

# EFFICIENT TRANSPORT STRATEGY FOR HARIDWAR CITY

## A DISSERTATION

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

*By*

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**JUNE, 2006**

# CERTIFICATE

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Certified that this report entitled "*Efficient Transport Strategy for Haridwar City*", which has been submitted by **Mr. Ajay Kumar Saroj**, in partial fulfillment of the requirements for the award of Post Graduate Degree in **Master of Urban and Rural Planning** in the Department of Architecture and Planning, Indian Institute of Technology, Roorkee, Roorkee, is the student's own work carried out by him under my supervision and guidance. The matter embodied in this dissertation has not been submitted for the award of any other Degree.

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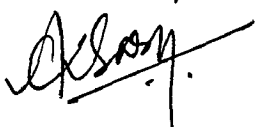
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I hereby certify that the work which is being presented in this thesis entitled "*Efficient Transport Strategy for Haridwar City*", in partial fulfillment of the requirement of the award of the Degree of Master of Urban and Rural Planning submitted in the Department of Architecture and Planning, Indian Institute of Technology, Roorkee, Roorkee, is an authentic record of my own work carried out during the period from January 2006 to June 2006 under the supervision of **Prof. Rajesh Chandra**, Department of Architecture and Planning, Indian Institute of Technology, Roorkee.

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

Dated: June, 05<sup>th</sup> 2006

  
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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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# CONTENTS

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CERTIFICATE	II
CANDIDATE'S DECLARATION	III
ACKNOWLEDGEMENT	IV
TABLE OF CONTENTS	V-VIII
LIST OF FIGURES	IX-X
LIST OF TABLES	X-XI
<b>CHAPTER 1: INTRODUCTIION</b>	<b>1-6</b>
1.1. The Context	1
1.2. Study Area	1
1.3. Need of The Study	2
1.4. Identification of Problems	3
1.5. Aim	4
1.6. Objective	4
1.7. Study Approach	5
1.8. Methodology	5
1.9. Tools and Techniques Used	6
1.10. Scope and Limitation	6
<b>CHAPTER 2: LITERATURE STUDY ON TRANSPORTATION</b>	<b>7-34</b>
2.1. An Introduction to Transport Planning	7
2.2. Classification of Transport Systems	10
2.3. Road Development and Transport Policies / Strategies -An Overview	11
2.3.1. Road Developments and Economic Development	11
2.3.2. Road Development in India	12
2.3.2.1. Jayakar Committee-1927	12
2.3.2.2. The Indian Roads Congress 1934	13
2.3.2.3. Nagpur Plan (1943-1963)	13

2.3.2.4. Bombay Plan (1961-1981)	15
2.3.2.5. Lucknow Plan (1981 -2001)	15
2.3.2.6. Approach Paper to Road Development Plan 2001-2021	17
2.3.2.7. Present Scenario	18
2.3.2.8. Present Special Programmes for Road Development	21
2.3.2.8.1. National Highways Development Projects (NHDP)	21
2.3.2.9. Plan Outlays in Transport Sector	24
2.4. Policies / Strategies Developed for Transport Sector at National Level	25
2.4.1. National Transport Policy-1980	25
2.4.2. Alternate Systems of Urban Transport-1985	27
2.4.3. Working Group on Urban Transport-1996	29
2.4.4. Draft National Urban Transport Policy 2005	30
2.5. Typical Cross Sections of Different Types of Urban Roads	31
<b>CHAPTER 3: CASE STUDY OF ALLAHABAD CITY</b>	<b>35-47</b>
3.1. Selection Criteria	35
3.2. Introduction to the Allahabad City	35
3.3. Transportation System of Allahabad City	37
3.3.1. Road Network	37
3.3.2. Railway Network	38
3.3.3. Air Network	39
3.4. Existing Mass Transportation System	39
3.5. Major Traffic and Transportation Problems of the City	45
3.6. Findings / Inferences from This Case Study	46
<b>CHAPTER 4: DATA REQUIREMENT AND COLLECTION</b>	<b>48-50</b>
4.1. General	48
4.2. Study Area	48
4.3. Secondary Data Collection	49
4.4. Compilation of Data	50

<b>CHAPTER 5: STUDY AREA</b>	<b>51-69</b>
5.1. Historical Background	51
5.2. Geographical Location	52
5.3. Regional Settings	53
5.4. Physical Expansion of the City	56
5.5. Demographic Profile of the City	58
5.5.1. Population Growth of Haridwar Urban Agglomeration	59
5.5.2. Floating Population	62
5.6. Socio-Economic Profile	63
5.7. Land Use Profile	65
5.8. Administrative Structure	68
5.9. Functional Character of City	69
<b>CHAPTER 6: ROAD NETWORK AND TRAFFIC CHARACTERISTICS</b>	<b>70-85</b>
6.1. Transport Network System	70
6.2. Road Inventory Analysis	71
6.3. Traffic Volume	75
6.4. Traffic Composition	77
6.5. Vehicle Parking Analysis	78
6.6. Pedestrian Movement Analysis	81
6.7. Road Accident Analysis	82
6.8. Existing Conditions of Roads in the City	82
<b>CHAPTER 7: TRAFFIC AND SOCIO-ECONOMIC CHARACTERISTICS</b>	<b>86-90</b>
7.1. Travel Pattern	86
7.2. Goods Transport System	87
7.3. Trip Purpose	87
7.4. Modal Share	88
<b>CHAPTER 8: PUBLIC TRANSPORT SYSTEM</b>	<b>91-93</b>
8.1. Role of Public Transport System	91

8.2. Existing Public Transport System in Haridwar City	91
8.2.1. City Bus System	92
8.2.2. Railway System	92
8.3. Intermediate Public Transport (L.P.T.)	93
<b>CHAPTER 9: TRAFFIC AND TRANSPORTATION PROBLEMS</b>	<b>94-98</b>
9.1. Identification of Major Trouble Causing Factors	94
9.2. Study of Problems and Their Causes	97
<b>CHAPTER 10: TRAFFIC PROJECTIONS / FORECAST</b>	<b>99-103</b>
10.1. Population Projection	99
10.2. Traffic Forecast	102
<b>CHAPTER 11: KUMBH MELA STUDY</b>	<b>104-107</b>
11.1. Kumbh Mela Scenario	104
11.2. Transport Network	105
11.3. Criteria for Traffic Management Plan for Kumbh Mela	106
<b>CHAPTER 12: TRANSPORT DEVELOPMENT PROPOSALS AND STRATEGIES</b>	<b>108-129</b>
12.1. In General	108
12.2. Short Term Proposals	108
12.3. Medium Term Proposals	111
12.4. Long Term Proposals	113
<b>CHAPTER 13: POLICY GUIDELINES, CONCLUSIONS AND RECOMMENDATIONS</b>	<b>130-133</b>
<b>BIBLIOGRAPHY</b>	<b>134-136</b>
<b>ANNEXURES</b>	<b>137</b>

## LIST OF FIGURES

Figure No.	Particular	Page No.
1.1	Methodology	05
2.1	2-lane National or State Highway	31
2.2	Expressway (6-Lane Divided)	32
2.3	Expressway (4-Lane Divided)	32
2.4	Arterial Street with (4-Lane divided)	32
2.5	Sub-arterial Street through Open Area (4-Lane Divided)	33
2.6	Collector Street through Residential Area	33
2.7	Collector Street (4-Lane divided)	33
2.8	Local street with sidewalk adjacent to carriageway	34
2.9	Urban Cul-de-sac	34
3.1	Transportation System of Allahabad City	37
3.2	Growth of Population in Allahabad City	40
3.3	Growth of Vehicles in Allahabad City	41
3.4	Directional flow of through goods vehicle on National Highways passing through the city	43
3.5	Traffic and Transport layout showing of positions of Truck and Bus terminals	44
5.1	Map of Haridwar City	53
5.2	Regional Linkages of Haridwar	55
5.3	Satellite Image of Haridwar City	56
5.4	Physical Expansion of Haridwar City	57
5.5	Population Growth of Haridwar Urban Agglomeration	60
5.6	Workforce Participation Rate in Haridwar City	64
5.7	Land use distribution of Haridwar UA	67
6.1	Road Network of Haridwar City	72
6.2	Average Daily Traffic Volume in Inner Cordon Areas	76
6.3	Average Daily Traffic Volume in Inner Cordon Areas	76
6.4	Location wise Parking Accumulation	79
6.5	Major Vehicle Parking Areas in the City	80
6.6	Peak Hour Parking Space Requirements	81
6.7	Important Road Junctions in the City	85
7.1	Trip Purpose Distribution in Haridwar city	88
7.2	Total No. of Fast Moving Vehicles Registered with RTO	89
7.3	Modal Share among Slow Moving Vehicles	90
8.1	Existing Public Transport System in Haridwar City	92
9.1	Traffic and Transportation Problems in the City	98
10.1	Population Projections by Various Methods	102
10.2	Traffic Forecast by Geometrical Increase Method	103
11.1	Kumbh Mela area divided into 31 Sectors	106
12.1	Proposed Landuse Distribution in Haridwar City	117
12.2	Improvement of Existing Roads in Haridwar City	118
12.3	Improvement of Bahadradab Y Junction	119



## LIST OF FIGURES

Figure No.	Particular	Page No.
1.1	Methodology	05
2.1	2-lane National or State Highway	31
2.2	Expressway (6-Lane Divided)	32
2.3	Expressway (4-Lane Divided)	32
2.4	Arterial Street with (4-Lane divided)	32
2.5	Sub-arterial Street through Open Area (4-Lane Divided)	33
2.6	Collector Street through Residential Area	33
2.7	Collector Street (4-Lane divided)	33
2.8	Local street with sidewalk adjacent to carriageway	34
2.9	Urban Cul-de-sac	34
3.1	Transportation System of Allahabad City	37
3.2	Growth of Population in Allahabad City	40
3.3	Growth of Vehicles in Allahabad City	41
3.4	Directional flow of through goods vehicle on National Highways passing through the city	43
3.5	Traffic and Transport layout showing of positions of Truck and Bus terminals	44
5.1	Map of Haridwar City	53
5.2	Regional Linkages of Haridwar	55
5.3	Satellite Image of Haridwar City	56
5.4	Physical Expansion of Haridwar City	57
5.5	Population Growth of Hardwar Urban Agglomeration	60
5.6	Workforce Participation Rate in Haridwar City	64
5.7	Land use distribution of Haridwar UA	67
6.1	Road Network of Haridwar City	72
6.2	Average Daily Traffic Volume in Inner Cordon Areas	76
6.3	Average Daily Traffic Volume in Inner Cordon Areas	76
6.4	Location wise Parking Accumulation	79
6.5	Major Vehicle Parking Areas in the City	80
6.6	Peak Hour Parking Space Requirements	81
6.7	Important Road Junctions in the City	85
7.1	Trip Purpose Distribution in Haridwar city	88
7.2	Total No. of Fast Moving Vehicles Registered with RTO	89
7.3	Modal Share among Slow Moving Vehicles	90
8.1	Existing Public Transport System in Haridwar City	92
9.1	Traffic and Transportation Problems in the City	98
10.1	Population Projections by Various Methods	102
10.2	Traffic Forecast by Geometrical Increase Method	103
11.1	Kumbh Mela area divided into 31 Sectors	106
12.1	Proposed Landuse Distribution in Haridwar City	117
12.2	Improvement of Existing Roads in Haridwar City	118
12.3	Improvement of Bahadrabad Y Junction	119

Figure No.	Particular	Page No.
12.4	Improvement of Devipura More Y Junction	120
12.5	Improvement of Shiv Murti Chowk	121
12.6	Improvement of Laltarao Chowk	122
12.7	Proposed Missing Links to be Constructed	123
12.8	Proposed Terminal Facilities in Haridwar City	124
12.9	Proposed Parking Facilities in Haridwar City	125
12.10	Proposed Kumbh Mela Traffic Plan	126
12.11	Improvements of Various Road Sections	127

## LIST OF TABLES

Table No.	Particular	Page No.
2.1	Bombay Plan	15
2.2	Growth of Road Transport Sector in the Country	19
2.3	Growth of Road Network (in '000 Kms.)	19
2.4	Total No. of Registered Motor Vehicles in India (1951-2002)	20
2.5	Existing Modal split in Indian cities (as % of total trips)	20
2.6	Desirable Modal split in Indian cities (as % of total trips)	21
2.7	North-South and East-West corridors	22
2.8	Golden Quadrilateral Corridors	22
2.9	Funds for National Highways Development Project	23
2.10	Expenditure in Transport ('000 crore) - India	24
2.11	Outlay and Expenditure (Centre and States) for Road Transport Sector during IX Plan & X Plan (Rs. in crores)	24
3.1	Modal Split of intra-city trips in Allahabad city	43
4.1	Sources of Secondary Data to be collected	49
5.1	Population Growth of Haridwar Urban Agglomeration	60
5.2	Ward wise Population of the Haridwar City (2001)	61
5.3	No. of Tourists Visit during Festival Season (2005)	63
5.4	Literacy rate in Haridwar	63
5.5	Workforce in Haridwar City	64
5.6	Workforce Participation Rate in Haridwar City	64
5.7	Land Use Profile of the city	66
6.1	Road Inventory of Road Network – Haridwar City	73
6.2	Average Daily Traffic Volume in Outer Cordon Areas	77
6.3	Average Daily Traffic Volume in Inner Cordon Areas	77
6.4	Location wise Parking Accumulation	79
6.5	Peak Hour Parking Space Requirements	79
6.6	Road Fatalities in the City	82
6.7	Status of the Roads Maintained by Nagarpalika	83
6.8	Status of the Roads Maintained by Public Works Department	83
7.1	Total No. of Fast Moving Vehicles Registered with RTO	88

<b>Table No.</b>	<b>Particular</b>	<b>Page No.</b>
7.2	Modal Share among Slow Moving Vehicles	89
9.1	Data collected by Rapid appraisal technique by the Author	95
10.1	Population Projections by Various Methods	101
10.2	Traffic Projection by Geometrical Increase Method	102
10.3	Total number of vehicles registered with RTO	103

## CHAPTER 1

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# INTRODUCTION

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### 1.1 THE CONTEXT

The traffic and transportation is a basic infrastructure which is usually a prerequisite for economic development. Transport plays a multi faceted role in the pursuit of development objectives. Transportation contributes to the economic, industrial, social and cultural development of any country. The growth of the city depends upon its transportation network. The transport is the medium through which demand and supply interact with each other. In developing countries like India transport is seen to grow at rates, which are two to four times the rate of growth of the economy. In India, because of country's size, population and diversity transport plays an important role. Since the natural resources are not equitably distributed, transport gives 'place utility' to the raw materials. Transport requirement in India is achieved by a number of modes such as railways, roads, air and water transport etc. Though the share of railways in the total G.D.P. of the nation is higher but roads are vital elements for economic development as they stimulate and support the growth in all sectors of economy.

### 1.2 STUDY AREA

Haridwar, literally means, the gateway to God ('Hari' means God and 'dwar' means a gateway or door). According to mythology, Haridwar has been known by names like Mayapuri, Gangadwar and Tapovan. From the Himalayas the holy Ganga first descends to the plains of India at Haridwar, hence it is also called 'Gangadwar' i.e. gateway to Ganga. The word Haridwar was first described in the 'Narad Purana' (a text of Hindu mythology) written around the 7th century. It also means the route to Lord Vishnu's abode; hence, the Vaishnavs, or the devotees of Vishnu, call it Haridwar. Kedarnath, the sacred place of Lord Shiva, is one of the

most important pilgrim places of India. The journey to Kedarnath starts from Haridwar. Hence, the Shaivites, or devotees of Shiva, call this place Haridwar (Har means Shiva). It is also a point of entry to Dev Bhoomi and Char Dham (*Four main centers of pilgrimage in Uttaranchal*) Viz. Badrinath, Kedarnath, Gangotri and Yamunotri.

Haridwar is also one of the four places; where Kumbh Mela occurs after rotation of every twelve Years and Ardh Kumbh after every six years. It is said that drops of Amrit (Elixir) fell in to the Brahmkund of Har-Ki-Pauri, therefore considered that a dip in the Brahmakund on this particular auspicious day called kumbh. Being one of the oldest living cities; Haridwar finds its mention in the ancient Hindu scriptures as it waves through the life and time stretching from the period of the Buddha to the more recent British advent.

A paradise for nature-lovers, Haridwar presents kaleidoscope of Indian culture and civilization. Haridwar has not only remained the abode of the weary in body, mind and spirit, but also served as centre of attraction for many, for learning the arts science and culture. Haridwar's long standing position as a great source for Ayurvedic medicines and herbal remedies as well as its unique Gurukul school of traditional education, the scenic beauty and lush greenery.

### **1.3 NEED OF THE STUDY**

As we know that Transport is an essential pre-requisite in bringing about movement of people and utilization of resources. The development of important sectors of the economy such as Industry agriculture, mining, forestry etc. depends upon the efficient transport network. The reality that emerges is that without an efficient transport network, the region shall continue to remain isolated, unseen and unheard.

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. But the resources are limited, so we have to plan for the infrastructure and services of the community well in advance. Transportation network being the most crucial component of the urban community, their proper planning would go a long way in conserving the scarce resources and ensuring the optimal use of the same.

With progressive urbanization and floating population (mainly pilgrimage), the travel demand in Haridwar has increased tremendously. In comparison to that, the growth of road length, rail length is slow and their augmentations in capacities are poor. This is evident from long delay and traffic congestion, accidents, over crowding in the public transport system, unorganized ribbon developments and serious air and noise pollution in several areas of the city. So, it can be seen that in the future the city is going to face an acute transportation problem which require distinct planning inputs. In order to make transport system efficient, there is a continuous need to maintain compatibility between travel demand and supply of transport facilities in Haridwar. Hence, a strategy has to be evolved by which the existing transport facilities are utilized optimally along with the provision of extra transport facilities for future for smooth, safe and efficient operation of the traffic and transportation system.

#### **1.4 IDENTIFICATION OF PROBLEMS**

1. Due to Hill on one side and river on the other side of the city the development is taking place only along its length.
2. Mixed traffic consisting of Bullock cart, cycle, Horse cart (Tanga), Rickshaw, Bus, Truck and Car are causing congestion of traffic and resulting in reduction of speed of traffic.
3. Main commercial establishments situated along the main city roads are causing the congestion of traffic.
4. Main commercial establishments situated along the main city roads

are causing the congestion of traffic.

5. Due to unplanned junctions and less width of access road to Har-ki pauri, it creates traffic congestion problems.
6. Main existing bus stand is situated at the centre of the city in 2 hectare area. Vendors and local shops are creating additional problem to smooth traffic movement.
7. NH-58 and Laksar road pass through densely populated areas and mixing of heavy and light vehicle takes place on these roads. Vendors, retail and whole sale market are also situated along these roads. This affects the Bus movement as well as the city activities.
8. At present all the pilgrims enter Har-Ki-Pauri from Haridwar-Rishikesh road and return by the same after taking bath. This causes congestion on the road and if the flow of incoming pilgrims is more, the return of pilgrims by this road becomes impossible.
9. On the road approaching to Har-ki-pauri (width of 4.5 m), slow moving vehicles are predominant due to large number of cycles and rickshaw. This is resulted into the reduction of speed of traffic.

### **1.5 AIM:**

Identifying the traffic and transportation problems in Haridwar City connected with major arterial roads, by-pass and highways and planning for an efficient transport strategy for Haridwar city.

### **1.6 OBJECTIVE:**

- ❖ To assess the existing transport system and travel characteristics in the city.
- ❖ To assess the land use pattern and its relationship with the traffic and transportation in the town.
- ❖ To identify the traffic problems in terms of traffic volume, accidents, road width and pedestrian movement.
- ❖ To forecast the vehicle numbers, population for 2021.

- ❖ To prepare a transport planning strategy to improve accessibility and mobility levels of city.

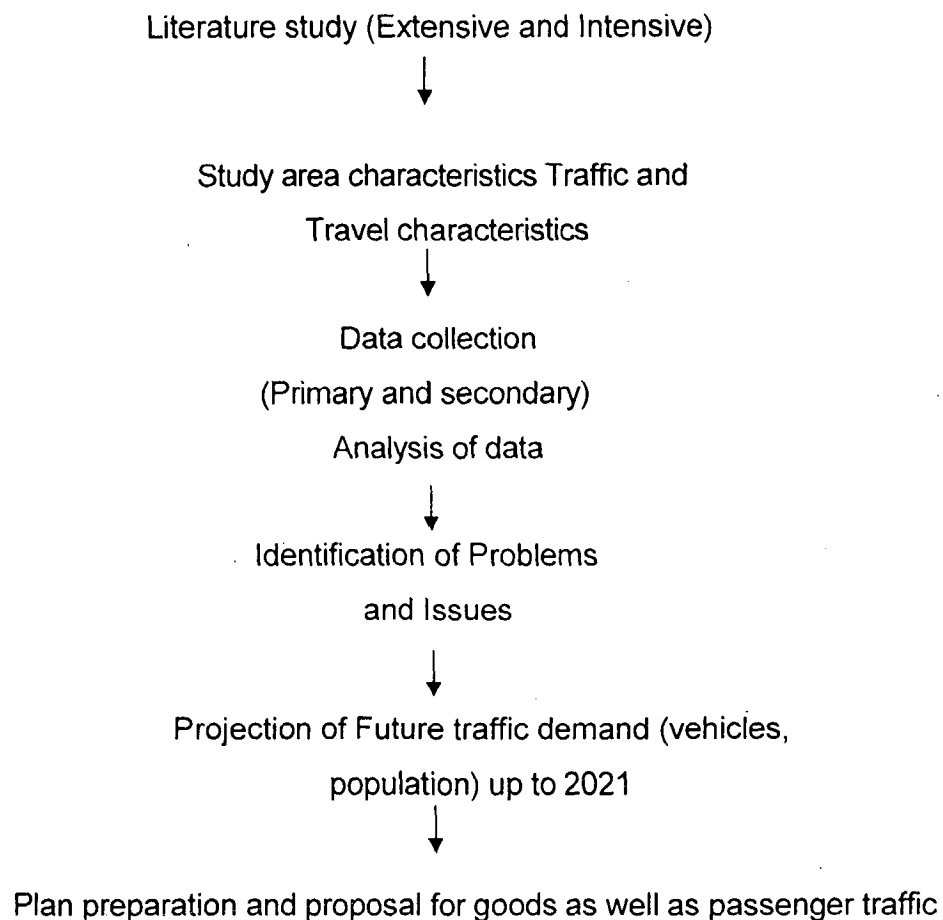
### 1.7 STUDY APPROACH

Study approach is broadly classified into four stages as:

1. Conceptualization of the study
2. Formation of the information base
3. Analysis of data.
4. Research findings, inferences, and Forecasting of needs.
5. Final proposition

### 1.8 METHODOLOGY

**Figure 1.1**





## 1.9 TOOLS AND TECHNIQUES USED

For identifying the major trouble causing factors related to traffic and transportation, an attempt has been made by the author to assess the existing situation by employing the "*Rapid Appraisal Technique*". For this, a sample of 50 people from different categories of society is taken and a questionnaire is prepared to collect as much information regarding the general problems of the transport.

