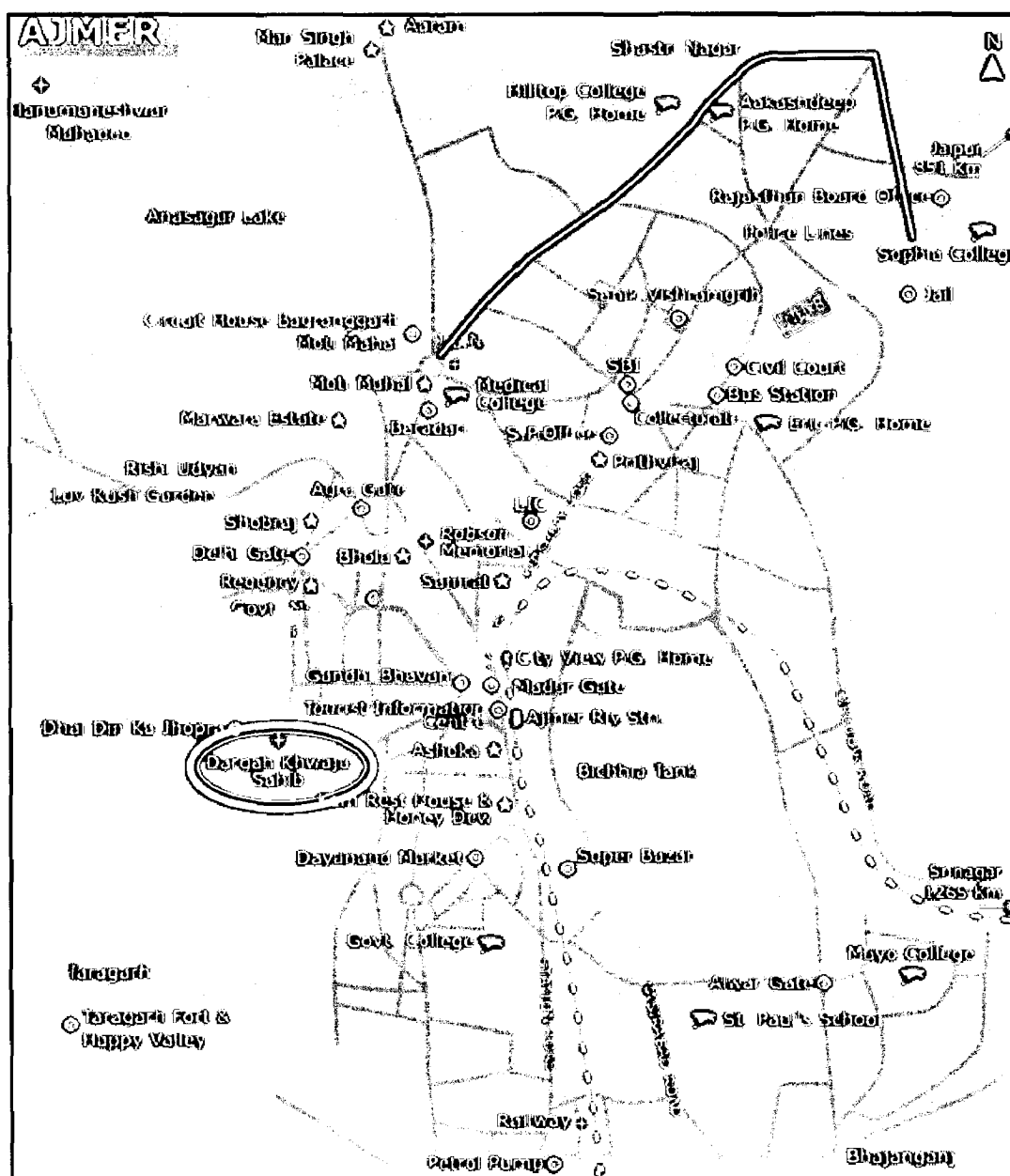
7.6.6 Channelization and Signaling at Major Junctions – It would be necessary depending on the land availability to provide channelisation of the junctions wherever possible. Signallization would become necessary with or without channelisation for easy handling of traffic at the following junction:

Bajrangarh Junction, Savitri School junction, Jwahaar Rangmanch junction, India Motors junction, Agra gate junction, Agra gate Circle, Mahaveer circle, Makadwali road junction, Regional college junction, Narishala Road-Beawar road junction, Martindal Bridge junction.