## 1.10 SCOPE AND LIMITATION

The scope and limitation of the study are as follows:

- This study is mainly concentrated on road transport system of the Haridwar City.
- The study is limited to the planning and design aspect of the road network system rather than economical aspect of the system.
- The study area is limited to Haridwar Municipal area comprising the areas of Haridwar main city, Jawalapur, Kankhal and Sapt Rishi area.
- The study covers the intra as well as inter-city travel behavior.
- The study also covers the planning aspect of traffic circulation pattern during festival season like Kumbh and Ardh-kumbh.

## CHAPTER 2

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### LITERATURE STUDY

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#### 2.1 AN INTRODUCTION TO TRANSPORT PLANNING

##### Transport

**Transport** or **Transportation** is the movement of people, goods, signals and information from one place to another. The term is derived from the Latin *trans* (across) and *portare* (to carry) but in a more technical and elaborated manner, transport can be defined as the medium through which the 'demand and supply' interact with each other.

##### Transport system

A transportation system can be defined as consisting of fixed facilities, flow entities and control system that permit people and goods to overcome the friction of geographical space efficiently in order to participate in a timely manner in some desired activity. **Fixed facilities** are the physical components of the system that are fixed in space and constitute the network of links e.g. roads, railways, pipelines etc. and nodes e.g. Intersections, interchanges, transit terminals, harbors and airports etc. **Flow entities** are the units that traverse the fixed facilities. They include vehicles, container units, railroad cars etc. **Control system** consists of vehicular control and flow control. Control refers to the technological way in which individual vehicles are guided on the fixed facilities.

In addition to these three basic components of a transport system there is another very important non physical component without which the definition of a transport system is incomplete, that is **organizational and institutional set-up** regulating these three basic components and also regulating the interaction between

the transport system and transport demand and supply.

### **Transport planning**

Transport planning is basically concerned with planning and designing of transportation network systems and their operations after understanding the resultant demand and supply characteristics and the interaction between them in an economy or society.

### **Process and Factors, Historical and Contemporary that have shaped the need for transport planning**

In the early times, before the invention of the railway and roads, cities were usually small in area but dense in population. Since transportation on land was difficult and costly, cities were often founded at natural harbors or beside navigable waterways to take advantage of cheaper sea transportation. The steam age brought about changes not only in the form of cities but also in their size. Rail technology imposed a linear system and a rigid radial form. The cities grew alongside the rail lines, all of which met at the center of the city. Rail systems, thus, enabled large number of people to work in central business districts while living in suburbs close to the rail lines.

Then, motor age introduced new possibilities in urban transport and new patterns of city form. Motor vehicle had simply augmented the trend started by rail toward dispersing urban populations. But road transport is very different from rail transport and has imposed its own unique form. Unlike railways, road transport systems can operate very efficiently at low as well as high traffic densities. Only roads can meet the enormous variety of demands for freight transport and personal mobility required by the twentieth-century city. Due to the greater flexibility of road system, transport has been developed both circumferential and radial.

This pattern of peripheral growth occurred in the United States, Europe,

Australia and Japan. Everywhere, trade and industry have migrated towards the cheaper land of the suburbs once roads provided access between suppliers and markets.

The pattern of transport growth largely on Increases in Population, Spread of Urban Areas, Availability of Motorized Transport, Increase in Household Income etc.

Road congestion is spreading, the movement of the people and goods is slowing to a crawl, and transport costs are escalating. The result has been a serious decline in productivity and city efficiency, a drain on city and national budgets, and a strain on urban institutions. Thus keeping the above factors in view it is clear that the future transport systems and institutions have to consider the economic viability, financial viability and efficiency in order to meet the future challenges.

### Indian Urban Structure, Movement and Transportation

Urban structure has been defined by **Hutchinson** 'as a particular articulation of adapted spaces, or land in different uses, that might exist in an urban area'. There are six variables that define an urban structure i.e. size of the city, shape of the city, location of activities, distribution of activities, intensity of activities and the network characteristics.

In accordance with the vehicular movement, Indian cities may be classified into three categories:

- (i) Cities having a predominance of fast-moving vehicles- large cities, including metropolis, with a population of above **five hundred thousand** fall under this category.
- (ii) Cities in which both fast and slow moving vehicles have more or less equal importance. The medium sized cities, with population from a

**hundred thousand** to five hundred thousand, fall under this category.

- (iii) Cities having a predominance of slow-moving vehicles. The small cities, with population below a **hundred thousand**, fall under this third category.

In accordance with the transportation, the Indian urbanites can be generally classified under **four categories** as identified by **Rangneker** as (i) the real haves, (ii) the dummy haves, (iii) the dummy have nots and (iv) the real have nots. These four categories of people follow distinct patterns in terms of their use of modes of movement. The 'real haves' (the rich business class), generally, move in cars. The 'dummy haves' (the high salaried executive class), mostly, travel in company cars or company subsidized cars. They occasionally travel in public transits, rickshaws and scooters. The number of 'real haves' and the 'dummy haves' increases with the size of the city which explains the increase in number of cars with the city size. The 'dummy have nots' (medium salaried employees in the organized sector, small businessmen, shop-owners etc.) are the principal users of public transport modes in large cities and scooters, bicycles and rickshaws in small and medium size cities. The 'real have nots' (very low paid workers in the organized sector) generally live near to their work place to avoid transportation cost and normally do not use any vehicle. They walk in small cities and use public transport in large cities only when it is absolutely necessary. The 'dummy have-nots' and the 'real have-nots' comprise the vast majority in all the three cities.

## **2.2 CLASSIFICATION OF TRANSPORT SYSTEMS:**

The transport systems can be classified in several ways. They are (i) by the type of usage, (ii) by the type of path-way required and (iii) by the type of technologies.

According to the **Type of Usage** transport systems may be classified as:

- Private modes like cars, scooters, mopeds and bicycles including walking.
- Para-transits such as rickshaws and auto-rickshaws.

- Mass transits like the bus systems, the tramway system in Kolkata, the light rail transit and the RTS (Rapid Transit System).
- Goods carriers such as trucks, cycle carts, hand carts and animal drawn carts.

According to the **Types of Path-way required** transport systems are grouped under road ways, water ways, railways, rope ways and airways.

According to the **Type of Technology** transport systems can be classified under

- Types of propulsion units like internal combustion engine, electrical motor, magnetic levitation and human and animal muscles.
- Capacity of modes such as number of persons, tones of goods, volume of goods etc.
- speed of vehicles
- Productivity of vehicles in terms of passenger kilometer per hour and tones kilometers per hour.

## **2.3 ROAD DEVELOPMENT AND TRANSPORT POLICIES / STRATEGIES - AN OVERVIEW**

### **2.3.1 ROAD DEVELOPMENTS AND ECONOMIC DEVELOPMENT**

The significance of road transport in economic sense has been recognized long ago. In the 10<sup>th</sup> century, Adam Smith had mentioned the importance of road transport. In fact, his **Theory of Division of Labor** mainly rests on the expansion of markets, made possible by the expansion of transport facilities. The road transport plays a multifaceted role in the pursuit of development objectives. It carries goods from one part to another and supports the transfer of labor cost from rural sector to urban sectors. It works as an intermediary sector to link primary secondary sector through supply of raw materials.

Road transportation is one of the major factors, which influence the location of industry. Expansion of transport helps industrialization directly and helps to raise national income.

The road transport can lower the costs of the barriers of time and space, which arise in connection with the processes of production. No economic objective can be achieved unless the involved transport cost lowered to the point at which the interchange of commodities and persons takes place.

With the development in transportation, the interior and backward regions can be developed. The regional imbalances can be mitigated and balanced economic development can take place.

### **2.3.2 ROAD DEVELOPMENT IN INDIA**

The economic development of the country and the consequent surge in the demand for transport services and also the strategic needs of the country necessitated expansion as well as improvement of the road network. Before independence, the development of highways was given importance just to meet the strategic and administrative needs. There was however an organized effort for road building at the national level in 1927 when Jayakar Committee considered improvement schemes of road system in a broad manner.

#### **2.3.2.1 JAYAKAR COMMITTEE-1927**

After the First World War, motor vehicles using the roads increased and the existing roads were not capable for the mixed traffic conditions. A resolution was passed by both chambers of the Indian legislature in 1927 for road development in India. Following this resolution, the Government of India appointed a committee,

called the **Road development committee** in 1927, popularly known as the Jaykar Committee. It is a major landmark in the history of roads in India. The committee was emphatic regarding the inadequacy of Indian road system and urged that further development of the system was desirable for the general welfare of the country as a whole for achieving some broad goals:

- a) For the better marketing of agricultural produce.
- b) For the social and political progress of the rural population, which will be advanced by the increased use of motor transport, and
- c) As a complement to railway development.

Subsequently, the Central Road Fund was formed in year 1929. Most of the recommendations of the Jaykar Committee were accepted by the government.

#### **2.3.2.2 THE INDIAN ROADS CONGRESS 1934**

Following the recommendations of Jaykar committee, a semi-official technical body known as Indian Roads Congress was formed in 1934. The Indian Roads Congress was established to provide a forum for regular pooling up the information, knowledge and experience for all matters relating to the planning, construction and maintenance of roads in India, to recommend standard specifications and to provide a platform for the expression of professional opinion on matters relating to road engineering, organization and administration. The Indian Roads Congress has played a vital role in the development of the three 20 year road development plans in India.

#### **2.3.2.3 NAGPUR PLAN (1943-1963)**

This is a major landmark in the entire history of road development in India, as it was the first attempt to prepare a coordinated road development programme in a planned manner. The main objectives of the Nagpur plan were as



follows:

- a) The responsibility of construction and maintenance of national highway will be assigned to the central government.
- b) In a highly developed agricultural area, no village will be more than 5 miles from a main road and the average distance will be less than 2 miles in most cases.
- c) In a non-agricultural area, no village will be more than 20 miles from a main road and the average distance will be 5 miles.

While calculating the requirements of the road length, the Nagpur plan had adopted the "grid and star" formula. The Nagpur plan gave the first classification for the road system for phased in the country, which is still in use:

- a) **National Highway:** These are the main highways running through the length and breadth of the nation connecting major ports, capitals of the State, large industrial and tourist centers and including roads required for strategic movement for the defense purpose.
- b) **State Highway:** These are all other main trunk or arterial roads of a state connecting District Head quarters and important cities within the state and connecting them with national Highways of neighboring state.
- c) **Major District Road:** These are important roads within a district serving areas of production and markets and connecting these with each other or with the main highways.
- d) **Other District Road:** These are roads serving rural areas of production and providing them with outlet to market centers, taluk headquarter, block development headquarter or other main roads.
- e) **Village Roads:** These are roads connecting villages or group of villages with each other and to nearest road of a higher category.

The Nagpur plan envisaged to provide for 1,96,000 km of surfaced or metalled roads and 3,33,600 km of unsurfaced or unmetalled roads. This target provides for 16km.

road per 100 square km area.

#### **2.3.2.4 BOMBAY PLAN (1961-1981)**

A modified "grid and star" formulae was used for different classes of roads. The overall objectives were.

a) To raise the density of road from 16 to 32 km. per 100 sq. km of area.

b) Criteria for distance of any place from a metalled road and any other road were:

**Table 2.1 Bombay Plan**

Description of area	Max. Distance (miles) of any place from a metalled road	From any road	Mileage per 100 sq. miles of area
Developed and agricultural area	4	1.5	70
Semi- developed area	8	3	30
Underdeveloped And uncultivable	12	5	19

Source: Highway Engineering by Khanna & Justo (1998).

During the plan period (1961 - 81), a sum of Rs.5, 200 crores had been worked out. This plan envisaged overall road length of 10, 57,330 km by the year 1981. Every town with population above 2000 in plains and above 1000 in semi-hill area and above 500 in hilly areas had been considered to be connected by a metalled road. The construction of 1600 km Expressways was also included in the plan.

#### **2.3.2.5 LUCKNOW PLAN (1981 -2001)**

##### **Major Policies and Objectives:**

(a) The road network should be developed to preserve the rural oriented economy and to develop small towns with all the facilities.

(b) All villages or groups of villages with a population of 500 and above (1981 census) will be connected by an all weather road by the turn of this century and for villages of less than 500 populations, the road network should be so planned as to result in all weather road being available within a distance of less than 3 kms in plain areas and 5 kms in hilly areas.

(c) The road network should be scientifically planned to provide the maximum utility. Long term master plans for roads should be prepared at the taluka, district, state and national level.

(d) The National highway network should be expanded to form a square grids of 100 km sides so that no part of the country will be more than 50 kms away from a National highway.

(e) The overall road density was targeted as 82 km per 100 sq. km area.

(f) Expressways should be constructed along major traffic corridors to provide fast travel.

(g) There should be improvements in environmental quality and road safety.

(h) This plan aims at increasing the total road length ( including urban and project roads) to 27,02,000 km by the year 2001.

### **Classification of Road System**

The main classification recommended in Lucknow plan is as under:

#### **a) Primary system**

1. Expressways
2. National Highways

#### **b) Secondary system**

3. State Highways
4. Major District Roads

#### **c) Tertiary system (rural roads)**

5. Other District Roads
6. Village Roads

### **2.3.2.6 APPROACH PAPER TO ROAD DEVELOPMENT PLAN 2001-2021**

Since the Lucknow Road Plan period ended by 2001, the Indian Roads Congress constituted a Committee in 1997 under the chairmanship of the Director General (Road Development) and Additional Secretary to the Government of India, Ministry of Surface Transport (Roads Wing) to carry out a review of the Lucknow Plan (1981-2001) and to prepare an Approach Paper for next 20 year Road Development Plan. This Committee set up a small Core group to steer the preparation of an Approach Paper for the next 20 years Road development Plan. The Committee has identified the major issues of concern to be addressed in 2001-2021 Plan. They are:

1. Planning for development of roads as an integral part of the total transport system comprising various modes.
2. Balanced development of the road network in various regions of the country.
3. Balanced development of various categories of roads.
4. Special needs of roads forming part of Asian Highways to promote international movement of goods and passengers including border-crossing facilities.
5. Expansion of road network to provide road link to remote villages particularly in tribal, coastal, desert and hill areas.
6. Upgrading the quality and level of service of the existing main roads by four-laning and constructing new Expressways.
7. Strengthening of the existing two lane sections, provision of paved shoulders and improving the riding quality of roads.
8. Widening single lane sections of National Highways and State Highways to two lanes including strengthening of pavement.
9. Maintenance of assets already created and ensuring proper level of service for road users.
10. Expansion of the National Highway network and State Highway network selectively.
11. Construction of bypasses and ring roads for cities and towns.

12. Construction of missing links of National Highways and State Highways.
13. Replacement of busy railway crossing with over bridges,
14. Reconstruction of weak bridges.
15. Improvement of geometries.
16. Widening of narrow cross drainage structures.
17. Traffic safety measure
18. Upgrading the secondary and tertiary road network.
19. Needs of tourism, agriculture and industries sectors.
20. Upgrading and improvement of roads in urban areas.
21. Provision of wayside amenities, traffic posts, highway patrolling, trauma centers as an integral part of highway development.
22. Improvements on implementation front covering capacity building in government institutions, strengthening the consultancy sector, improving contracting industry, equipment supply and management and human resource development.
23. Increasing R & D efforts in the highway sector.

#### **2.3.2.7 PRESENT SCENARIO**

India has 3.32 million kilometers of road network, which is the second largest in the world. Roads occupy an eminent position in transportation as they, as per the present estimate, carry nearly 65% of freight and 85% of passenger traffic. Traffic on roads is growing at a rate of 7 to 10% per annum while the vehicle population growth, for the past few years, is of the order of 12% per annum.

The total length of National Highways in the country at present is 65,569 km (which includes about 7457 km lengths of newly declared National Highways in February, 2004) and comprises only 2 per cent of the total length of roads in the country, but carries over 40 per cent of the total traffic across the length and breadth of the country. The National Highways is thus the lifeline of the country, connecting the farthest corners and the remotest border areas. The National Highways are

therefore highly congested, have slow moving traffic, high wear and tear and low safety standards. 15 per cent of NH network is still single lane and only 2 percent of network is 4 laned. SH and MDR together carries 45 to 50 per cent of the traffic, and 60 per cent of SH are single lane. Moreover, majority of National Highways and state Highways are structurally weak to cater to high volumes of traffic and the existing bridges need rehabilitation or even replacement. About 17 lakh km of rural roads and their cross-drainage works are in extremely poor condition. This condition of the road network has resulted from the continued neglect to the road development programs ever since. The shortage of funds has been the main reason for poorer specification and maintenance outputs. Government spending on road sector has declined from 1.6 per cent of total plan outlay in First Plan to 0.6 per cent in the Eighth Plan.

YEAR	SHARES OF TRAFFIC BY ROAD		ROAD LENGTH LENGTH	NH LENGTH	NO.OF VEH.
	FREIGHT (BTK)	PASSENGE R (BPK)	(MILLION KMS)	(KM)	(MILLION)
1951	6	23	0.4	22000	0.3
1995	700	1200	3.05	34300	31.5
2001	1175	3000	3.5	55000	54

Source: Ministry of Shipping, Road transport & Highways, Government of India 2001

**Table 2.3 Growth of Road Network (in '000 Kms.)**

Category	1951	1996	%AGE	Change p.a.
National Highways	19.8(5%)	34.5	(1.04%)	1.24
State Highways	60.0(15%)	135.1	(4.07%)	1.82
Other Roads	318.0(80%)	3150.0	(94.89%)	5.23
Total	400.0(100%)	3319.6	(100%)	4.81

(Note: Figures in parentheses are in percentages of total road network)

Source: Ninth Five Year Plan (1997-2002), Volume II

**Table 2.4 Total No. of Registered Motor Vehicles in India (1951-2002)**

Year	All Vehicles	Two-Wheelers	Cars, Jeeps, and Taxis	Buses	Goods Vehicles	Others
1951	306	27	159	34	82	4
1961	665	88	310	57	168	42
1971	1865	576	682	94	343	170
1981	5391	2618	1160	162	554	897
1991	21374	14200	2954	331	1356	2533
1999	44875	31328	5556	540	2554	4897
2000	48857	34118	6143	562	2715	5319
2001 (P)	54991	38556	7058	634	2948	5795
2002 (P)	58863	41478	7571	669	3045	6100

Source: Transport Research Wing, Ministry of Road Transport & Highways, Government of India, New Delhi. Motor Transport Statistics of India. Various issues.

Note: P indicates provisional; Others include tractors, trailers, three-wheelers (passenger vehicles), and other miscellaneous vehicles that are not separately classified.

**Table 2.5 Existing Modal split in Indian cities (as % of total trips)**

City Population (in millions)	Walk	Mass Transport	IPT		Car	Two- wheeler	Bicycle	Total
			Fast	Slow				
0.10-0.25	37.1	16.4	10.4	20.1	3.3	24.1	25.7	100.0
0.25-0.50	37.8	20.6	8.9	17.2	2.6	29.8	20.9	100.0
0.50-1.0	30.7	25.4	8.2	12.0	9.5	29.1	15.9	100.0
1.0-2.0	29.6	30.6	6.4	8.1	3.3	39.6	12.1	100.0
2.0-5.0	28.7	42.3	4.9	3.0	5.0	28.9	15.9	100.0
5.0+	28.4	62.8	3.3	3.7	6.1	14.8	9.4	100.0

Source: Ministry of Urban Development, Government of India, New Delhi. 1998. *Traffic and Transportation Policies and Strategies in Urban Areas in India*. Final Report.

Note: IPT denotes intermediate public transport vehicles such as taxis and three-wheeler auto-rickshaws.

**Table 2.6 Desirable Modal split in Indian cities (as % of total trips)**

City Population (in millions)	Mass Transport	Bicycle	Other Modes
0.1–0.5	30–40	30–40	25–35
0.5–1.0	40–50	25–35	20–30
1.0–2.0	50–60	20–30	15–25
2.0–5.0	60–70	15–25	10–20
5.0+	70–85	15–20	10–15

Source: Ministry of Urban Development, Government of India, New Delhi. 1998. *Traffic and Transportation Policies and Strategies in Urban Areas in India*. Final Report.

### **2.3.2.8 PRESENT SPECIAL PROGRAMMES FOR ROAD DEVELOPMENT**

#### **2.3.2.8.1 NATIONAL HIGHWAY DEVELOPMENT PROJECT (NHDP)**

In order to give a boost to the sustained economic development of the country along with promoting national integration, in October 1998, Former Prime Minister Shri Atal Behari Bajpayee announced that National Highways on North-south corridor from Kashmir to Kanyakuman and East-West corridor from Silchar to Porbandar would be widened to 4/6 lane. It was also decided that along with development of North-South and East-West Corridors, the NH connecting four metros Delhi, Mumbai, Chennai and Kolkatta known as Golden Quadrilateral (GQ) would also be widened. Thus a new framework for development of National Highways has been evolved with the setting up of National highways Development Project (NHDP).

The basic thrust of the NHDP is as follows:

- a) Covers 18 states of the country
- b) To shift the emphasis from connectivity to mobility



- c) To develop 6-lane or expressway standards facility
- d) To de-congest existing congested corridors
- e) To provide access to high speed transport facility within a short distance
- g) To provide opportunities for growth and development of all regions
- h) To promote industries related in highway construction
- i) To generate employment opportunities - both direct and indirect
- j) To support economic growth of the country.

### **NORTH-SOUTH AND EAST-WEST CORRIDORS**

The programme will be completed in different phases by December 2007. The total length of North-South corridor from Srinagar to Kanyakuman (including Cochin-Salem spur) and East-West corridor from Silchar to Porbandar is about 7,300 kms.

**Table 2.7** North-south and east-west corridors

Total length	7300 kms
Work taken up in Phase 1	280 kms
Balance length target	6000 kms to be completed up to Dec. 2007.

Source: Ministry of Shipping, Road transport & Highways, Government of India 2005

### **GOLDEN QUADRILATERAL**

Total Length	5846 kms
Already 4 laned	504 kms
Under Implementation	734 kms
Under Project Preparation	3700 kms (approx)
Balance for Project Preparation	900 kms (approx)

Source: Ministry of Shipping, Road transport & Highways, Government of India 2005

Golden Quadrilateral is targeted for substantial completion (92%) by December 2005. Major requirement for achieving targets for the completion have been identified as under:

- Efficiency in implementation
- Availability of adequate funds
- Adequacy of consulting services
- Adequacy of contracting industry

Requirement of funds for National Highways Development Project is about Rs.58,000 crores and this is proposed to be met as under:

#### Funds for National Highways Development Project

**Table 2.9** Funds for National Highways Development Project

Funds Required	Rs. in Crores
Dedicated funds cess on petrol and diesel	20,000
loan from multi-lateral and bilateral agencies	20,000
Private sector participation	4,000
Toll collection and market borrowing	13,000

Source: Ministry of Shipping, Road transport & Highways, Government of India 2005

giving effect to relevant components of the National transport policy by the Central and State Governments and major transport agencies at National, State and local levels.

c) Identify the areas in which the data base of the transport system should be strengthened in order to be able to formulate integrated transport plans, and to suggest procedures and methodologies for formulating and appraising such plans at the Central, State, District and Block levels

d) Recommend areas in which research and development in the transport field should be undertaken and the institutional framework for carrying it out

e) Suggest measures for improving training facilities in transport planning and management

### **Recommendations of National Transport Policy**

A brief general recommendations made in the National Transport Policy are the following:

- Long periods are involved in building up transport capacity. A long-term view has, therefore, to be taken and funds allocated for creating transport capacity ahead of demand.
- Passenger transport should be given proper attention to improve travel conditions.
- Attention must be given to transport demands of rural areas together with inter-urban and intra-urban passenger travel.
- When planning new transport facilities, it is essential to ensure a realistic appraisal of traffic demand.
- The issues to be considered in evolving an integrated framework for transport policy are determination of the size of total transport investment, distribution

of these resources between various transport modes and the fixation of tariffs for transport services.

- Transport should be included in the priority sector for determination of intense priorities for the plan. The allocation of funds to the transport sector has to be larger than those sectors where the incidence of lumpiness of investment is not so heavy.
- There has been a progressive decline in the share of transport in the total plan outlay and if it continues, it could damage the nation's economy. There is also need for maximum economic use of all available capacities in the transport system.
- Investment policy for an optimal inter-modal mix should be based on comparative resource cost analysis of various transport modes.
- Every transport undertaking should at least cover its short run operating costs. Attempts should be made to avoid subsidies unless there are weighty considerations for their retention on social grounds in which case they should be direct.
- Transport agencies should be given freedom to fix their own fares and freight rates on the basis of their costs so long as they do not violate the broad pricing guidelines set by the Government.
- Impact of environmental objectives on transport should be considered.

#### **2.4.2 ALTERNATE SYSTEMS OF URBAN TRANSPORT-1985**

The Government of India has been concerned over the problems of urban transport, especially in our metropolitan cities, and efforts have been made in the case of Mumbai, Kolkata, Chennai and Delhi to improve the urban transport situation. These efforts have either produced very high cost solutions like the Metro in Kolkata, which is beyond the reach of the country's resources, or partially adequate systems, which have not satisfied either the user or management because of inherent deficiencies. Taking note of these experiences and recognizing that urban transport is a nation-wide problem where all cities will need suitable urban

transport systems to serve them, the Government of India decided that a Study Group should be formed on the subject and that group would recommend alternative systems of urban transport.

### **Objectives**

The objectives of the study were:

- I. To recommend alternative systems of urban transport that could be developed using the latest available and feasible transport technology.
- II. To establish parameters for such systems to suit Indian cities and conditions.
- III. To establish capabilities and costs of various systems manufactured internationally and the expertise and general commercial conditions with which they are available looking at the trade-offs between various alternatives.

### **Recommendations**

The following are the brief recommendations made by the committee.

- ❖ The starting point for urban public transport development for small and medium cities should be when the population reaches 0.25 million and a modal split of 30% should be targeted when the population reaches 0.50 million.
- ❖ A city of around one million should plan for circular or grid shape of network to keep transport requirements and trip lengths to a minimum. A transport corporation should be set up and a modal split of 35% plus should be targeted.
- ❖ A city of 1.5 million should target for a modal split of 40% plus.
- ❖ A city of 3.0 million should have polynuclear centers with most of its main corridors of 6 lanes with exclusive right-of-way for bus operations. They should target for a modal split of 50% plus.
- ❖ A city of 6.0 million would need a mass transit system on certain corridors and

- they should target for a modal split of 70% plus,
- ❖ When a corridor reaches 10000 (persons per hour per direction) pphpd then 3 lanes per direction should be provided.
  - ❖ When a corridor reaches 20000 pphpd then a grade-separated bus way should be provided.
  - ❖ When a corridor reaches 40000 pphpd then an exclusive, grade separated rail based system must be provided.

### **2.4.3 WORKING GROUP ON URBAN TRANSPORT-1996**

In the 25th meeting of the Council of Ministers of Local Self Government in 1996, constituted a working group to prepare policy paper containing recommendations on:

- a) For preparation of transport development plans for large cities;
- b) Constitution of transport cells;
- c) Constitution of Unified Metropolitan Transport Authorities;
- d) Creation of special fund for transport projects.

#### **Recommendations:**

The following are the some of the recommendations made by the committee:

- During the preparation of development plan for the cities, necessary inputs needed for traffic and transportation should be imparted.
- Instead of a single dominating CBD, polynodal and polycentric city should be planned to avoid tidal movement.
- To avoid the problem of vehicular pollution, eco friendly modes should be introduced.
- Since two wheelers and private cars are less energy efficient and occupy

higher road space per passenger, efficient and reliable public transport should be developed.

- Advance reservation of land for transport network must be carried out.
- Transport development plans for the towns with population of 3 lakhs must be prepared.
- Low cost transport improvement measures should get precedence over capital-intensive projects.

#### **2.4.4 DRAFT NATIONAL URBAN TRANSPORT POLICY 2005**

Despite a number of plans and policies, the easy and sustainable flow of goods and people has been facing several problems like traffic jams, explosive growth of motor vehicles coupled with the limitation on the road space, increasing cost of travel, increasing accident rates etc. and due to this, economic growth adversely affecting and quality of life is deteriorating. So, a policy is needed on the approach to deal with this rapidly growing problem along with a clear direction and a framework for future action.

##### **Major objectives:**

- Incorporating urban transportation as an important parameter at the urban planning stage rather than being a consequential requirement;
- Encouraging integrated land use and transport planning so that travel distances are minimized and access to livelihoods, education, and other social needs, especially for the marginal segments of the urban population is improved;
- Improving access of business to markets and the various factors of production;
- Bringing about a more equitable allocation of road space with people, rather than vehicles, as its main focus;
- Investing in transport systems that encourage greater use of public transport and non-motorized modes instead of personal motor vehicles;

- Establishing regulatory mechanisms that allow a level playing field for all operators of transport services;
- Introducing Intelligent Transport Systems for traffic management;
- Increasing effectiveness of regulatory and enforcement mechanisms;
- Addressing concerns on road safety and trauma response;
- Reducing pollution levels through changes in traveling practices, better enforcement, stricter norms, technological improvements, etc.;
- Building capacity (institutional and manpower) to plan for sustainable urban of all urban transport professionals, such as planners, researchers, teachers, students, etc.;
- Promoting the use of cleaner technologies;
- Raising finances through innovative mechanisms that tap land as a resource, for investments in urban transport infrastructure;
  - Associating the private sector in activities where their strengths can be beneficially tapped; and
  - Taking up pilot projects that demonstrate the potential of possible best practices in sustainable urban transport.

## 2.5 TYPICAL CROSS SECTIONS OF DIFFERENT TYPES OF URBAN ROADS

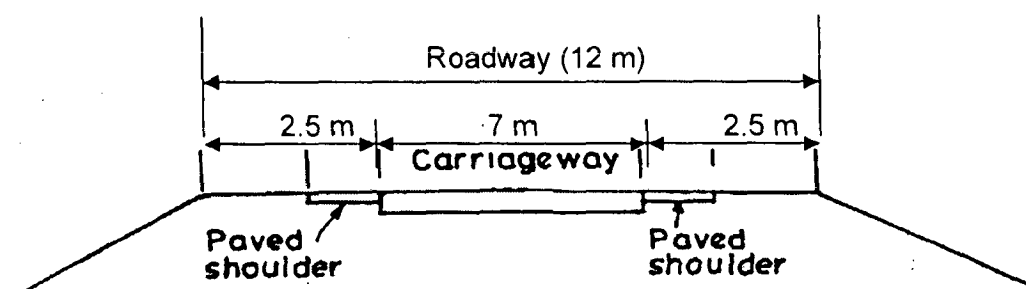


Figure 2.1: 2-lane National or State Highway



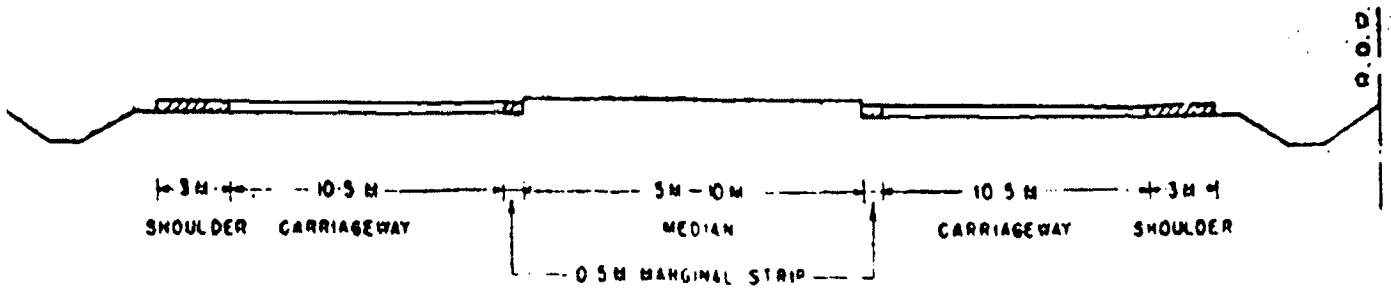


Figure 2.2: Expressway (6-Lane Divided)

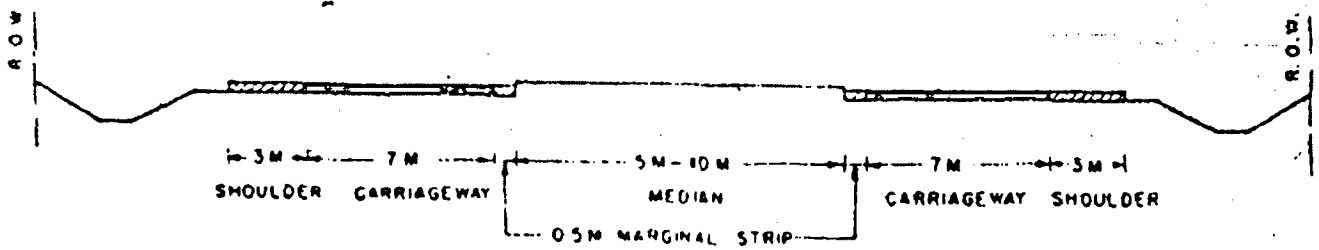


Figure 2.3: Expressway (4-Lane Divided)

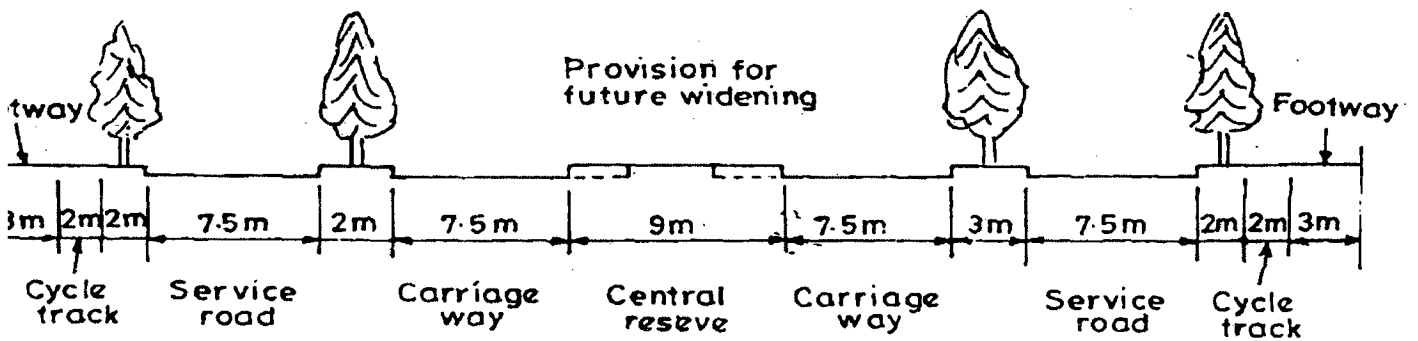


Figure 2.4: Arterial Street with (4-Lane divided)

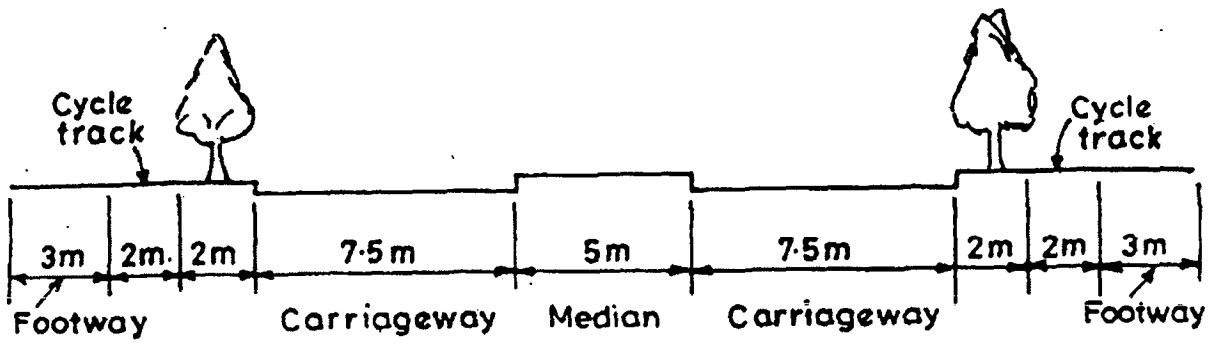


Figure 2.5: Sub-arterial Street through Open Area (4-Lane Divided)

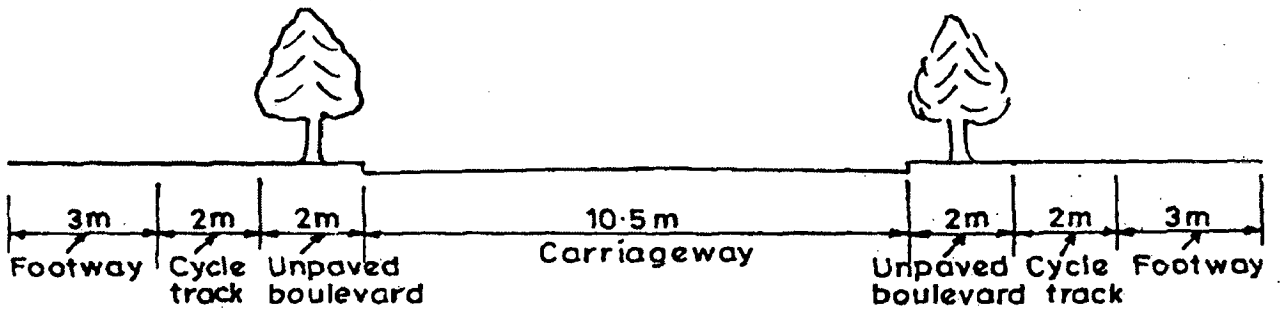


Figure 2.6: Collector Street through Residential Area

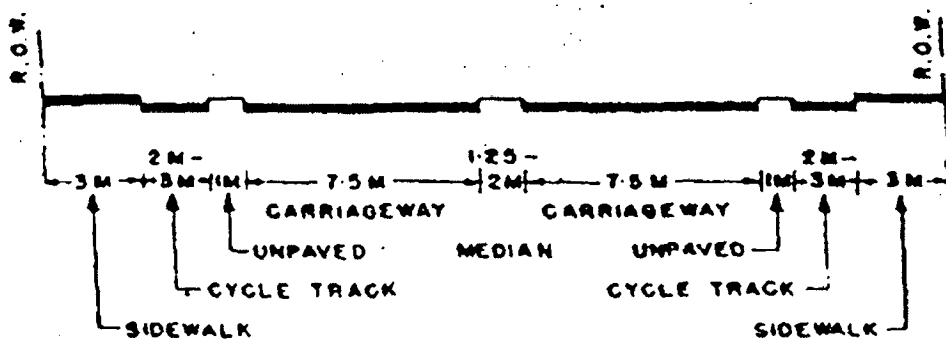


Figure 2.7: Collector Street (4-Lane divided)

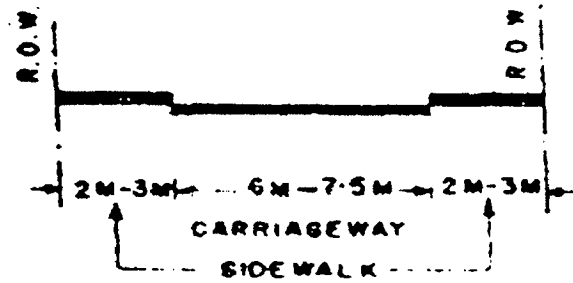


Figure 2.8: Local street with sidewalk adjacent to carriageway

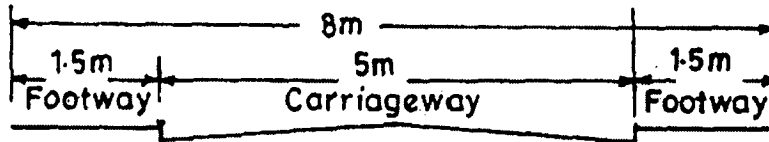


Figure 2.9: Urban Cul-de-sac

Source: i) Indian Roads Congress (IRC) Code: 69-1977, "Space Standards for Roads in Urban Areas".

ii) Indian Roads Congress (IRC) Code: 98-1997, "Guidelines on Accommodation of Utility Services on Roads in Urban Areas".

## CHAPTER 3

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# CASE STUDY OF ALLAHABAD CITY

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### 3.1 SELECTION CRITERIA

**Characters of the City** – Both the cities are Pilgrimage city and considered as one of the most sacred places in Hindu mythology. These two cities are among the four cities where world famous Kumbh Mela occurs after every Twelve years.

**Geographical nature** – Both cities are situated on the bank of river Ganga.

**Ancient cities** – Both cities are related to ancient history and are mentioned in Old Purans.

### 3.2 INTRODUCTION TO THE ALLAHABAD CITY

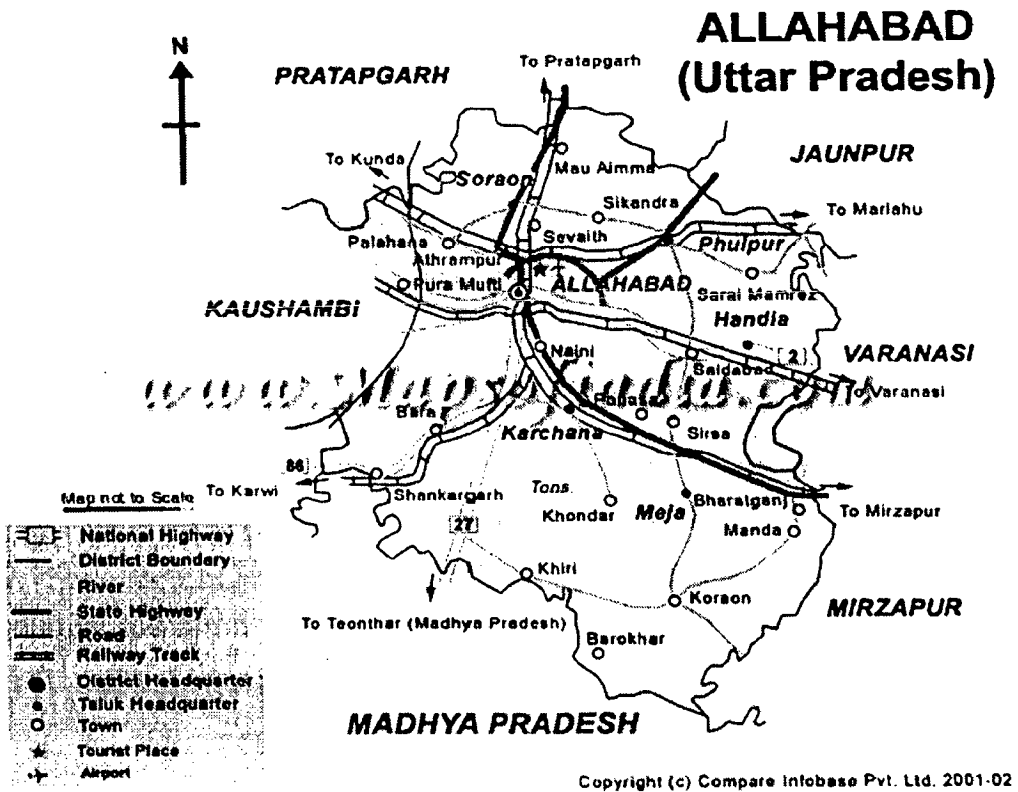
The city of Allahabad is among the largest cities of Uttar Pradesh and is situated at the confluence of three rivers - Ganga, Yamuna and the invisible Saraswati. The meeting point is known as 'Triveni' and is especially sacred to Hindus. The earlier settlements of the Aryans were established in this city, then known as Prayag. Its sanctity is manifest by references to it in Purans, the Ramayan and the Mahabharata. According to Hindu mythology, Lord Brahma, the creator God of the Trinity, chose a land on earth (i.e. Prayag) to perform 'Prakrista Yag', at the beginning of the creation and he also referred to it as 'Tirth Raj' or the 'King of all pilgrimage centres'. As per writing of 'Padam Puran' - "As the sun is amongst the moon and the moon amongst the stars, likewise 'Prayag' is best amongst all places of pilgrimage".

The name Allahabad, meaning "city of God", was given to the city by the Mughal Emperor Akbar in 1583. In Indian alphabets it is spelt "Ilahabad": "ilah" is Arabic for "a god", and "abad" is Persian for "place of". The monarch realized its

strategic importance as a waterway landmark in North India and also built a magnificent fort on the banks of holi 'Yamuna'. Allahabad today is an important city where history, culture and religion create a magical confluence, much like the sacred rivers that caress this blessed land. Due to its religious importance, many pilgrims come to Allahabad in the bathing season, the Hindu month of Magh (mid January to mid-february), to purify themselves.

Over the centuries, Allahabad has remained on the forefront of national importance - more so, during the days of the Indian Independence struggle. The chequered history of Allahabad with its religious, cultural and historical ethos also gave rise to several renowned scholars, poets, writers, thinkers, statesmen and leaders. Under British rule, Allahabad was the capital of the United Provinces till the 1920s. It was well-known as an educational centre, and in the first few decades of the 20th century, the Allahabad University had earned for itself the epithet of 'Oxford of the East'. It was also a major literary centre for Hindi, and numerous litterateurs were connected to it in some way or the other.

Allahabad was the birthplace of Jawaharlal Nehru, and the Nehru family estate, called the Anand Bhavan, is now a museum. It was also the birthplace of his daughter Indira Gandhi, and the home of Lal Bahadur Shastri, both later Prime Ministers of Bharat. Thus Allahabad has the distinction of producing the majority of PMs in national history.



Location	25.28° N 81.52° E
State	Uttar Pradesh
District	Allahabad
Altitude	98 metres MSL
Area	63.07 km <sup>2</sup>
Population (2001)	1206785

**Fig. 3.1 Transportation System of Allahabad City**

### 3.3 TRANSPORTATION SYSTEM OF ALLAHABAD CITY

#### 3.3.1 ROAD NETWORK

Road network in a city is a basic and important component of transportation system. Its efficiency indicates the quality of urban life and its defects induce decay. Roads constitute around 8 percent of the total area. The total lengths of major roads have been found to be around 100 kms. Besides the two major highway (NH 2 and

**NH 27**) forming the spinal network, the present urban road system comprises of three state highways (SH 44 to Mirzapur, SH 38 to Rae Bareilly and SH 9 to Sultanpur) and a number of major urban roads. In terms of road network the city can be divided into two parts:

- South of Allahabad junction Railway Station area (old city area)
- North of Allahabad junction Railway Station area.

The coverage by roads for the old city area, is comparatively much less than the northern part. The overall road network does not present any pattern except **Civil Lines area** where it follows a **grid-iron pattern**. At present most of the roads in Allahabad have fallen victim to encroachment and on-street parking leaving a circulation space quite inadequate for the present day traffic. The functional hierarchy of the road network now stands undefined and it is felt that a reclassification of the hierarchy is necessary for the purpose of assigning proper level of service to each constituent link.