7.7 Traffic improvement of Dargah Area

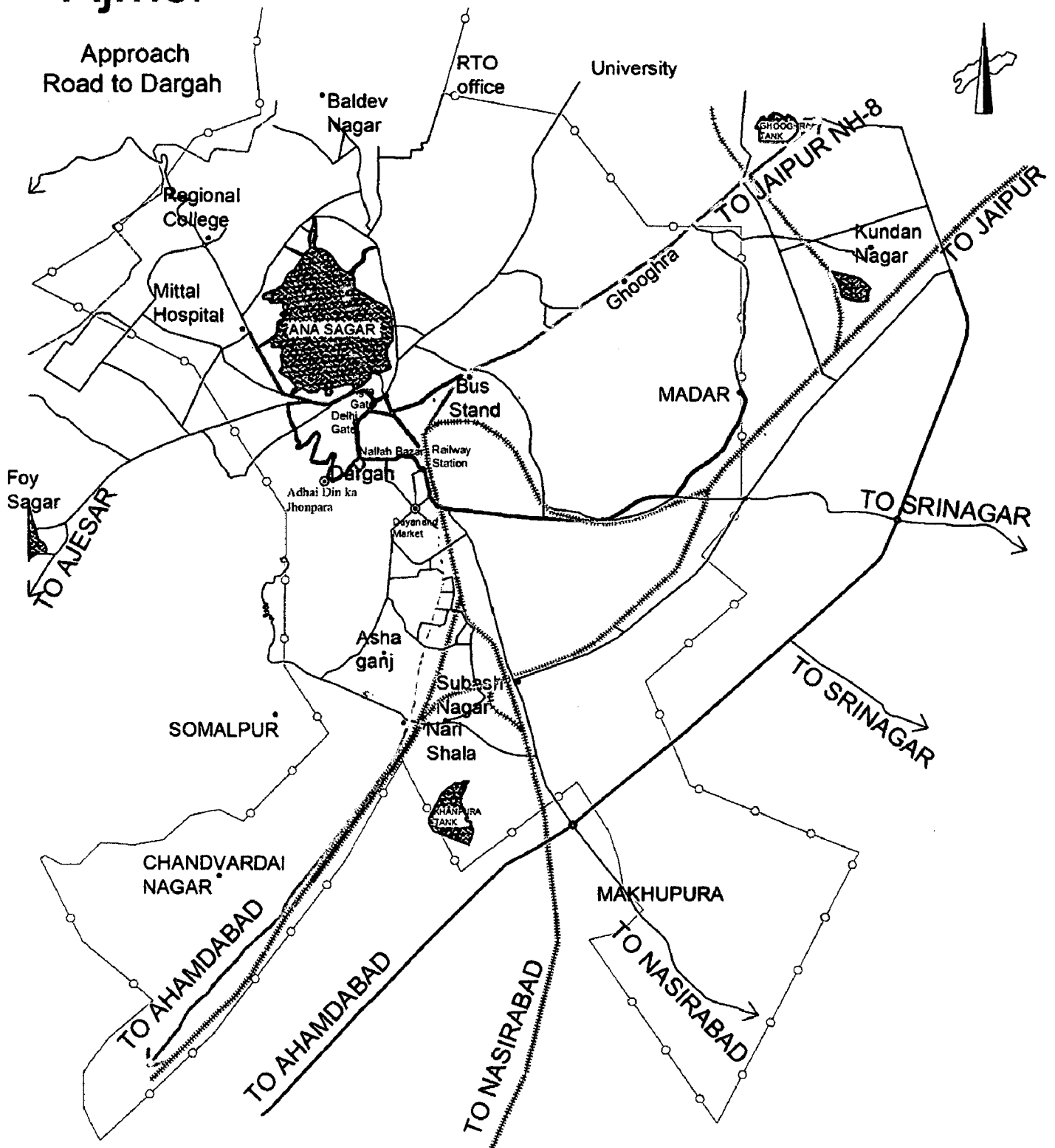
Road development

- Four laning of approach road from Ganj to Dargah via Delhi Gate (0.975km)
- Four laning of approach road from Madar to Dargah (Nallah Bazar) (1.0km)
- Four laning of Pushkar road to Adhai Din ka Jhonpara (3.2km)



Map 38: Different Approach Road to Dargah

Ajmer



- Ganj to Dargah via Delhi Gate
- Madar to Dargah (Nallah Bazar)
- Pushkar road to Adhai Din ka Jhonpara

Map 38: Plan of Ajmer Town: Different approach road to Dargah

Conclusions and Recommendations

From the foregoing discussions the following two factors becomes evident:

1. The regional traffic concentrates towards the high density residential and commercial areas and is typically disconnected from the major economic activities of the town by a segregation of feeder traffic lines.
2. The concentration of major economic activities such as grain market and vegetable market within the high density residential areas creates local problems of mixed traffic for movement and parking etc.