### **3.3.2 RAILWAY NETWORK**

Allahabad is well linked with rest of the country by well established rail routes. Earlier, it was the divisional headquarter for Northern Railways. Now, it is the **zonal headquarter of North-Central** railway. It is connected with cities like Delhi, Kanpur, Lucknow, Varanasi, Faizabad Kolkata, Gorakhpur, Jabalpur, Baroda, Jhansi and Mumbai.

At present there are 11 railway stations within the Allahabad city. With the railway tracks cutting across the city there are a number of railway level crossings of which three level crossings viz. Chauphatka, Naini and Phaphamau create serious bottlenecks for the traffic flow.

### **3.3.3 AIR NETWORK**

Allahabad is connected by air to Delhi. Indian Airlines operates its domestic flights from **Bamrauli** airport situated on the western end of the city.

### **3.4 EXISTING MASS TRANSPORTATION SYSTEM**

The present intra-city passenger transport modes mainly comprise of city buses, tempos, autorickshaws, cycle-rickshaws and tongas (excluding the personalised modes). The existing mass transport scenario is mostly dominated by **cycle-rickshaws and tempos**.

Allahabad city is the head quarters of Allahabad district and a major focal point for many other activities. As the mobility pattern is directly dependent on the city function, its development should be of prime importance for upgradation of the functional characteristics of the city as well as quality of life for the inhabitants. The city is having a population of about 12 lakhs at present and the decadal growth is about 33 percent. The development of the city is largely guided by the physical constraints created by the two rivers (the Ganga and the Yamuna) and the low level of accessibility between various parts of the Master Plan area. As a result, the pressure on the mother city with its limited infrastructure facilities is increasing day by day. To make the situation worse, the number of registered fast vehicles are increasing at a rate of **10 percent per annum** of which about 90 percent are personalised vehicles and the number of slow vehicles (mainly cycles and cycle-rickshaws) is about **1.75 lakhs** (1991) The increasing number of vehicles on the limited road space is mainly due to the absence of adequate public transportation system and increasing mobility requirement of the residents which is creating a wide gap between demand and supply.

The city bus service plays a crucial role in the intra-city mobility in a growing city like Allahabad. But the existing service provided by UPSRTC could neither



efficiently make the area coverage nor the demand satisfaction, resulting in gross dependence of the users on the low capacity and inefficient modes like cycle-rickshaws and tempos, (mainly in terms of road space utilisation, fare and reliability). It was observed that the overall utilisation of buses and load factor is quite below the desired level. Though the utilisation of buses may be directly related to the inadequacy of fleet strength and maintenance facilities yet the low load factor does not really reflect the poor demand but the unreliability of the service.

Apart from buses and tempos, cycle rickshaws and tongas cater to a significant portion of the intra-city travel demand. The operations of these modes are only limited in particular areas with concentration in Allahabad Railway station, Kutchery and Rambagh Station.

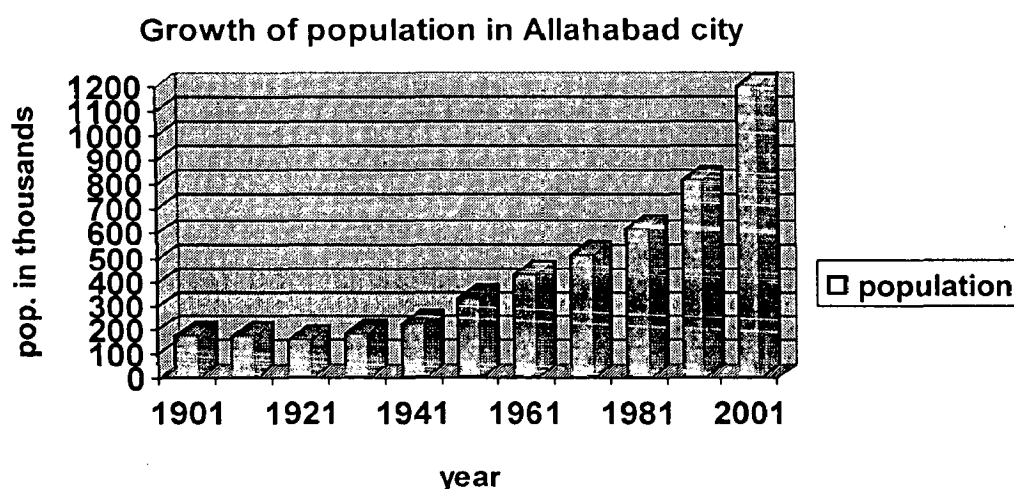


Fig 3.2 Growth of Population in Allahabad City

Source: Census of India, 2001

### Growth of vehicles in Allahabad City

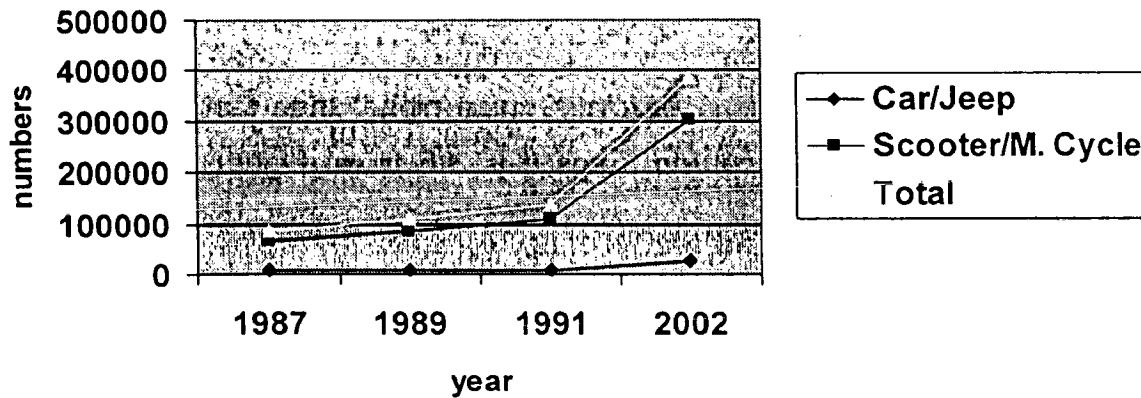


Fig 3.3 Growth of Vehicles in Allahabad City

Source: Transport Division, Allahabad Municipal Corporation 1994.

### SOME FACTS AND FIGURES ABOUT TRAFFIC AND TRANSPORTATION OF THE CITY

- 2434.80 ha has been proposed for traffic and transportation sector in Revised Master plan 2001, out of which 900.20 ha for main city, 752.98 ha for Naini, 301.24 ha for Jhusi and 480.38 ha for Phaphamau are proposed.
- Whole city is divided into two portions for traffic survey, one is outer cordon involving Jawaharlal Nehru road, MLN road, Stainley road, Purushottam Das Tandon Marg, Louder road and GT road (west and east), other portion is inner cordon involving MG Marg, GT road (south), Nurulla road, Sarojini Naidu road and in east Louder road.
- According to a survey conducted by Traffic department of Municipal Corporation of Allahabad it has been observed that the 73% traffic is in inner cordon and 27% in outer cordon areas.

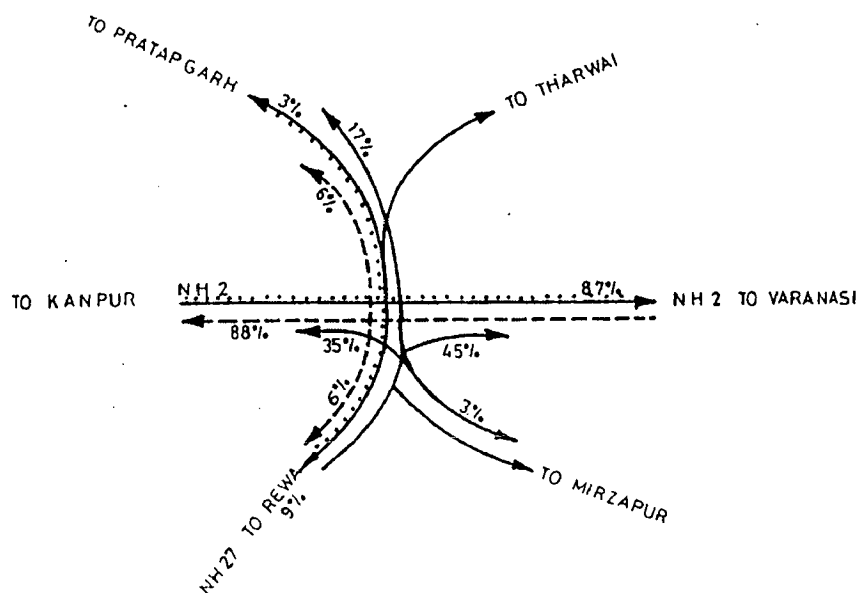
- In outer cordon, highest no. of vehicle has found in Purushottam Das Tandon Marg (24.56%) and in inner cordon Mahatma Gandhi Marg (66.14%).
- The no. of slow moving vehicle is much higher than fast moving vehicles; particularly in inner cordon areas it is 3.5 times higher than fast moving vehicles.
- Out of total vehicles, percentage of Cycle Rickshaw is 39% and Cycle is 33%.
- 73% of the average daily traffic load is taken by inner cordon roads.
- Peak hour vehicle no. is 34.4 % of the total average daily traffic counts.
- Stanley road is having highest peak hour traffic volume while MG road carries highest traffic load.

**Table No. 3.1 Modal Split of intra-city trips in Allahabad city**

Modal split of existing (1991) and projected (2011) intra-city trips in the study region

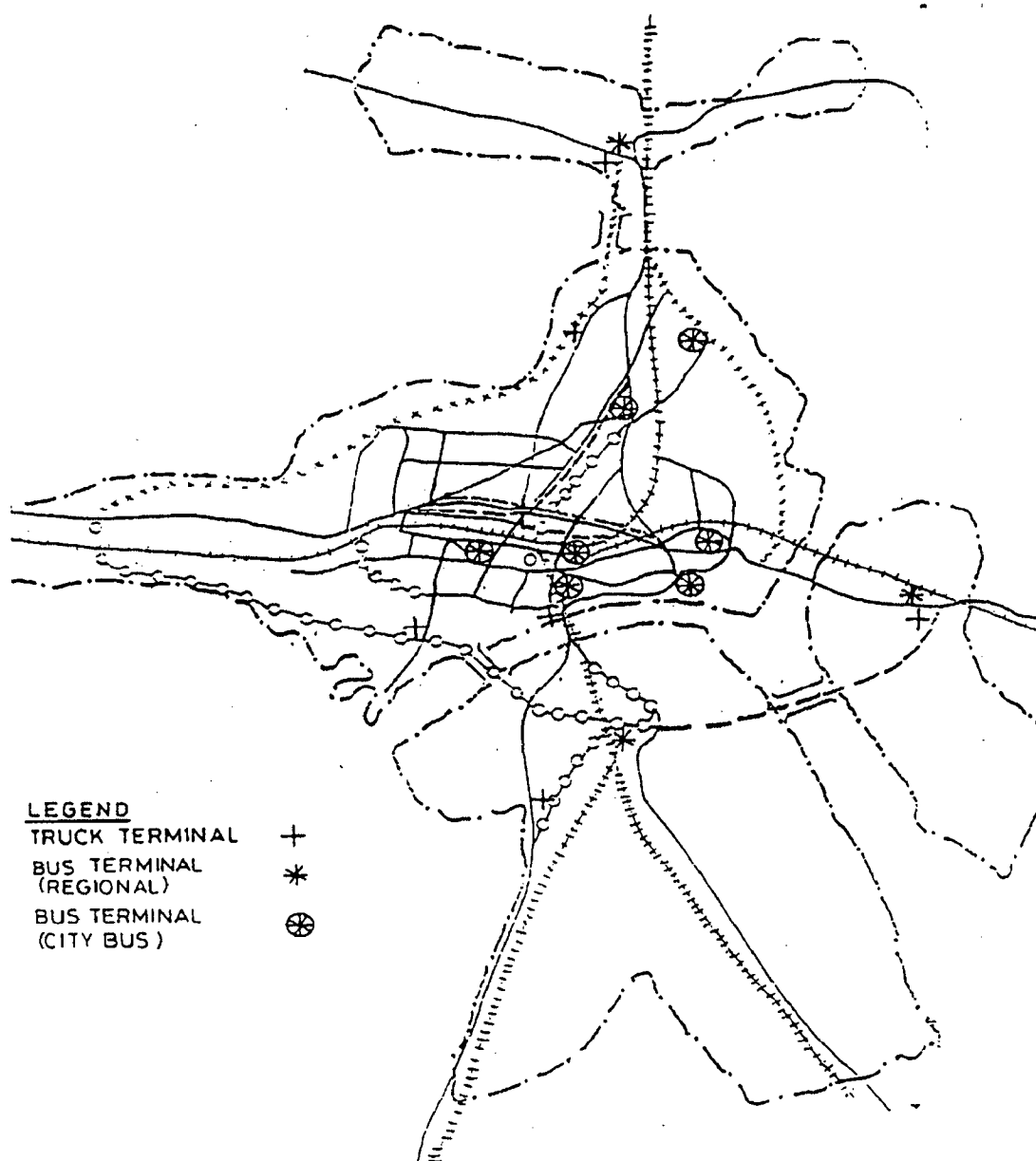
Sl. No.	Mode	Model split in %	
		Existing	Horizon year
1	Bus	0.64	30
2	Motor cycle/scooter	15.97	20
3	Car	1.08	3
4	Auto	3.56	5
5	Cycle	36.82	20
6	Other slow modes	16.32	5
7	Other modes (incl. walk)	25.61	17
		100.00	100

Source: Transport Division, Allahabad Municipal Corporation (Dec. 1994)



**Fig. 3.4 Directional flow of through goods vehicle on National Highways passing through the city**

Source: Transport Division, Allahabad Municipal Corporation (Dec. 1994)



**Fig. 3.5** Traffic and Transport layout showing of positions of Truck and Bus terminals

Source: Transport Division, Allahabad Municipal Corporation (Dec. 1994)

### **3.5 MAJOR TRAFFIC AND TRANSPORTATION PROBLEMS OF THE CITY**

Except the Civil Lines area which is well planned with wide roads and proper development control, the rest of the main city area suffers from acute transportation problems. The old city area, south of Allahabad Railway Station, mainly starting from Leader Press in the east upto Kothaparcha Junction, is the worst affected area. The G.T. Road which passes through the area has already become a local road with high degree of commercialization, on-street parking, encroachment, inter-mixing of slow and fast vehicles, loading and unloading activities and pedestrian spill over. The Ghantaghar area which is considered as a hub of the city is facing similar type of problems making the situation worse day by day specially at major intersections viz, Johnstonganj, Motimahal, Ghantaghar, mansarovar, Khuldabad and Kotha Parcha. The major roads in the area like Zero Road, Swami Vivekananda Marg, G.T.Road, Sheo Charan Lal Road and netaji Sjbhash Road are the worst affected sections where the situation has reached beyond imagination.

Besides the old city area acute problem is faced at both ends of the Yamuna bridge connecting main city with Naini. The old rail cum road bridge with only 5 mts. carriageway on each side and with limited circulation space for the significant volume of conflicting traffic at both ends result in choking of the bridge most of the times of a day. Allahabad being located at a strategic location having direct linkages with major cities in the country attracts a lot of heavy commercial traffic. In the absence of any bypass, the regional traffic passes through the city causing inter-mixing of regional and local traffic and making those stretches accident prone. The problematic locations where the conflict has been observed to be significant are Government Press intersection, Dhobi Ghat intersection, Public Service Commission intersection, Allahabad University roundabout, Bharadwaj Ashram intersection, G.T.Road - J.L.Nehru road intersection and Kotha Percha intersection. In brief the transportation problems of the city are caused by the following reasons:

- a) Steep vehicular growth specifically personalised vehicles;
- b) Inter-mixing of local and through traffic in the absence of bypass;

- c) Presence of heterogeneous traffic mix on major roads;
- d) Lack of adequate intra-city public transport system and dependence on low capacity modes like cycle rickshaws and tempos;
- e) Absence of proper development control and enforcement measures;
- f) Insufficient road space, coupled with on-street parking and encroachments;
- g) Absence of pedestrian facilities on major roads.

### **3.6 FINDINGS / INFERENCES FROM THIS CASE STUDY**

Findings from this case study are described as follows –

- As planning of traffic facilities is a never ending process in the context of unpredictable socio-economic environment and technological developments, there is a need for constant monitoring and evaluation of the traffic scenario.
- Authorities have to initiate steps to create and sustain the spirit of traffic awareness among the road users consisting of vehicle operators, passengers and pedestrians.
- A high power committee should be set up involving Transport Department, Nagar Mahapalika, TCP, Development Authority, Police department and the Revenue department to carry out planning, evaluation , monitoring and investment decision in the sector.
- The most fundamental requirement toward the development of a healthy transport system is the prevalence of a viable public transport system for intra-city travel that can cater to 30 to 40 percent of the total trips in the city.
- Any traffic and transportation planning studies should visualize a desirable urban development strategy which will ensure the balanced development of the various components of the urban sector.

- The effectiveness of traffic and transportation plan depends upon making as realistic as possible an estimation of future travel demand, its distribution pattern and related characteristics and the probable modal split of trips.
- The solutions to traffic and transportation problems should involve a judicious mixture of short and long term plans. Short term plans include intersection improvement, traffic circulation plans, parking plan and pedestrian movement plans which are to be implemented immediately and long term plans include widening and improvement of existing roads, construction of additional links, terminal facilities for both passenger as well as goods vehicles and construction of bypasses.
- Private sector participation should be encouraged for the development of some basic infrastructure facilities like bridges on the basis of BOT (Build, Operate and Transfer).



## CHAPTER 4

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# DATA REQUIREMENT AND COLLECTION

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### 4.1 GENERAL

Data collection is very important aspect for formulating a base by understanding the existing characteristics of the city. It is also equally important to obtain authentic and realistic data base since the proposals are absolutely based on prevailing city profile. The over all data collection have been completed through primary surveys and secondary sources.

### 4.2 STUDY AREA

The study area for the efficient traffic and transportation study of the city is mainly limited to the jurisdiction of Nagarpalika of Hardwar city. Besides this the urban areas having impact on the urban transportation system have also been considered. The municipal area as the study area has 27 municipal wards excluding BHEL Township. Precisely, the study area includes mainly Municipal Area covering the Hardwar main city, Kankhal, Jawalapur, Sapt Rishi and Bhupatwala areas.

Study area has been delineated mainly into two cordon lines namely:

- i) Outer cordon line coinciding with the boundary of the study area
- ii) Inner cordon line covering the main business and commercial areas of the city.

## 4.3 SECONDARY DATA COLLECTION

**Table 4.1**

Sl. No.	Source	Type of data needs to be collected
1.	Town and country planning organization	Existing Landuse details and Master plan of Haridwar
2.	Census office	Census handbook, population statistics, no. of workers, no. of households in each ward
3.	Haridwar Development Authority	Road network map, future development programme
4.	Regional Transport Office	No. of registered vehicles in the city, details about private operators
5.	USRTC, Haridwar	Operational & performance characteristics of intra-city buses, details about scheduling
6.	SSP, Traffic police	Road accident data, prevailing traffic regulations in the city
7.	Mela Bhawan	Report on Ardh-kumbh 2004 and Kumbh Mela.
8.	Nagarpalika	Ward map of the region
9.	SM, Railway Station, Haridwar	Information regarding rail transport system

Source: Author

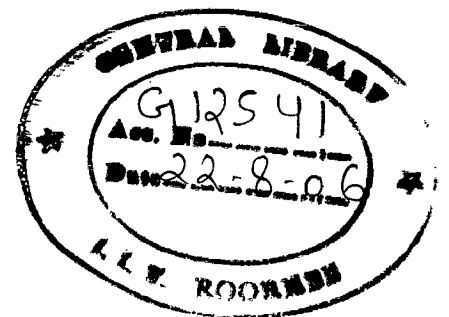
**Sources of Secondary Data to be collected**

For identifying the major trouble causing factors related to traffic and transportation, an attempt has been made by the author to assess the existing situation by employing the "*Rapid Appraisal Technique*". For this, a sample of 50 people from different categories of society is taken and a questionnaire is prepared to collect as

much information regarding the general problems of the transport.

#### 4.4 COMPILATION OF DATA

A considerable attempt has been made to collect authentic data through primary as well as secondary sources having direct and indirect impact on transportation system of the city. The collected data is compiled and rechecked thoroughly before using it for analysis.



## CHAPTER 5

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### STUDY AREA

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#### 5.1 HISTORICAL BACKGROUND

Haridwar, literally means, the gateway to God ('Hari' means God and 'dwar' means a gateway or door). According to Skanda Puran, Padma Puran and Shiv Puran, the place has been bestowed by three great gods namely Lord Vishnu, Lord Brahma and Lord Shiva. All three gods set their lotus feet on this place and sanctified the ground at the call of their beloved devotees from time to time. Accordingly, Haridwar is known by several names like Brahm Puri, Mayapuri, Panch Puri, Ganga Dwar, Kapila etc.

Lord Brahma was pleased by the devotional penance of Raja Swetu and therefore blessed him a boon to make it his dwelling place at Brahmkund and thereafter, it was known as Brahmपुरi. Lord Vishnu bestowed his pleasure on Daksha Prajapati, the son of Lord Brahma. The Lord then set his feet on the place called Har-Ki-Pauri where mother Ganga touches the feet of her Lord all the time and so it is called Haridwar. It is also known as Shivपुरi, Neel Parwat and Haridwar after the name of Lord Shiva. There is another name as Mayapuri after the sacrificial role of Sati Mahamaya.

Sapta-Rishi is an area in the north east of Har-Ki-Pauri where it is said that seven rishies at the sapta-sarovar compelled Mata Ganga to flow in seven streams before their seven cottages. There is another story that asuras Shumbha-Nishumbha fought a fierce battle with Shaktima at the Mansa Devi Parvat. Chamunda Devi selected the mountain west of Mansa Devi and Chandi Devi's temple is situated on the other side of the Ganges while Gauri Shankar is inhabited just below at the foot of that hill. In Dwapar Yuga, Bharat, the brother of Sri Rama, is said to have gone via Haridwar to Rishikesh where the famous Bharat Mandir is named after him. The Pandvas, during their way to Swarga went through this place leaving Bhimgoda as

the mark of their passage. King Ashoka also ruled Haridwar which is evident by the presence of Ashoka Stambh.

During the tenure of King Harshvardhana, Chinese explorer Hwain-Sang visited India for around 15 years and described Haridwar as Myun city which meant for the present day Mayapuri. In the Eighth century (A.D.) this city got a new name, Gangadwar but got devastated in later age. Haridwar regained its glory in the tenure of king Akbar. King Mansingh friend and minister in Akbar's rulings laid the foundation for the present days Haridwar.

Haridwar is also one of the four places; where Kumbh Mela occurs after rotation of every twelve Years and Ardh Kumbh after every six years. It is said that drops of Amrit (*Elixir*) fell in to the Brahmkund of Har-Ki-Pauri, therefore considered that a dip in the Brahmakund on this particular day which is very auspicious and when Jupiter (*Brahaspati*) comes to the sign Aquarius (*Kumbh*) once in every twelve years the Maha Kumbh fair is celebrated at Haridwar.

This sacred character of the city attracts many sages, saints, rishies and maha rishies. and number of temples and shrines have been built in the city. Consequently, the place having gained such significance that it has become the important centre, of pilgrimage for Hindus and this has resulted in developing a rich heritage of the city. In this way the Hardwar city has a long rich, historical background which contributed towards the various phases of development and prosperity of the city.

## 5.2 GEOGRAPHICAL LOCATION

Haridwar is located at latitude 29° 58' north and longitude 78°10' East in the foothills of Shivalik Mountain ranges and the plain starts from here. It has on South Ganga River, on North and North West Shivalik hills. It is situated on NH-58 between Roorkee and Rishikesh and is well connected by rail and road.

Haridwar district, covering an area of about 12,302 sq km. is in the western part of Uttaranchal state. The height from the sea level is 249.7 mts. Prior to its inclusion in the newly created state of Uttaranchal in November 2000, this district was a part of Saharanpur Divisional Commissioner. The district is ringed by Saharanpur in the West, Dehradun in the North and East, Pauri Garhwal in the East, Muzaffarnagar and Bijnor in the South.

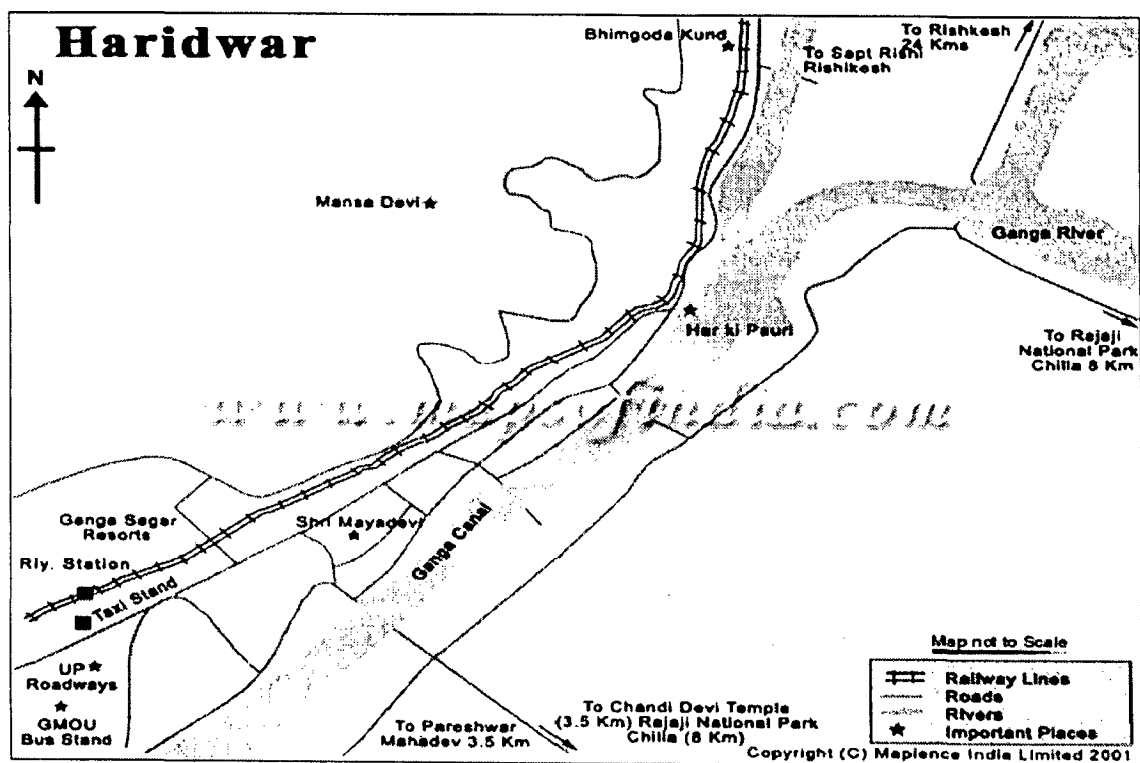


Figure 5.1 Map of Haridwar City

Source: [www.mapsofindia.com](http://www.mapsofindia.com)

### 5.3 REGIONAL SETTINGS

The Haridwar city is the district headquarter of Haridwar district. The district of Haridwar was earlier created in 1988, from the district of Saharanpur. With the creation of Uttaranchal state in 2000, the district of Haridwar has become the part of the newly formed hill state.

Haridwar city occupies a significant position in the northern region of India due to its pilgrimage character. It is located at the junction of important regional roads from Delhi, Dehradun, Rishikesh, Nazibabad and Laksar.

### **By Road**

Haridwar is located on NH 58 (Earlier SH-45) connecting Delhi and Rishikesh and NH-74 with Nazibabad. It is about 220km in the north-east of Delhi on leading to Pauri and Nitipass. It is 141 km from Meerut, 81 km from Saharanpur, 494km from Lucknow, and 52km from Dehradun.

### **By Rail**

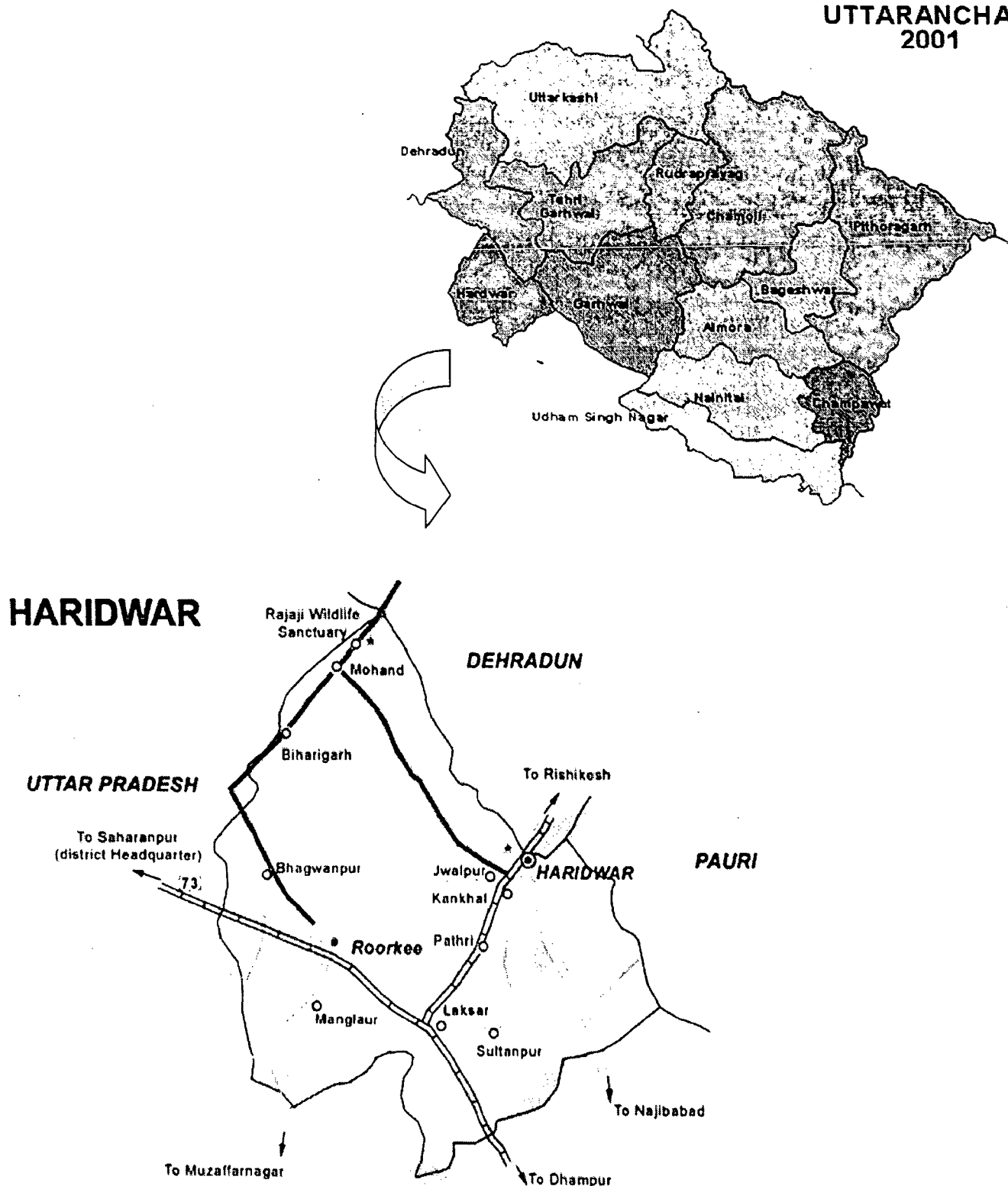
Haridwar is the main station of Northern railway and is well connected with the railways with major cities in India viz, Delhi, Mumbai, Howrah, Lucknow, Agra etc.

### **By Air**

The nearest airport is at Jollygrant (Dehradun) 35 Kms.

The most influenced regional area of the city is Rishikesh which is at a distance of about 25km from the city centre. Gradually, the expansion of both the cities is likely to make it as Twin city.

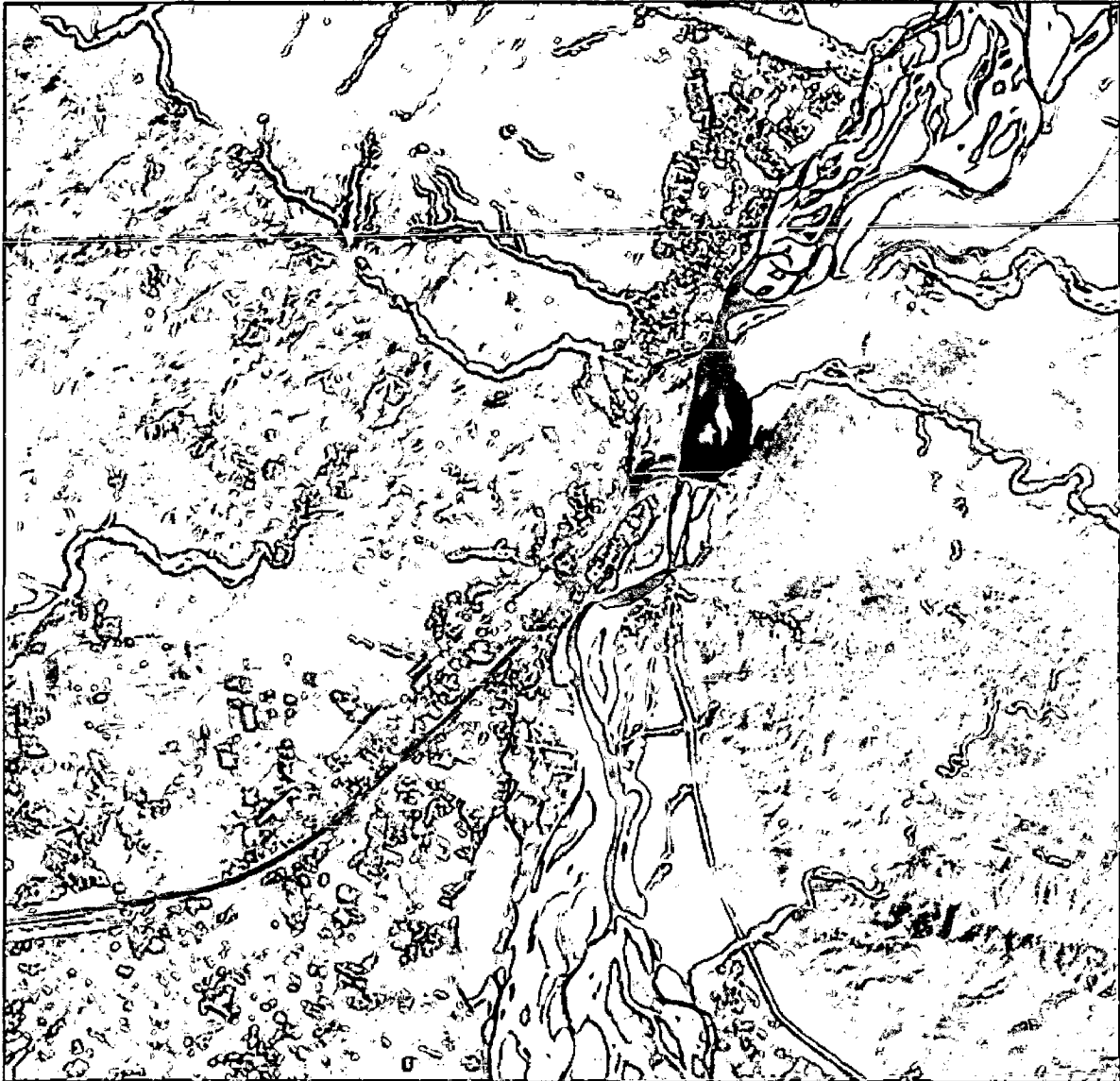
**UTTARANCHAL  
2001**



**Figure 5.2 Regional Linkages of Haridwar**

Source: [www.ua.nic.in](http://www.ua.nic.in)



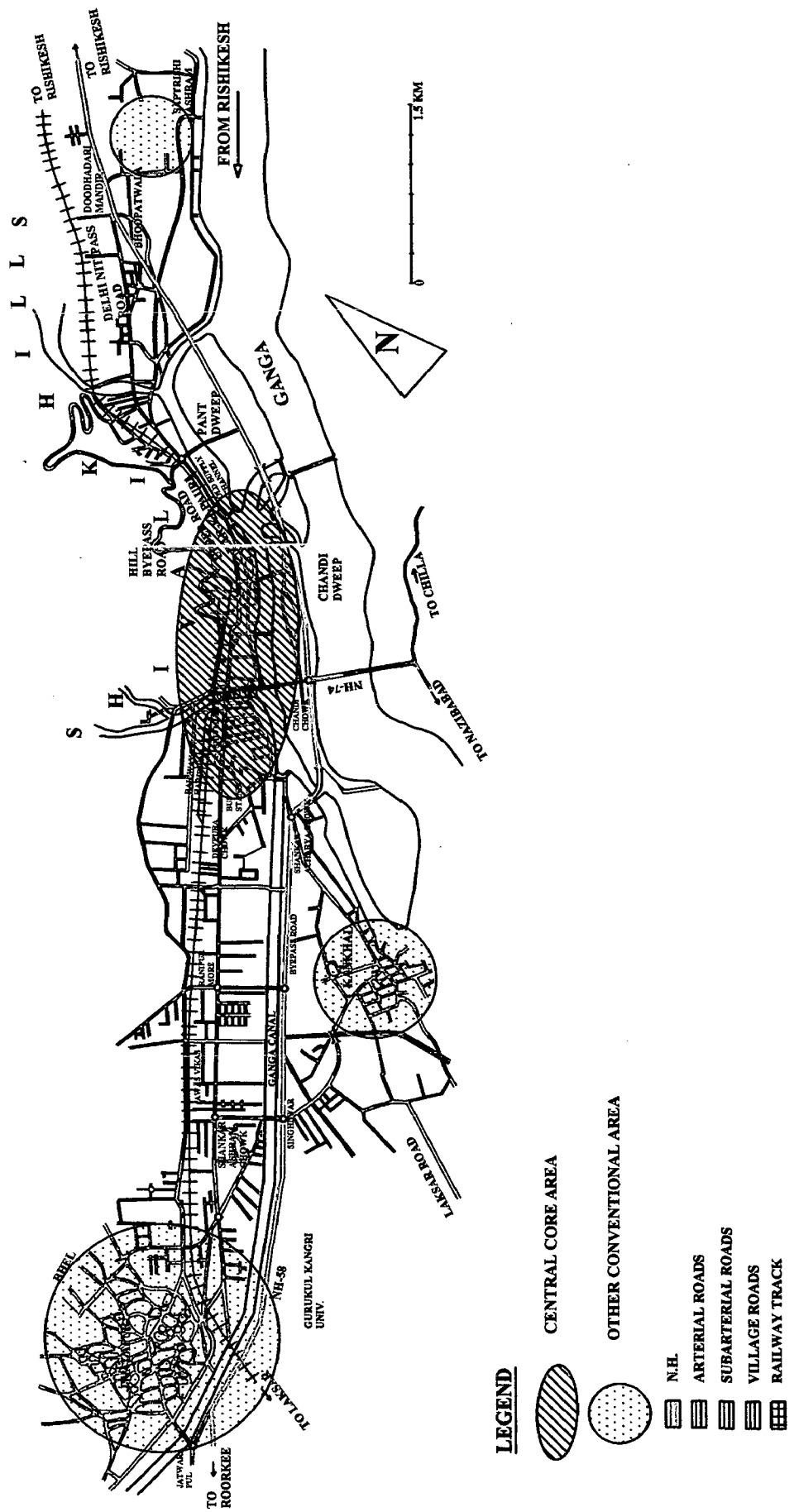


**Figure 5.3 Satellite Image of Haridwar City**

Source: Dept. of Geomatic, IIT Roorkee.

#### **5.4 PHYSICAL EXPANSION OF THE CITY**

The city being located between the Shivalik Hill Ranges in the North West and river Ganges in the South East has expanded linearly from Dudhadhari to Jawalapur area. Due to physical constraints, the expansion has been oriented towards south and south west along the Delhi Road and Laksar Road. The total area under



**Fig. 5.4 PHYSICAL EXPANSION OF HARIDWAR CITY**

Source: Author

Haridwar Municipal area is 54,723 hectares according to 2001 census which comprises the areas of Haridwar city, Jawalapur, Kankhal and SaptRishi area. Haridwar main city is the centre of almost all the activities agglomerating around Har-Ki-Pauri area.

Jawalapur is a conventional area located in the west of Haridwar at a distance of about 6 km. The development of space in between Haridwar city and Jawalapur along the Jawalapur Road has made it as a part of the main city. Kankhal is in the south of Haridwar city located in the low lying area along the river Ganges. It is about 5km away from the city centre separated by Ganga Canal. This is the area where most of ancient temples are located. Bharat Heavy Electrical Limited (BHEL) is an Independent township newly developed in the north west of main city area. It is an industrial town which is anticipated to play a vital role for the uprise of socio-economic character of the city.

## **5.5 DEMOGRAPHIC PROFILE OF THE CITY**

Haridwar Municipal area comprises the areas of Haridwar city, Jawalapur, Kankhal and Sapt Rishi area. According to Master Plan 2001, total developed area is 1620.65 acres where as total Master Plan Area is 2932.84 acres.

Haridwar is the most densely populated (612 persons per sq. km) district in the state. Haridwar city itself has distinct features of population growth. Till 1961, there was a nominal growth of population from 25,597 in 1901 to 59,910 in 1961 with an annual growth rate of 2.24%. But from 1961 to 1981 there was high growth of population from 59,960 to 1,15,513 with average growth rates of 32.22% and 45.71% in the respective decades. The development of BHEL Industrial Township is the main factor for this fast growth. In 1991 and 2001, the population of the Haridwar city (excluding BHEL area) was 1,49,011 and 1,76,909 respectively with decadal growth rates of 28.99% and 18.72% respectively.

So, it is clear that the decadal growth rate of the city population is not uniform. The main reason behind this is the economic activities of the city and the large floating population due to its important pilgrimage status.

Demographically, the city has grown more than 7 times from a meager population of 25.6 thousand in 1901 to 1.77 lakh in 2001. It will grow much fast due to the establishment of IIE (Integrated Industrial Estate), North West of the BHEL covering an area of about 2034 acre.

Work Force of Haridwar city was 27.64% (41180) of total population in 1991 which is 27.28% (48255) in 2001 and it is expected to increase rapidly by the end of the next decade due to rapid industrialization indicating a sound economic base of the city.

### **5.5.1 POPULATION GROWTH OF HARIDWAR URBAN AGGLOMERATION**

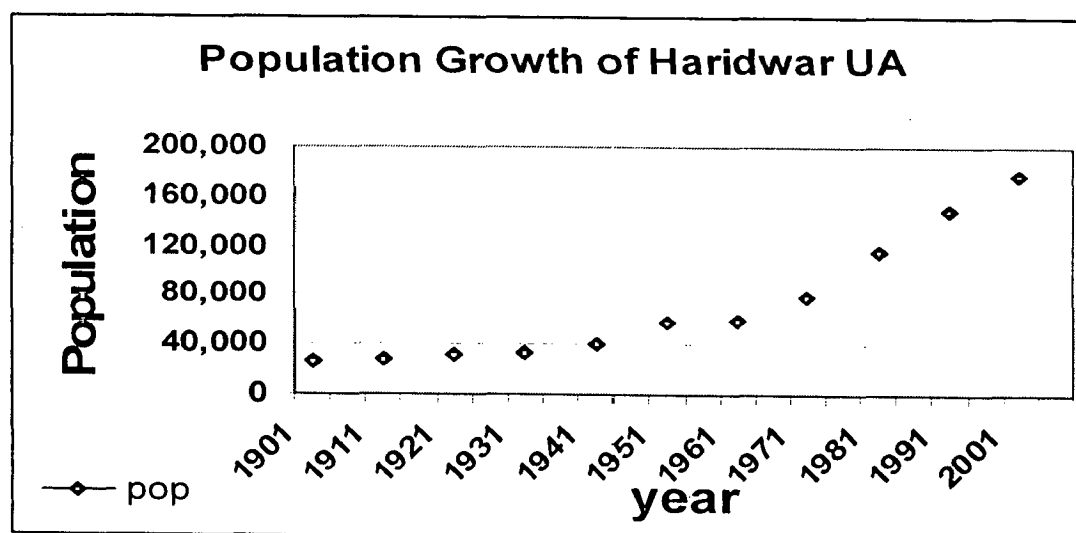
Haridwar urban agglomeration consists of three areas namely

1. Haridwar Municipal area
2. Gurukul Kangri University
3. Jwalapur Mahavidyalaya

YEAR	POPULATION	DECADAL GROWTH	GROWTH RATE (%)
1901	25,597	-	-
1911	28,682	3,085	12.05
1921	30,764	2,082	7.26
1931	33,287	2,523	8.20
1941	40,823	7,536	22.64
1951	57,338	16,515	40.46
1961	59,960	2,622	4.57
1971	79,277	19,317	32.22
1981	1,15,513	36,236	45.71
1991	1,49,011	33,498	28.99
2001	1,76,909	27,898	18.72

**Table 5.1** Population Growth of Hardwar Urban Agglomeration

Source: Census of India 2001.



**Figure 5.5** Population Growth of Hardwar Urban Agglomeration

Source: Census of India 2001.

WARD WISE POPULATION**Table 5.2**

Ward No.	Name of Ward	Population of Ward
1	Bhoopat wala	5819
2	Kadkhari	7202
3	Har Ki Pauri	8659
4.	Brahampuri	7909
5.	Gau Ghat	5596
6.	SarvanNath Nagar	6512
7.	Nirmala Chawni	6437
8.	Maya pur	7849
9.	Ravidas Basti	6081
10	Acharayan	8566
11	Rajghat	6929
12	Krishna Nagar	5538
13	Rishi kul	4799
14	Govindpuri	3399
15	Arya Nagar	2620
16	Awas Vikas	3283
17	Tibri	9617
18	Ambedkar Nagar	9484
19	Kadach	5621
20	Kotarwan	7568
21	Dholiyan	7926

22	Chaklan	6360
23	Valmiki Basti	4671
24	Lakdharan	6875
25	Mehtan	4643
26	Lodhamandi	7543
27	Kassawan	6951
	Total	175010
Gurukul Kangri University + Jwalapur Mahavidyalaya (1899)		176909

Ward wise Population of the Haridwar City (2001)

Source: Nagar Palika, Haridwar (2001)

### **5.5.2 FLOATING POPULATION**

Besides the permanent population, Haridwar has a floating population comprises pilgrims and tourists especially for 8 to 9 months. Haridwar is one place where fairs are being organized with full enthusiasm round the year, such as Somwati Amavasya, Kartik Poornima, Shravan Poornima, Ganga Dussehra and other important bathing dates of Hindu calendar. The Kanwad mela during the month of Shravana is very popular among masses in which lakhs of devotees of Lord Shiva come to Haridwar to take holy water of river Ganga. The following table shows the average number of tourists visiting Haridwar.