The problem that would demand rational solutions are actually constricted by the following facts:

- A. The local and intercity traffic movements betray practically all rational solutions because of the traditional high density occupational patterns. Remedial solutions such as minor adjustment in the alignments are an impossibility because of overloaded choking of the roads and street edges. Perhaps a surgical solution through major demolitions may be the only solution, but this is a practical impossibility within the present economic/ political situation of the country.

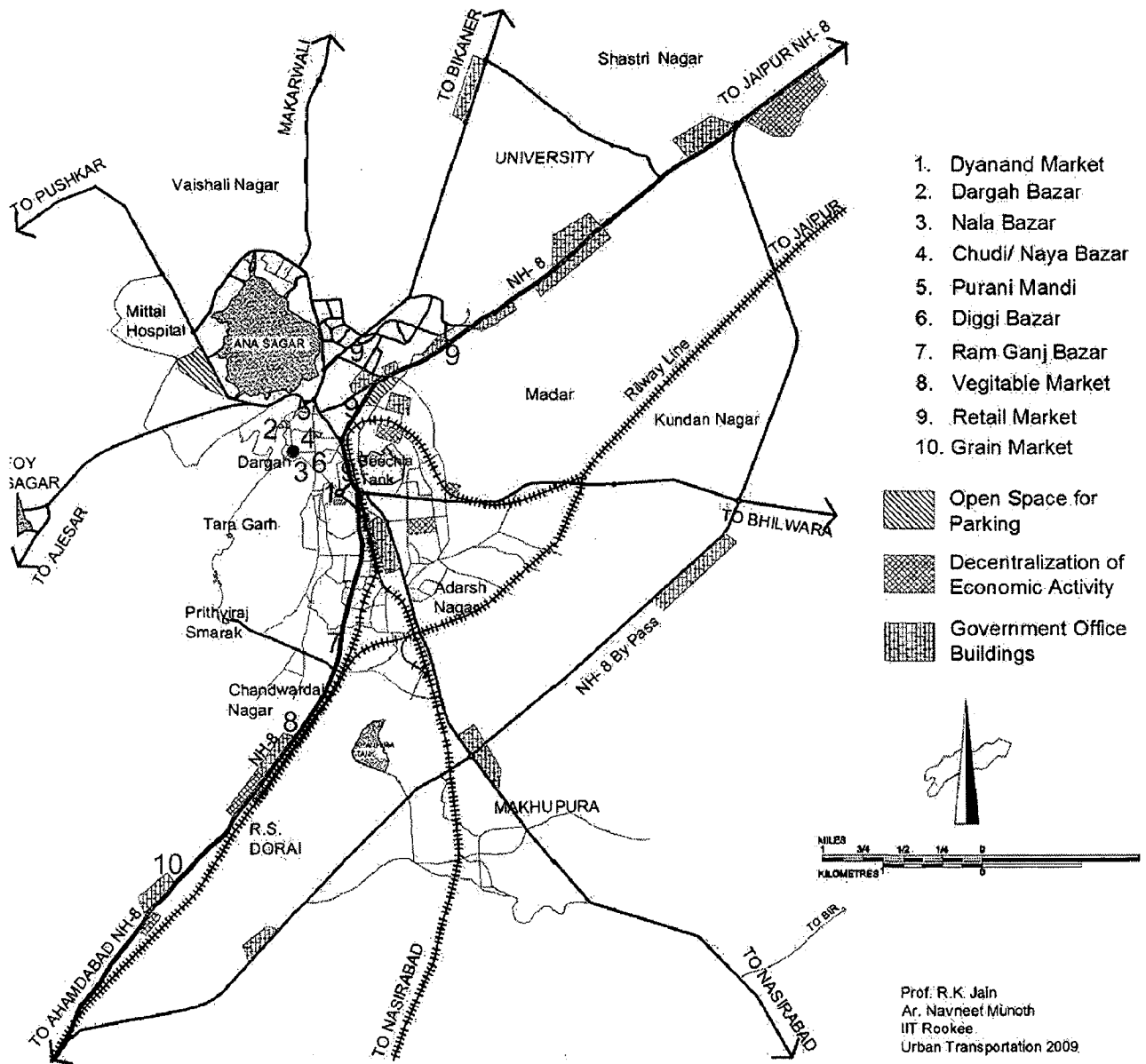
- B. Any alternatives to regional flow also betray rational transportation solution because of the locational geography of the city. The city is barricaded by major locational geographic factors,
1. On the east and west are the mountain ranges of Nag hills, Madar hills and Taragarh hills with visible ecological pressure on water bodies and green cover.
 2. The rail network across the city and the interspersed hills formed limitation for development resulting in a high density city core.

These barriers are strong constraints to any possible solution for diversion of regional traffic and therefore the present regional distribution limits are intricately mixing with the local movement lines which have created a complex problem of high density mixed traffic without indicating any segregation of different type of traffic from the regional to local traffic.

Considering the above parameters of the problems, it is a strong conviction of the authors that immediate efforts need to be concentrated on the possible mitigation factors more than the comprehensive approach to the solution.

In view of the differentiation between the old and the new settlements of town in the west and east side of Aravali rang respectively there is a need for imposing traffic regulations during the peak period of the commercial activities, that is

a. No vehicular traffic should be permitted on the main spine of the old settlement, instead the vehicular traffic should be limited to identified feeder lines. Incidental open spaces already existing may be utilised for parking of vehicles during day times. The character of the old town demands that it should serve efficiently the functional movements of pedestrians and slow moving traffic Map 39.



Map 39: Plan of Ajmer Town: Major Activity

- b. The new settlement has the capacity to permit business traffic of slow and fast moving modes. It may still desirable to apply the same principle as for the old settlement i.e. segregation of business traffic to such places where they do not impede the normal functioning of commercial transactions.
- c. During evening hours when the local traffic show its highest density in both the areas it may be desirable to opt for either (i) No entry of traffic or (ii) One way entry of traffic, system.