**Table 5.3** No. of Tourists Visited during Festival Season (2005)

Month	Occasion	Approx. no. of Tourists visited
January	Makar Sakranti	2-2.5 lacs
Feb-March	Maha Shivratri	2 lacs
March-April	RamNavmi	3-4 lacs
April	Baisakhi	8-10 lacs
May	Buddha Poornima	3 lacs
May	Ganga Saptami	2 lacs
June	Ganga Dussehra	8-10 lacs
July	Kanwar Mela	25-30 lacs
July	Somwati Amavasya	20-25 lacs
August	Janmashtmi	1 lac
October	Durga Puja	3 lacs
November	Kartik Poornima	7-8 lacs
Every Month	Ekadashis	2 lacs
	Poornimas	2 lacs
	Amavasyas	2 lacs
	Surya Grahans	4-5 lacs
	Chandra Grahans	4 lacs

Source: Mela Bhawan, Haridwar (2005) and [www.haridwar.nic.in](http://www.haridwar.nic.in)

## 5.6 SOCIO-ECONOMIC PROFILE

### Literacy

**Table 5.4** Literacy rate in Haridwar

Population Literate	120397
Male Literate	69703
Female Literate	50694

Source: Census of India 2001.



## Workforce

Table 5.5 Workforce in Haridwar City

Total Worker	48255
Male Worker	43747
Female Worker	4508
Total Main Worker	43481
Total Marginal Worker	4774
Cultivators	201
Agriculture Labourers	344

Source: Census of India 2001

Table 5.6 Workforce Participation Rate in Haridwar City

Year	Total population	Total workers	% age of workers
1971	79277	23145	29.18
1981	115513	31723	27.46
1991	149011	40825	27.34
2001	176909	48255	27.28

Source: Census of India 2001

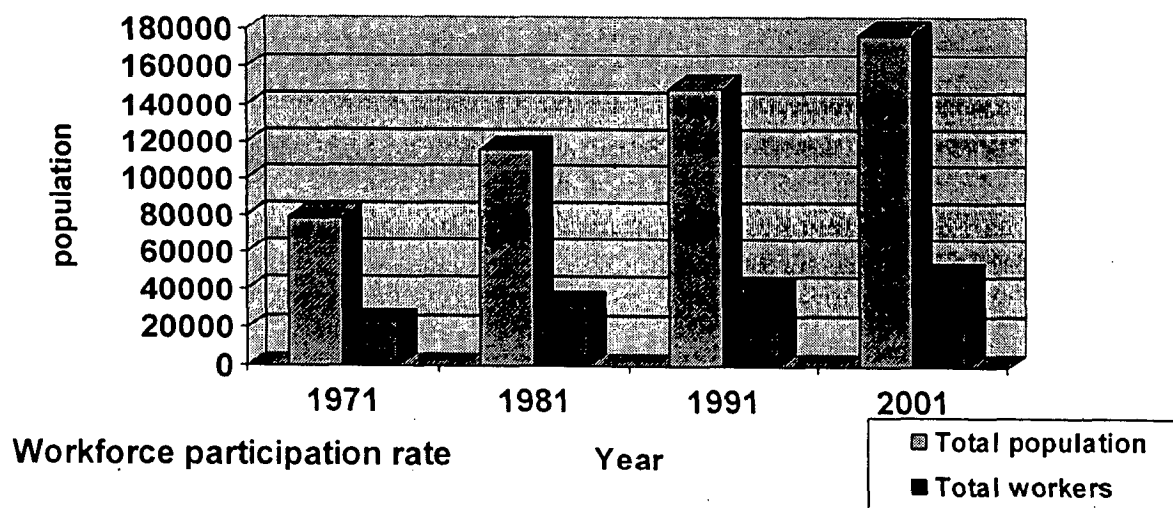


Figure 5.6 Workforce Participation Rate in Haridwar City

Source: Census of India 2001

Till 1971, the economic base of the city pertained mainly to pilgrimage and tourism industry besides agriculture. Due to its unique character, large number of hotels, restaurants and shops have come up in the city. This has strengthened the business and other commercial activities in the city. After 1971, there has been fast industrial development which contributed to the workforce share as well as economic prosperity of the city. BHEL is the major boosting factor for the economic development of the city. Another industry in the vicinity of the city is Indian Drugs and Pharmaceuticals Limited at Virbhadra on Rishikesh Road. Other major economic activities in the city are trade and commerce, transport and communication, construction and government services. Haridwar is also famous for wholesale trade in timber, grain and stone at Jawalapur. Now, the set-up of IIE (Integrated Industrial Estate) by SIDCUL in North-Western segment of BHEL will drastically change the socio-economic structure of the city as well as the whole region. In the IIE Haridwar, total investment is targeted as 2000 crore with 30,000 employment generation. The big companies which are planned to set-up their plant in IIE Haridwar are HLL, Mahindra and Mahindra, ITC, Kirby Limited etc.

## 5.7 LAND USE PROFILE

The development of the city has been greatly influenced by the physical constraints of having ranges of Shivalik Hills in the North West side and river Ganges in the south-eastern side. This has directed the development of the whole city in a linear form along the river Ganges originally starting from Har-Ki-Pauri in north east to south west direction. Besides the existing linear expansion from Bhupatwala to Jawalapur, the growth has been oriented towards south and south-west directions along the major radial corridors.

With development point of view, the land use can broadly be categorized into two parts namely (i) Developed Area and (ii) Undeveloped Area as per existing land use distribution in the Master Plan 2001. Out of total area of 2931.84 acres, 44.7% is undeveloped area (1311.19 acres) which can be utilized for balancing the land use

distribution in the city (Table-2:5). Land use of Developed Area is mainly attributed to residential (38.8%), religious (14.9%), commercial and industrial (11.1%) and camping (17.1 %) areas. The land use under transportation sector is 6.5% which is highly inadequate to meet the travel demands of the city.

Hardwar has conventional mixed type of land use distribution without following planning norms and standards. Consequently the present scenario of landuse has constrained the planned development of the city besides disturbing almost all the physical and social systems. This *mixed landuse* has been developed informally along the major spines of road network system like Station Road, Rishikesh Road and Kankhal Road. This has created a number of problems in transport sector for its appropriate operation. Area around Har-ki-Pauri and Main Bazaar hardly has any space left for widening of roads. The shop keepers and commercial establishments have encroached the major portion of road space and even some of the internal roads have been converted into local markets. The land use under transport sector has been increased from 6.5% to 17.4% by 2001 indicating progressive development of transport sector but this is still inadequate to meet the explosive travel demand of the city particularly during special occasions.

**Table 5.7 Land Use Profile of the city**

S.NO.	LANDUSE	EXISTING (1985)		PROPOSED(2001)	
		AREA (Acres)	(%)	AREA (Acres)	(%)
<b>DEVELOPED AREA</b>					
1.	Residential	627.89	38.7	3690.90	46.6
2.	Commercial	30.58	1.9	303.45	3.8
3.	Industrial	148.55	9.2	365.37	4.6
4.	Public & Semi Public	391.74	24.2	1083.73	13.7
5.	Govt. & Semi Govt.	33.68	2.1	235.32	3.0
6.	Traffic and transport				
	(i) Bus stand	4.95	0.3	43.35	0.5
	(ii) Transport	—	-	37.16	0.5

	(iii) Circulation	100.83	6.2	1293.67	16.4
7.	Tourism	4.95	0.3	-	-
8.	Camping Area	277.48	17.1	-	-
	<b>TOTAL</b>	<b>1620.65</b>	<b>100</b>	<b>7913.75</b>	<b>100</b>
<b>UNDEVELOPED AREA</b>					
10.	Kumbh Mela Area	-		1424.34	
11.	Open Area	468.18		959.88	
12.	Garden	252.69		185.78	
13.	Water Bodies	232.23		495.42	
14.	Other use	358.09		549.92	
	<b>Total</b>	<b>1311.19</b>		<b>3615.34</b>	
	<b>G. Total</b>	<b>2931.84</b>		<b>11529.09</b>	

Sources: Master plan 2001 Haridwar.

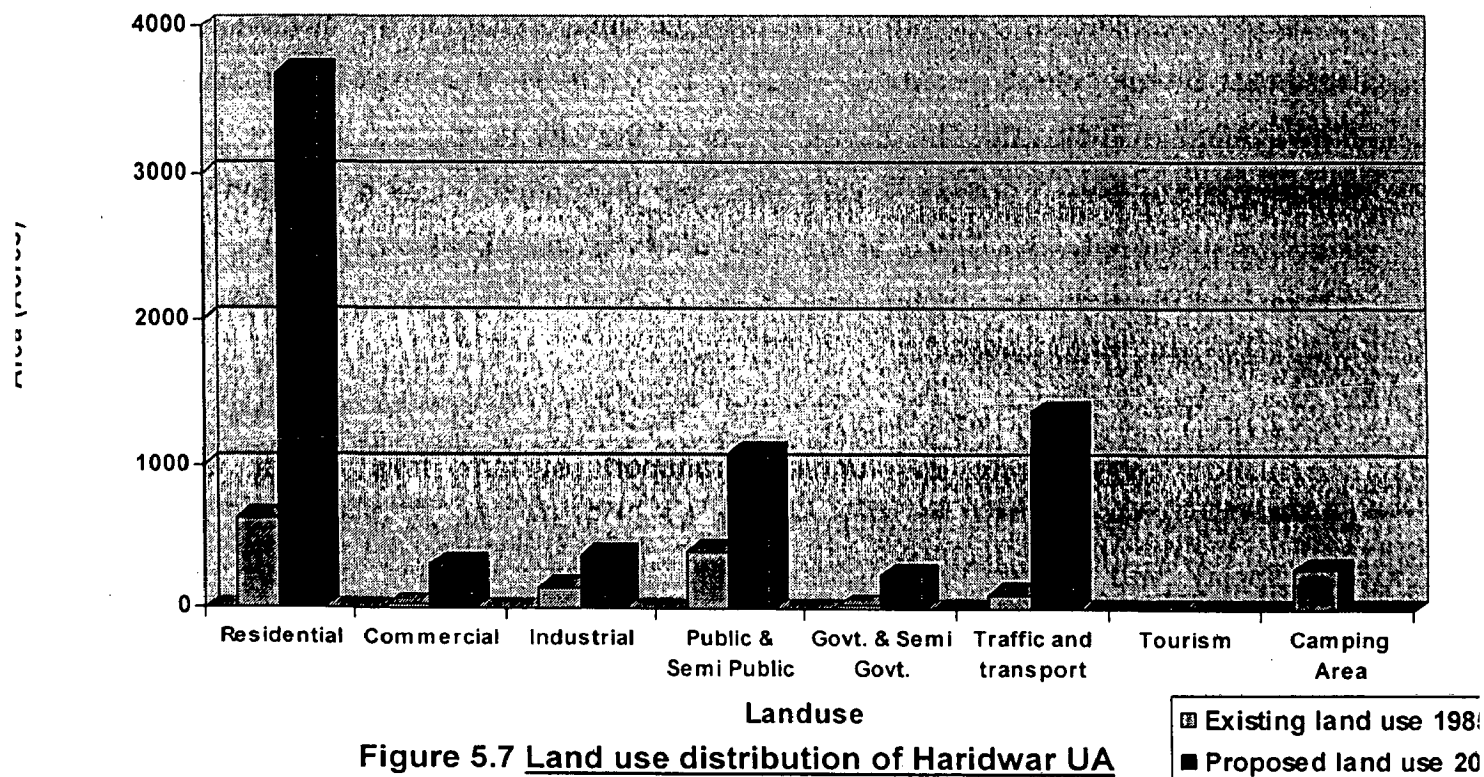


Figure 5.7 Land use distribution of Haridwar UA

Sources: Master plan 2001 Haridwar.

## 5.8 ADMINISTRATIVE STRUCTURE

Haridwar is the most densely populated (612 persons per sq. km) district in the Uttaranchal state. The city of Haridwar is the district headquarter of the Haridwar district. The most important and conventional administrative organization in Haridwar city is **Haridwar Nagar Palika** which was constituted in 1868 in order to control and manage the infrastructural facilities of the city. Gradually, the city grew and over the years, it has increased fastly in its size and character. In 1951, Haridwar Municipal area, Gurukul Kangri University and Jawalapur were also included in Haridwar Urban Agglomeration.

The population pressure over the urban infrastructure forced the city to grow in haphazard manner which warranted the state government to orient its development in a planned way. Then in 1986, **Haridwar Development Authority**, Haridwar was setup to control the undesirable development of the city and also to formulate and execute program for the planned development of the city. At present, Haridwar Development Authority (HDA), Haridwar is the major administrative organization to look after the development of the city in a planned way. Besides these organizations, there are several other administrative offices controlling various activities of the city like Office of the District Magistrate, Divisional Office of Public Works Department, Uttaranchal state road Transport Corporation, Mela Authority, State Electricity Board etc.

The responsibility of running transport system falls under several administrative heads. The development of roads in the city is undertaken by the Municipality and Public Works Department. Planning of road network system incorporated in the landuse plan falls within the perview of Haridwar Development Authority and Town and Country Planning Office. The divided and inappropriate integration and coordination administrative responsibility, to build and maintain road network system, is posing serious road network problems. So, there is an urgent

need for proper coordination among various departments of the city in order to improve the road network system.

### **5.9 FUNCTIONAL CHARACTER OF CITY**

The city of Haridwar is one of the most important pilgrimage centres of India. It is considered to be the most sacred place of Hindus where a large number of pilgrims and tourists come every year. Every evening, large gathering take a holy dip at Har-ki- Pauri and perform Pooja (Aarti) of goddess Ganga. After every six years, Ardh Kumbh or Poorna Kumbh melas are celebrated here. So the devotional thinking of the people towards the holy city of Haridwar named it as 'City of Hindu Pilgrimage'.

The city of Haridwar forms the gateway to the hill state of Uttaranchal and therefore the economic development of the hilly region is closely related to the development of the city. It is also emerged as a very important transit centre within the region for having a strategic location between plains and hills.

## CHAPTER 6

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# ROAD NETWORK AND TRAFFIC CHARACTERISTICS

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### 6.1 TRANSPORT NETWORK SYSTEM

Transportation network is oriented by the socio-economic and physical development of the city and in return, it affects significantly the functional performance of various systems in the city. The existing circulation pattern in Haridwar city is characterized by its physical constraints and haphazard linear land use development. The city being located between the Shivalik Hill Ranges in the North West and river Ganges in the South East has expanded linearly from Dudhadhari to Jawalapur area. This expansion has been oriented towards south and south west along the Delhi Road and Laksar Road.

The transport network mainly consists of roadways. Roads serve both inter-city as well as intra-city traffic, whereas railways serve the inter-city-traffic only. Major roads are meeting the linear shape of the city at staggered locations. These roads are as follows

- a) NH-58 linking Haridwar to Delhi in south west direction and Nitipass in north east direction.
- b) NH-74 linking Haridwar to Nazibabad and Bijnor in the east side.
- c) Laksar Road linking Haridwar to Laksar in the south side

Urban roads are highly congested due to mixed traffic pattern, narrow road width and emergence of informal sector along the road sides. Heavy encroachments on roads as well as development of hotels and restaurants along the urban roads have reduced the road capacity considerably. As a result, the urban roads have frequent bottlenecks with cross-sectional elements changing their values and do not continue to function homogeneously. The Master Plan width of major roads ranges

from 30 m to 45 m but the temporary as well as permanent encroachments have reduced the road width drastically leaving hardly any scope for further widening.

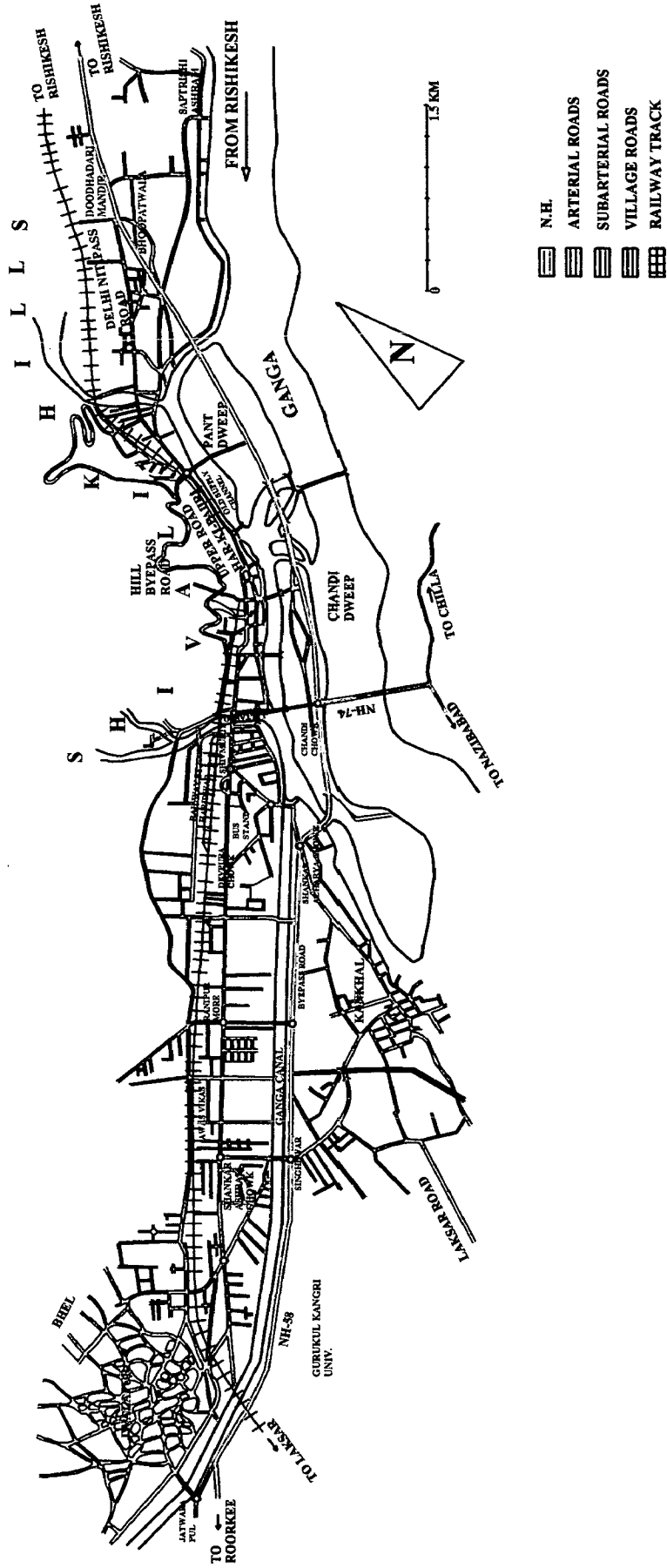
The intra-city transport network is a part of inter-city regional network system. The major roads meeting the travel needs are Station Road, Kankhal Road, Bypass Road, Hill Bypass, Rishikesh Road and Sapt-Rishi Road. These roads radiate from the principal road corridor of NH-58 at the staggered locations. The orbital circulation is totally missing putting the total strain on radial roads. The high density areas developed along the Station Road, Kankhal Road and Rishikesh Road have further aggravated the traffic problems. The Station Road being the major spine of urban road network system has the highest development of mixed landuse pattern along the road.

## 6.2 ROAD INVENTORY ANALYSIS

The land use under transport sector is just 6.5% of the developed area which is highly insufficient to meet the travel demands of the city particularly during festival seasons. The proposed landuse under transport has been increased to 17.4% which will certainly augment the capacity of the system provided the landuse is saved from encroachment problems.

The Station Road being the major spinal corridor serves more than 60% of the city population linking Jawalapur Bus Stand, Railway Station, Kotwali, Har-ki-Pauri and main bazaar area. Consequently the road has ceased to function at few points only and even the local administration has stopped the movement of vehicular traffic beyond Kotwali. Functionally, the character of the Station Road has been marred by the unauthorized development of hotels, restaurants and extension of shops. The capacity of the roads has been further constrained by the *on-street parking* of vehicles as well as on road markets.





**Fig. 6.1 ROAD NETWORK OF HARIDWAR CITY**

Source: Author

Table 6.1 Road Inventory of Road Network – Haridwar City

Sl. No.	Name of Road	ROW (m)	Carriageway (m)	Central Verge (m)	F. Path (m)	Shoulder (m) L/R	Land-use	Surface Cond.
1.	Pul Jatwara-jwalapur Chowk	24.7	10.7	0.7	—	6.8/7.2	Comm.	Poor
2.	Jwalapur Chowk- R.Bridge	15.0	9.0	0.7	—	3.0/3.0	Res.	Fair
3.	Surprise Hotel-Ranipur More	24.0	10.0	0.7	—	8.5/5.5	Res., Comm.	Good
4.	Ranipur More-Devipur Chk.	25.0	10.0	0.7	—	7.0/8.0	Res., Comm.	Good
5.	Devipur Chk-Shiv Murti Chk	25.2	14.0	0.7	—	5.0/5.5	Comm.	Good
6.	ShivMurti Chk-Laitarao Chk	18.0	12.0	—	—	4.0/2.0	Comm.	Good
7.	Lalrao Chk-Kotwali	18.0	12.0	—	—	4.0/2.0	Comm.	Good
8.	Singh Dwar-Desh Rak. Chk	18.0	6.5	—	—	5.5/6.0	Res., Comm.	—
9.	Sh. Charya Ckh-Sh. Tulsi Chk	10.5	7.1	—	—	18/1.6	Govt.	Good
10.	Sh. Tulsi Chk-Shiv Murti Chk	13.3	6.6	—	—	2.7/4.0	Res., Comm.	Poor
11.	Dudhadhari Ash-Bopatwala	25.0	9.5	—	—	9.0/6.5	Open, Res.	Good
12.	Singh Dwar-Sh Charya Chk	30.0	7.5	—	—	11.5/11.	Open	Fair
13.	Hill Bye Pass	25.0	3.5	—	—	—	Open	Poor
14.	Anya Nr. Chk-Rail. Phatak	20.5	7.0	—	—	7.5/6.0	Comm.	Poor
15.	Ranipur More-Tibri W. Works	29.7	7.5	—	—	11.2/11.	Comm.	Fair
16.	Devipur Chk-Sh. Tulsi Chk.	21.0	9.4	—	—	5.6/6.0	Res, Open, Go	Good
		12.0	7.5	—	—	3.1/1.4	Res.	Poor
17.	Kankhal Chk-R.K.Mission Chk	13.3	4.4	—	—	4.0/4.9	Res.	Poor

Source: Haridwar Development Authority and PWD, Haridwar (2006)

Development of conventional mixed landuse in various pockets of the city pose special problems of widening the roads. The urban roads including junctions are very *poorly designed* causing traffic jams and unsafe travel conditions in the city.

The city has been divided into several pockets due to natural and man made barriers like canals, distributaries, rails, hills etc. This has posed the special problems of accessibility and indicates highly capital intensive solutions for providing linkages through bridges and tunnels.

The road network does not have defined hierarchy. Besides, the divided administrative responsibility to build and maintain road network system further aggravates the traffic problems. There is intense need for *proper coordination* among various departments of the city in order to improve the road network system.

Due to passing through the main conventional part of the city, station road has lost its functional character. The section from Devipur Chowk to Shiv Murti Chowk has right-of-way ranging from 20.0 ms to 25.0 ms with divided carriageway and is highly encroached by shopkeepers which has constrains the scope of further widening. The section from Shiv Murti to Kotwali has right-of-way of 15.0 to 19.0 ms with undivided carriageway of 12.0 ms and is being degraded by the on-road activities which have to be restricted by design measures. The carriageway of road from Bhimgoda to Dudhadhari Chowk of Rishikesh Road is 7.0 m to 10.0 m. The commercialization and extension of shops on the road have degenerated the functional character of the road.

Bypass Road is a two-lane road with right-of-way of 30.0 m. This road is functioning well for through traffic. The carriageway of Kankhal Road varies from 5.0 ms to 7.0 ms. This is one of the important roads linking Kankhal area to the city centre but it is very narrow and somewhere it leads to a bottleneck.

Therefore, it can be concluded that the roads are having poor geometric designs, poor accessibility, encroachments, absence of footpaths, uncontrolled

intersections. These problems have reduced the travel speed and road capacity of the city roads forming great barrier for the growth of the city.

### 6.3 TRAFFIC VOLUME

Study area has been delineated mainly into two cordon lines namely:

- i) Outer cordon line coinciding with the boundary of the study area
- ii) Inner cordon line covering the main business and commercial areas of the city.

The traffic in Haridwar city enters through four points outer cordon line namely (i) Bahadrabad Check Post, (ii) Luxur Road Check Post, (iii) Nazibabad Check Post and iv) Bhopatwala Check Post. According to the *Study report 1997 by Haridwar Development Authority*, the traffic volume is 13,892 PCUs highest at Bahadrabad Check Post followed by 8,985 PCUs on Bhopatwala Check Post, 6655 PCUs on Nazibabad Check Post and 3,388 PCUs on Luxur Road Check Post.

At city level, the traffic volume is highest on the Station Road between Shiv Murti and Kotwali Chowk (27,990 PCUs) and second highest between Devipur Chowk and Shiv Murti Chowk (20597 PCUs). On Bypass Road average daily traffic volume ranges from 9,000 PCUs to 14,000 PCUs. Hill Bypass has very nominal traffic volume due to less usage of road.

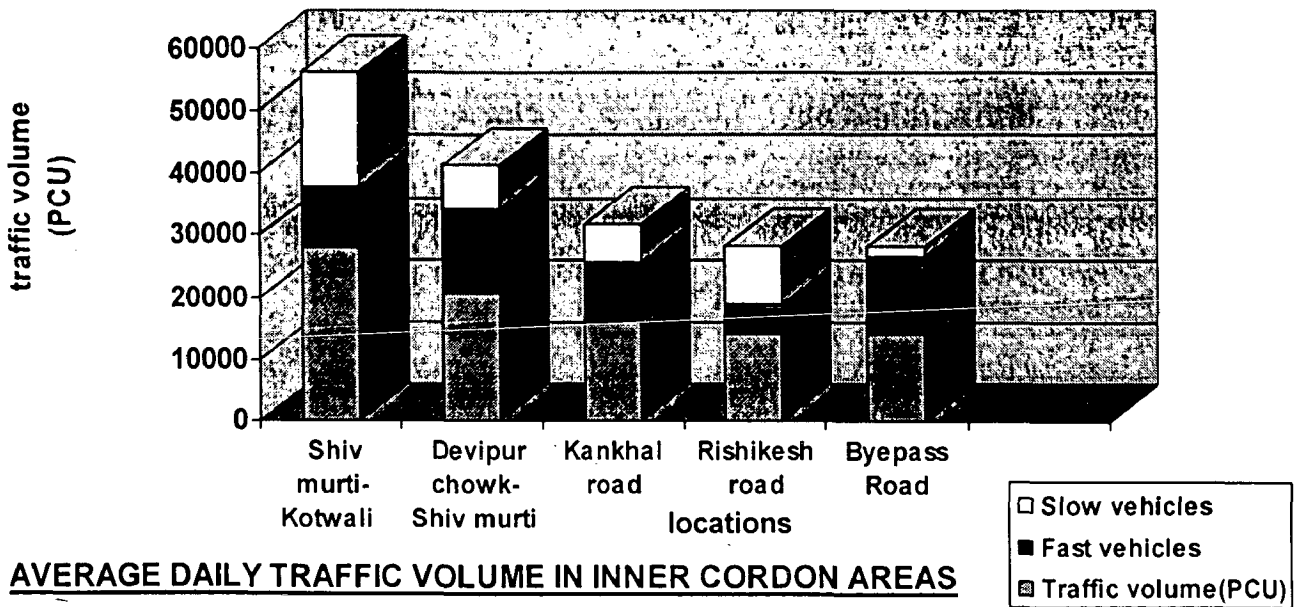


Figure 6.2 Average Daily Traffic Volume in Inner Cordon Areas.

Source: Traffic Study report 1997 by Haridwar Development Authority

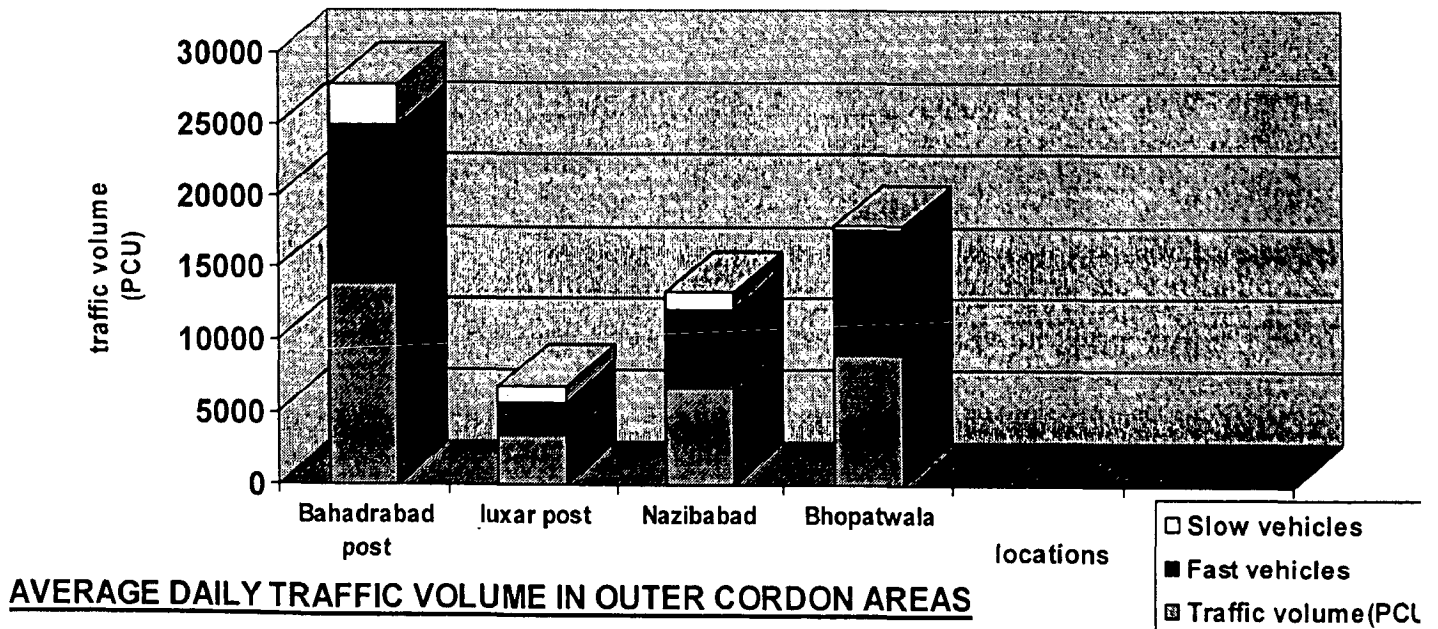


Figure 6.3 Average Daily Traffic Volume in Outer Cordon Areas

Source: Traffic Study report 1997 by Haridwar Development Authority

**Table: 6.2 AVERAGE DAILY TRAFFIC VOLUME IN OUTER CORDON AREAS**

	Bahadrabad post	luxar post	Nazibabad	Bhopatwala
Total Traffic vol.(PCU)	13892	3388	6655	8985
Fast vehicles (PCU)	11035	2362	5446	8734
Slow vehicles (PCU)	2858	1027	1209	251

Source: *Traffic Study report 1997 by Haridwar Development Authority*

**Table: 6.3 AVERAGE DAILY TRAFFIC VOLUME IN INNER CORDON AREAS**

Traffic Vol.(PCU)	Shivmurti-Kotwali	Devipurcho wk-Shivmurti	Kankhal road	Rishikesh road	Byepass-Road
Total Traffic vol.	27990	20597	15938	14105	14161
Fast vehicles	9980	13730	9726	4782	12498
Slow vehicles	18010	6867	6212	9323	1663

Source: *Traffic Study report 1997 by Haridwar Development Authority*

#### 6.4 TRAFFIC COMPOSITION

In the city centre between Shiv Murti and Kotwali, the traffic volume comprises 35% fast and 65% slow vehicles. Similarly at Kankhal Road from Kankhal Chowk to Shankaracharya Chowk and on Rishikesh Road near Bhimgoda, the fast traffic is 30% to 35% and slow traffic is 65% to 70%.

At the outskirts parts of the city, the composition of traffic is 60% to 70% as fast and 30% to 40% as slow vehicles. On Bypass Road, the fast traffic is 85% to

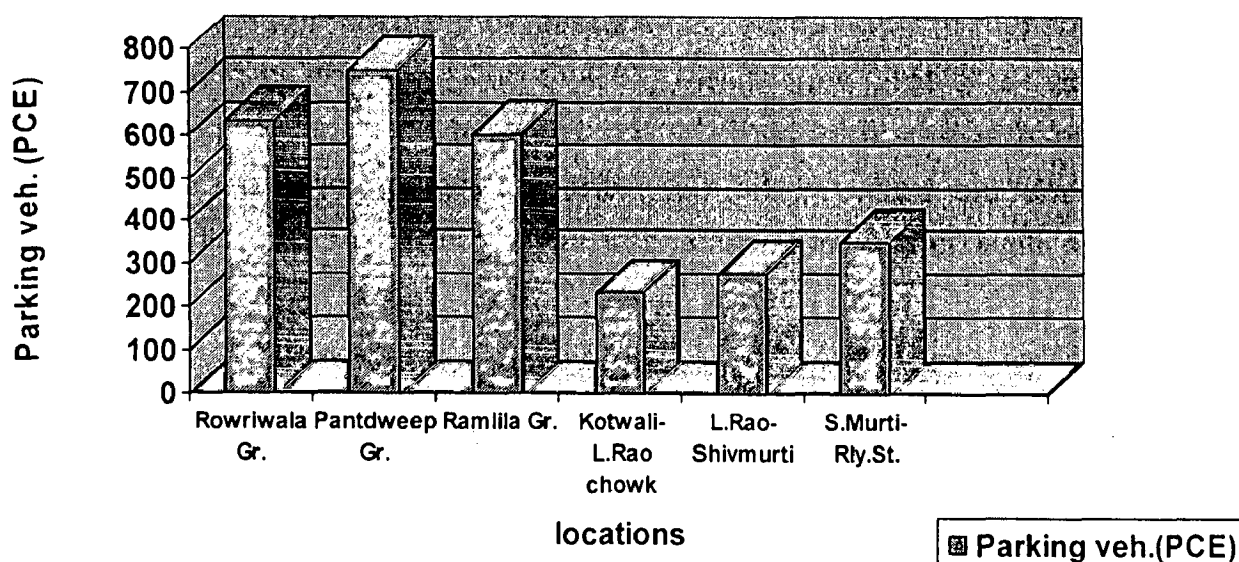
95% and quantum of slow vehicles is very less. At the central part of the city, the share of slow vehicles is very critical (50% to 60%) comprising mostly bicycles and cycle rickshaws thereby reducing the speed of traffic flow considerably. At the same time the traffic at the out skirts has high volume of fast vehicles comprising a large number of trucks and buses indicating the inter-city movement of traffic.

It is observed that the areas having higher composition of slow vehicles comprise more than 40% as *cycle rickshaws* whereas on Bypass Road, bus and truck traffic is more than 50%. Precisely, it reveals that the percentage composition of fast and slow vehicles is 30:70 in the main city area and the composition is reversed in the outskirt areas.

## 6.5 VEHICLE PARKING ANALYSIS

Parking analysis is done to study the parking problems in terms of parking accumulation, parking demand and parking supply. It is observed that most of the locations having intensive parking problems fall in Central Business District area in and around *Har-Ki-Pauri*. The intensive areas of parking accumulation are Station Road, Ramlila Ground, Rowriwala and Pantdweep.

According to the *Study report 1997 by Haridwar Development Authority*, Pantdweep area has the highest parking accumulation i.e. 751 Passenger Car Equivalent (PCEs) and Rowriwala area has the second highest vehicle accumulation (634 PCEs). Other areas where vehicle parking is quite high are Ramlila Ground (601.PCEs.) and Station Road from Shiv Murti to Railway Station (352 PCEs).



**Figure 6.4 Location wise Parking Accumulation**

Source: Traffic Study report 1997 by Haridwar Development Authority

**Table: 6.4 Location wise Parking Accumulation**

Locations	Rowriwala Ground	Pantdweep Ground	Ramlila Ground	Kotwali-L.Rao chowk	L.Rao-Shivmurti	S.Murti-Rly.St.
Parking Vehicles (PCE)	634	751	601	233	276	352

Source: Traffic Study report 1997 by Haridwar Development Authority

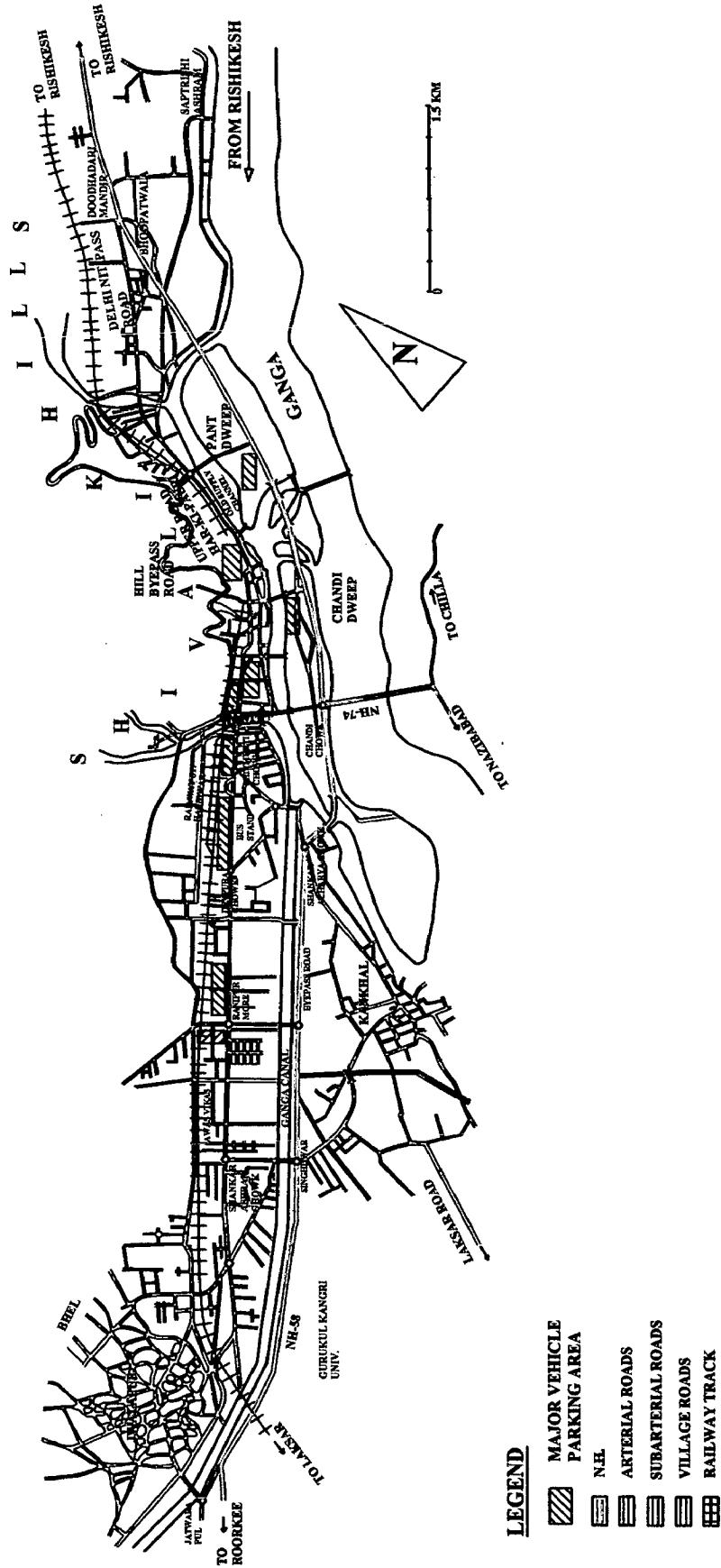
**Table: 6.5 Peak Hour Parking Space Requirements**

Locations	Rowriwala Ground	Pantdweep Ground	Ramlila Ground	Kotwali-L.Rao chowk	L.Rao-Shivmurti	S.Murti-Rly.St.
Space (Sq. M.)	2750	1989	2311	1105	1391	2506

(1 PCE = 12.5 Sq. M. + Extra 30 % for Circulation)

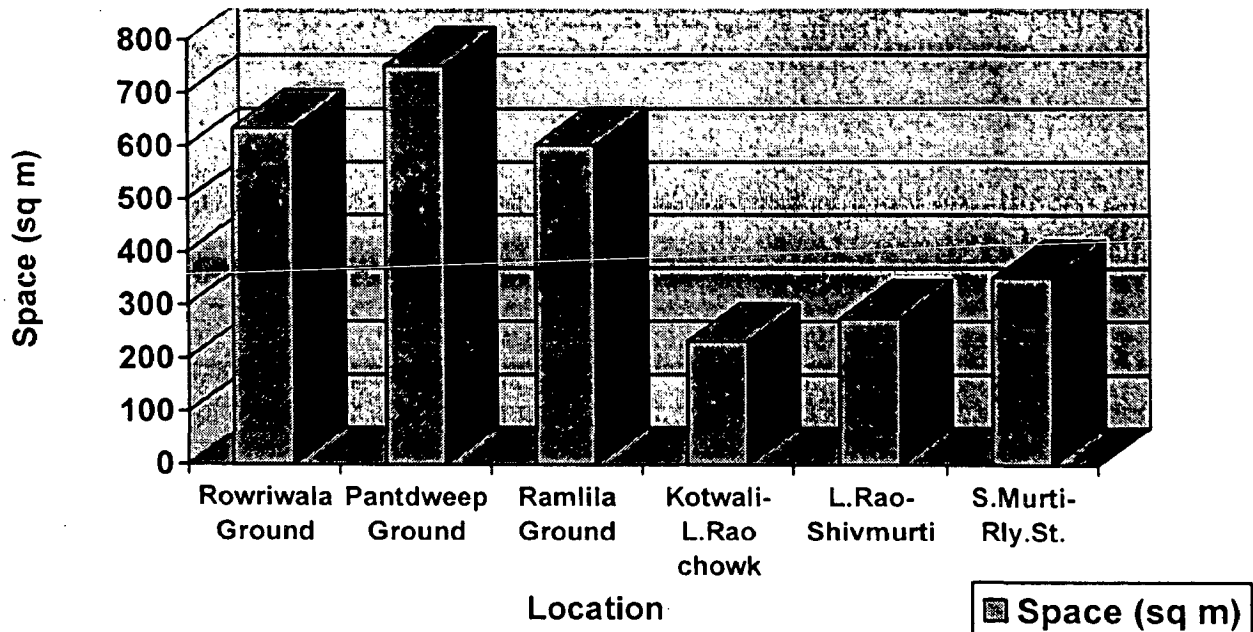
Source: Traffic Study report 1997 by Haridwar Development Authority





**Fig. 6.5 MAJOR VEHICLE PARKING AREA IN THE CITY**

Source: Author



**Figure 6.6 Peak Hour Parking Space Requirements**

Source: *Traffic Study report 1997 by Haridwar Development Authority*

## 6.6 PEDESTRIAN MOVEMENT ANALYSIS

The existing traffic and travel conditions have adversely affected the road users of the city due to chaotic and accidents prone conditions. The character of the city is such that there is a lot of pedestrian movement towards Har-Ki-pauri in the morning as well in the evening. Their movement is almost along the major arterial roads and creating traffic chaos and accident situations. So, there is a need to re-orient the pedestrian movement safely. The road stretch from **Local Bus Stand to Kotwali Chowk** is the worst effected due to the pedestrian movement due to the location of Bus stand and Railway station along with taxi and tonga stand. This road stretch is also suffering from high degree of commercialization.

Other sections having the same problems are **Shiv Murti Chowk** and **Kotwali Chowk**, **Sukhi Nadi to Bhimgoda Chowk**, **Chandi Chowk to Cable Bridge**.

## 6.7 ROAD ACCIDENT ANALYSIS

**Table 6.6 Road Fatalities in the City**

YEAR	DEAD	INJURED
1998	23	18
1999	13	18
2000	08	16
2001	14	14
2002	14	17
2003	13	12
2004	17	19
2005	10	09

Source: Kotwali, Haridwar

According to the above data, it can be said that the total road accidents cases are less as compared to the other major cities in India but these are the major accidents and many other accidents are not registered. The main reasons behind these accidents are traffic congestion; inter mixing of slow and fast moving vehicles, increase in the personalized vehicles, lack of traffic awareness especially among young users, absence of footpaths for pedestrians, reduction in the road capacity etc.

## 6.8 EXISTING CONDITIONS OF ROADS IN THE CITY

The road development and maintenance responsibility is mainly carried by Public Works Department and Nagarpalika. In general, the roads in the outer cordon areas are mainly maintained by Public Works Department and the roads in the inner cordon areas are maintained by Nagarpalika.