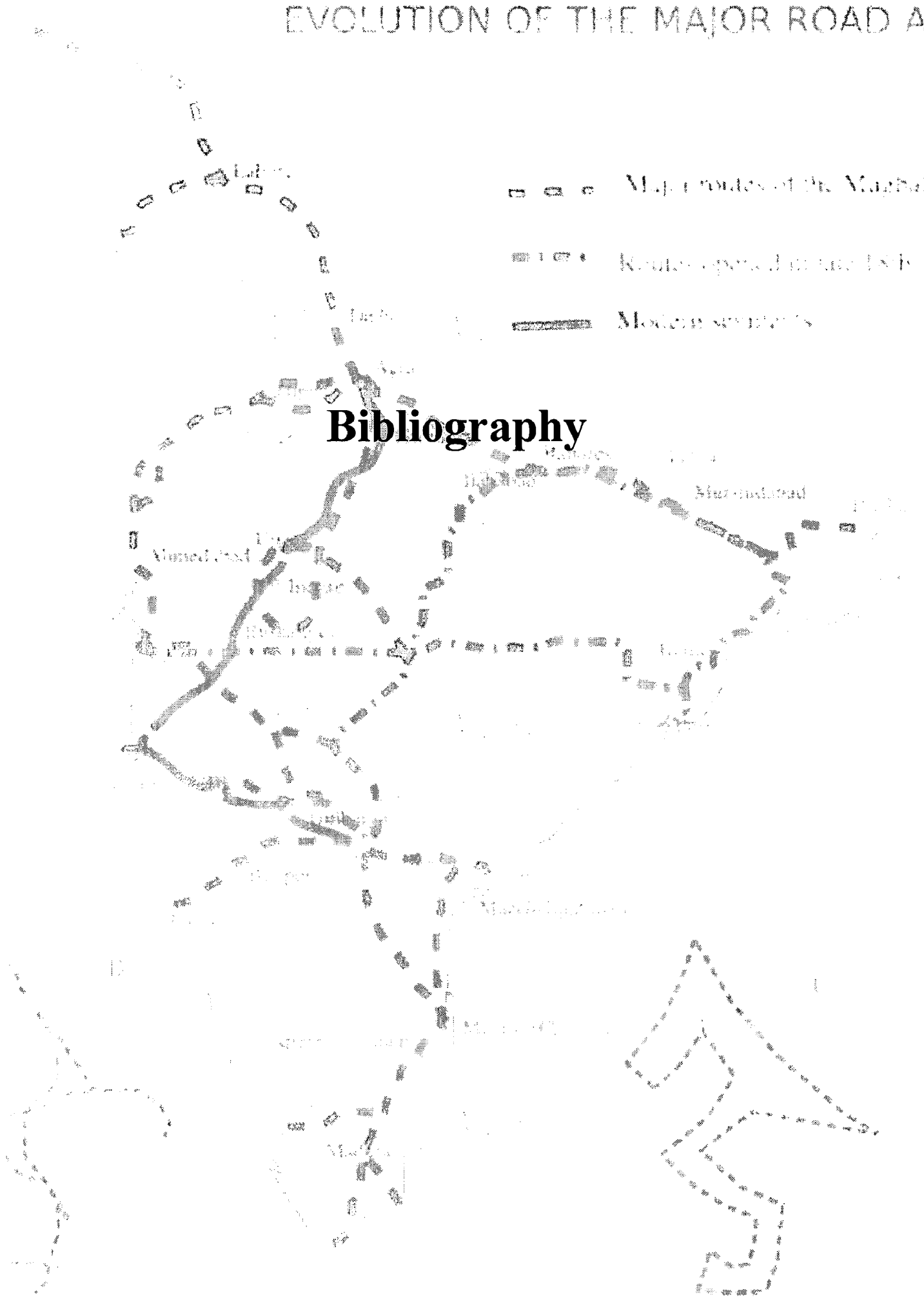
The character of the old and new settlements has a definite possibility of creating a network of pedestrian movement system away from the commercial spine. For this purpose there is,

- i. A need of identification of open spaces particularly those which are linked up with the street pattern so that a comprehensive network of a variety of open spaces can be created for the pedestrians.
- ii. This may involve connection of old and new settlements with series of new pedestrian way to promoting a flow of present traffic from across the settlements more spontaneously.

EVOLUTION OF THE MAJOR ROAD AXES

- Major routes of the Maghrib
- Routes opened in the 18th century
- Modern routes

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