**Table 6.7 Status of the Roads Maintained by Nagarpalika**

Year	Motor road (km)	Pedestrians roads (km)	Kattcha roads (km)	Total (km)
2000-01	137.516	7.775	-	145.291
2001-02	137.516	7.775	-	145.291
2002-03	137.516	7.775	-	145.291
2003-04	146.636	9.655	-	156.291
2004-05	184.252	1.437	28.411	214.100

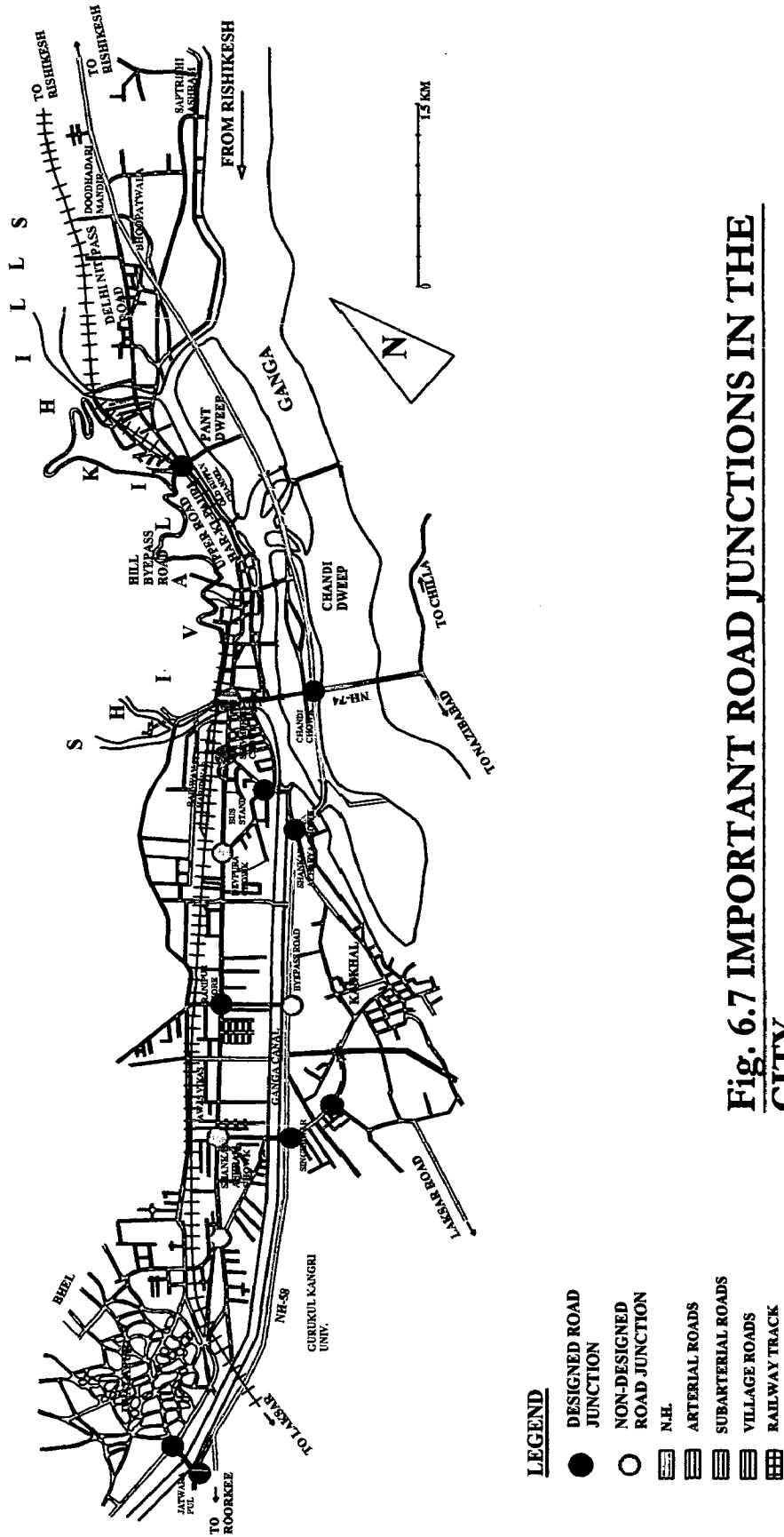
Source: Nagarpalika, Haridwar 2005.

**Table 6.8 Status of the Roads Maintained by Public Works Department**

Name of Road	Category of Road	Length of Road(Km)	Type of road layer	Surface condition
Delhi-Nitipass Road (NH-58)	National Highway	61	Bituminous	good
Nazibabad Road (NH-74)	National Highway	30	Bituminous	good
Jwalapur-Laltarao Marg	Other District Road (ODR)	4.705	Bituminous	Fair
Jwalapur Railwar feeder Marg	Other District Road (ODR)	0.515	Bituminous	Fair
Gurukul Kangri Univ. Road	Other District Road (ODR)	2.00	Bituminous	Fair
Sapt-rishi Ashram Road	Other District Road (ODR)	1.25	Bituminous	Fair
Hill Bypass Road	Other District Road (ODR)	6.38	Bituminous	Poor

Inspection Bhawan Link Road	Other District Road (ODR)	0.75	Bituminous	Fair
Old D.N. Road	Other District Road (ODR)	1.24	Bituminous	Fair
A.B. Link Road	Other District Road (ODR)	0.80	Bituminous	Fair
Motichur Railway Feeder	Village Road	0.40	Bituminous	Fair
Mansadevi Road	Village Road	1.30	Bituminous	Fair
Bhimgoda Link Road	Village Road	0.285	Bituminous	Fair

Source: Directory of Roads, Divisional Office, Public Works Department, Haridwar 2005.



**Fig. 6.7 IMPORTANT ROAD JUNCTIONS IN THE CITY**

Source: Author

## CHAPTER 7

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# TRAFFIC AND SOCIO-ECONOMIC CHARACTERISTICS

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### 7.1 TRAVEL PATTERN

In Haridwar city, the traffic and transportation system is characterized by mainly slow moving low capacity modes. The poor public transport system, rapid increase of personalized vehicles and deficient road network has resulted into dominance of *Intermediate Public Transport (IPT)* modes. IPT mainly include cycle rickshaw, auto rickshaw, articulated tempo and tonga as the prominent modes of transport serving the needs of urban travel. This enforced dependency on slow speed and low capacity modes has resulted into serious traffic problems and inefficient utilization of the transport infrastructure.

Urban roads have become chaotic due to mixed type traffic pattern coupled with narrow road width and development of informal sector on the road space. The registered vehicle population in Haridwar city in the year 2005 was 14091 vehicles out of which 11751 are two wheelers equivalent to 83.39% composition. In the year 2005, 1733 Cycle rickshaws, 15 tonga and 100 Jotagadi (Bullock cart) have been registered with Nagar palika. The overall composition of fast and slow vehicles in Haridwar city is observed to be 60% and 40% respectively.

The increasing use of personalized modes and the dependence on low capacity IPT have created the severe congestion on the limited road network. This is mainly due to the absence of adequate public transport system and increasing mobility requirement of the residents which is creating a wide gap between demand and supply.

#### Traffic Movement in Outer Cordon Areas

Out of the total outer cordon points, about 66% of the total traffic is destined for inner cordon of the city. The highest movement of trucks is visualized on Roorkee

Road (47.88%) and the second highest on Nazibabad Road (17.73%). It is also observed that there is high intensity of movement between Roorkee Road, Nazibabad Road and Rishikesh Road which indicates that there is immediate need to link these traffic movements through a bypass Road or Outer Ring Road in order to least disturb the city traffic.

## **7.2 GOODS TRANSPORT SYSTEM**

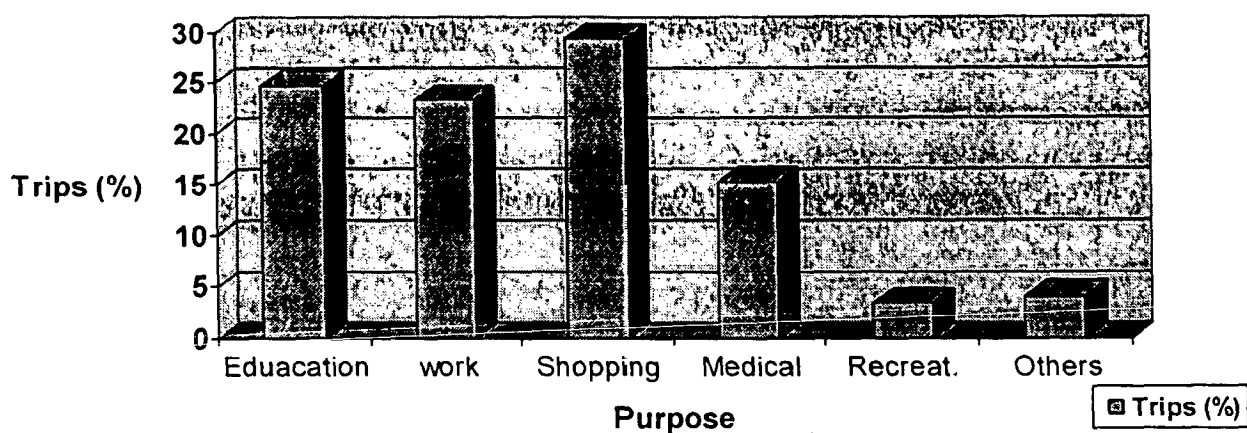
Haridwar city is functioning as a transit point for goods movement. But there is no provision for parking of trucks or for transiting goods from one mode to another. This enforces the trucks to be parked on the city roads adversely affecting the road capacity.

The local goods distribution is mainly dealt by tempos and carts and unfortunately there is no proper truck terminal for re-distribution of goods. But the new Transport Nagar construction is on progress to meet the future demand. The main city area particularly Naya Bazaar Area which is densely populated and main business centre has narrow lanes and by-lanes. There is no space for movement of vehicles or carts during day time. So movement of goods cannot simply take place during the business hours. It is desirable to shift Sabzi Mandi as well as some of the whole sale traders in order to decentralize the area.

## **7.3 TRIP PURPOSE**

Total number trips are broadly subdivided into home based and non-home based trip which are as 95% and 5% respectively. Homebased trips are those trips which have one end either origin or destination at home. Home based trips-are further classified as per purpose of the trip such as work, education, shopping, medical, recreation and others. It is found that 23.26% trips are accounted for work and 24.74% trips are made for education. Shopping trips account to 29.27%. Trips for medical, recreational and social purpose are quite nominal, thereby indicating poor mobility for social trips.





**Figure 7.1 Trip Purpose Distribution in Haridwar city**

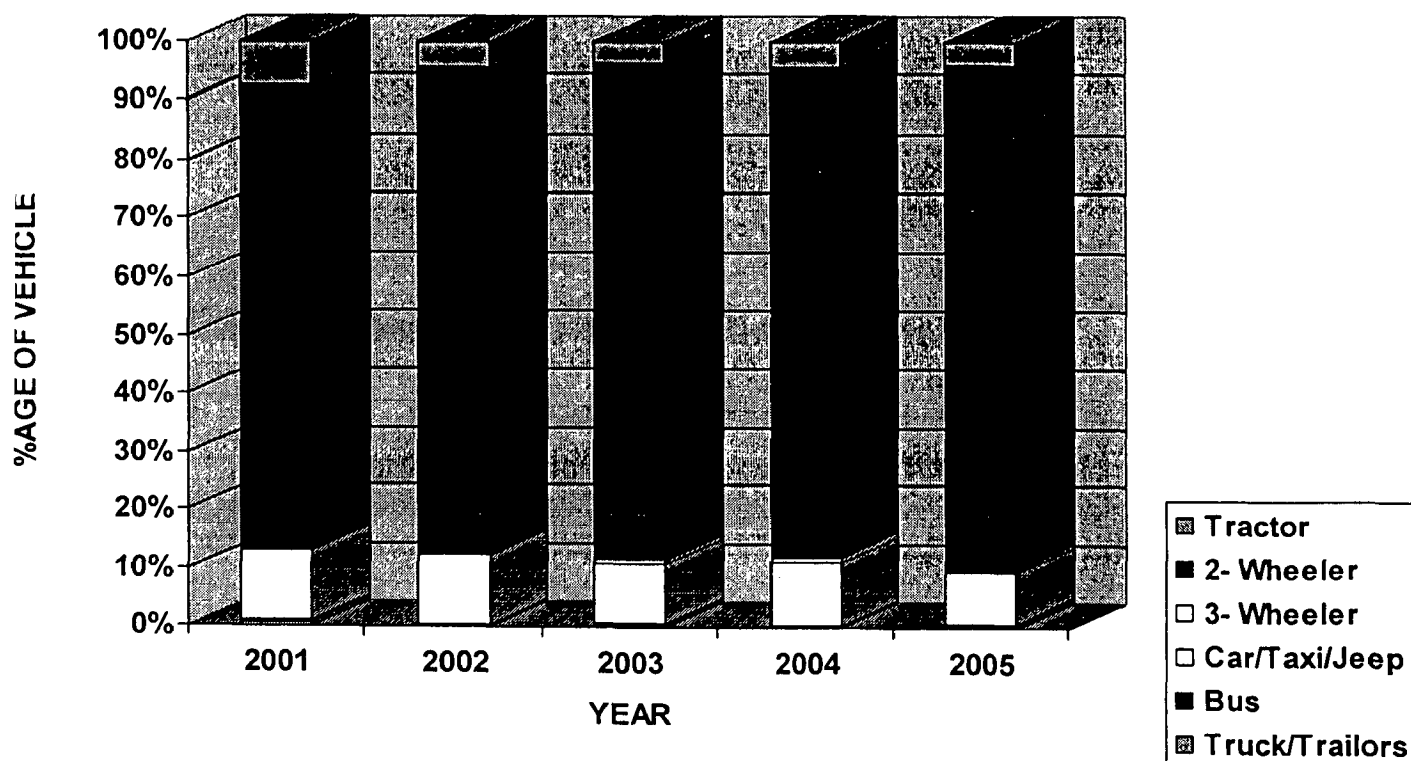
Source: Traffic Study report 1997 by Haridwar Development Authority.

#### 7.4 MODAL SHARE

**Table 7.1 Total No. of Fast Moving Vehicles Registered with RTO**

Type of vehicle	2001	2002	2003	2004	2005
Truck/Trailors	44	10	53	39	83
Bus	23	27	15	28	46
Car/Taxi/Jeep	775	906	1035	1236	1191
3- Wheeler	29	41	52	107	62
2- Wheeler	5161	6388	8459	9739	11751
Tractor	493	350	394	508	554
Total	6530	7725	10017	14905	14091

Source: R.T.O., Haridwar 2006.



Source: R.T.O., Haridwar 2006.

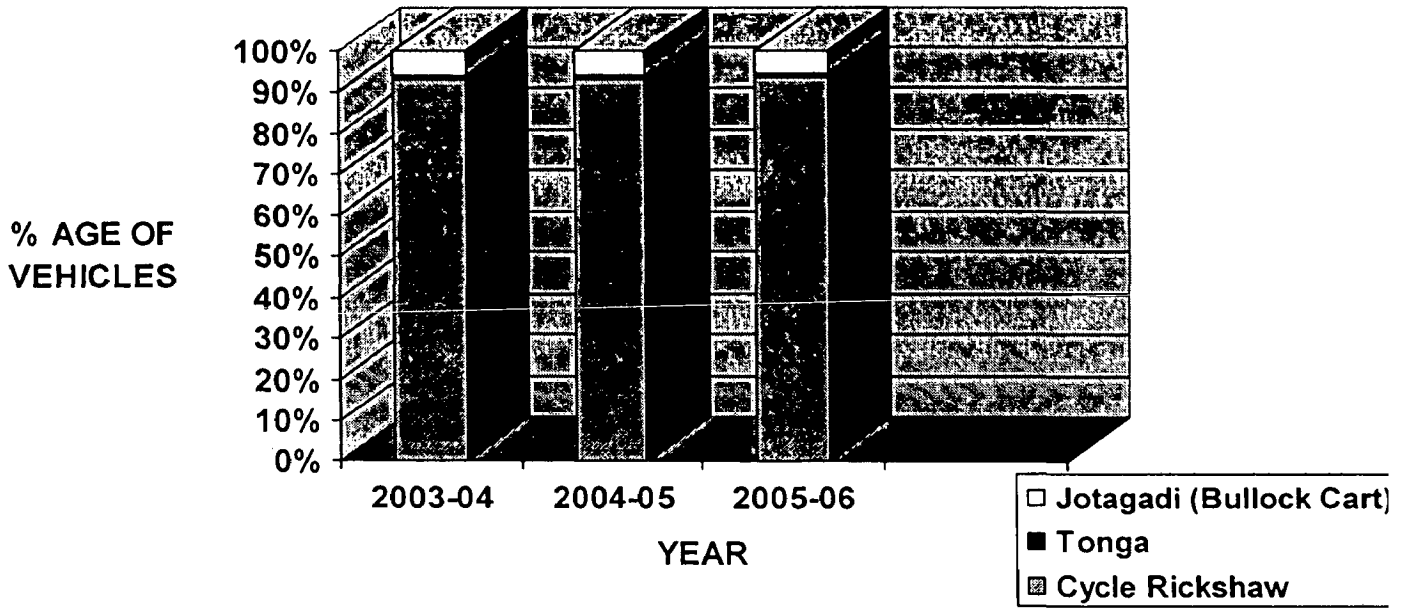
**Figure 7.2** Total No. of Fast Moving Vehicles Registered with RTO

**Slow vehicles**

**Table 7.2** Modal Share among Slow Moving Vehicles

Type of vehicle	2003-04	2004-05	2005-06
Cycle Rickshaw	1542	1549	1733
Tonga	15	15	15
Jotagadi (Bullock Cart)	100	100	100

Source: Nagarpalika, Haridwar 2006.



Source: Nagarpalika, Haridwar 2006.

**Figure 7.3** Modal Share among Slow Moving Vehicles

## **CHAPTER 8**

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# **PUBLIC TRANSPORT SYSTEM**

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### **8.1 ROLE OF PUBLIC TRANSPORT SYSTEM**

An efficient public transport system is a prerequisite for sustained economic development of the region. It is not only the key infrastructural input for the growth process but also plays a significant role in promoting the access to other amenities, more people to people interaction. Cheap public transport system promotes economic development and helps in preventing unduly economic decline. It helps in decentralization of city development for creating a cohesive urban environment. The important contributions it makes in terms of utilization of road capacity, safety, mobility for disadvantaged section of the society and economic savings in terms of fuel and environment.

### **8.2 EXISTING PUBLIC TRANSPORT SYSTEM IN HARIDWAR CITY**

The present Public transport in Haridwar city mainly comprises of bus service, railways and intermediate public transport (I.P.T.) system. While the bus and the rail largely fulfill the inter-city travel demand, the I.P.T. modes mainly cycle rickshaw, auto rickshaw, tonga fulfill the intra-city travel demand. The regional transport in the city operating from Bus Stand links vast areas in all directions by bus transport run under Uttaranchal State Road Transport Corporation. A fleet of more than 200 buses is plying under Bus Stand, State Roadways in order to meet the regional travel demand. But the condition of urban public transport is very alarming. Public transport is inadequate both in level of service as well as areas served. The intra-city public transport modes mainly comprises of Auto-rickshaws, Cycle-rickshaws and tonga. Besides local public transportation, one can hire taxis to commute between the various pilgrim sites in and around Haridwar.



**Figure 8.1 Existing Public Transport System in Haridwar City**

Source: Photographs taken by the Author (Feb. 2006)

### **8.2.1 CITY BUS SYSTEM**

The city bus service for intra-city travel demand is almost negligible, except a few buses operating for employees and students during morning and evening hours. For general public, there is no Government bus plying in the city. Only a few private buses are operating under the royalty system of UASRTC. This has led to a highly unreliable situation of city bus transport.

### **8.2.2 RAILWAY SYSTEM**

Haridwar city is well connected by the Railway system to the rest of the country, mainly fulfilling the inter-city travel demand. But Railways play a negligible role in

intra-city travel demand. Since the railway lines pass through the centre of the city and that too linearly touching almost every part of the city but it has not been provided with appropriate accessibility to enhance the usage of rail service. Presently, railway contribution in satisfying the local travel demand is almost zero.

### **8.3 INTERMEDIATE PUBLIC TRANSPORT (I.P.T.)**

The unreliability of bus service and its inefficient operation coupled with deteriorated road network has resulted in high patronage of IPT modes. It is serving almost all the public transport demand of the urban area of the city. Cycle rickshaw and auto rickshaw are the major I.P.T. modes which predominantly serve the needs of urban travel. Beside these, some Tonga also plays a role in IPT modes. Cycle rickshaws provide the maximum door to door service where auto rickshaws modified to 6 sealers are plying from point to point service. Most of the IPT modes are not having any fixed fare structure enforcing the passengers to use their own vehicles. Private taxies are also plying in the city but they are less effective due to high fare structure and longer-trip length.

Over all public transport analysis indicates that the public transport system, in general, is inadequate, inefficient and unplanned and therefore, it is not able to serve the travel demand of the city. Particularly, the city bus system which should play a major role in prospering Haridwar city is not available to the public. The deficient bus operation has forced the people to depend upon I.P.T. transport modes and personalized modes which are very costly and environmentally undesirable. This has resulted into a severe degree of congestion in the city along with a huge economic environment loss.

Therefore, considering the city structure and fluctuation in demand, it is proposed to have an integrated transport system in the city.

## CHAPTER 9

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# TRAFFIC AND TRANSPORTATION PROBLEMS

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### 9.1 IDENTIFICATION OF MAJOR TROUBLE CAUSING FACTORS

For identifying the major trouble causing factors, an attempt has been made by the author to assess the existing situation by employing the “**Rapid Appraisal Technique**”. For this, a sample of 50 people from different categories of society is taken and a questionnaire is prepared to collect as much information regarding the general problems of the transport.

The sample survey of 50 people includes people from 5 main categories, namely

- 10 people from government / non-government employees, teachers, traffic police officers.
- 10 people from business community like shopkeepers and wholesale traders.
- 10 people from informal sectors like street vendors, thelawala, and rickshaw wala.
- 10 people from students community.
- 10 people from the housewives of different localities.

**Table 9.1** Data collected by Rapid appraisal technique by the Author.

Category	Has motor vehicle (y/n)	Frequency of usage per week.	Has parking place (y/n)	Distance traveled per day
Officers	Yes-10	Daily	Yes-9, No-1	10-12 km Avg.
Businessman	Yes-10	Daily	50 % are having parking facility	20-30 km Avg.
Street vendors	Yes- 01	2-3 times	No parking facility	4-5 km. Avg.
Student	Yes-07	4-5 times	Yes-07	5-10 km Avg.
Housewife	Yes-03	4-5 times	Yes-03	5-10 km Avg.

Source: Data collected by Rapid appraisal technique by the Author (March 2006)

#### **Major Problems facing by Category “Officers” –**

1. Traffic Congestion due to narrow roads and encroachments.
2. Absence of an efficient public transport system.
3. Poor condition of road
4. Absence of proper parking facilities in main areas of the city.
5. Uncontrolled flow of traffic i.e. no signaling system.
6. No fixed fare structure of IPT modes specially cycle-rickshaw.

#### **Major Problems facing by Category “Business People” –**

1. Traffic congestion on main bazaar area.
2. There is no facility for transit of goods like truck terminal. (New Transport Nagar construction is on progress.)



3. Absence of proper parking facilities.

**Major Problems facing by Category “People from informal sectors” –**

1. No proper place for selling of their goods.
2. Harassment by traffic police.
3. Poor condition of the roads.
4. No fixed fare structure of IPT modes specially cycle-rickshaw.

**Major Problems facing by Category “Student Community” –**

1. Absence of an efficient public transport system.
2. Unreliable and low capacity IPT modes.
3. No signaling system to control the traffic flow.
4. Non following of traffic rules and regulations.
5. Traffic congestion in main areas of the city.
6. Mixed traffic.
7. No facilities for pedestrians like footpaths.

**Major Problems facing by Category “House wives” –**

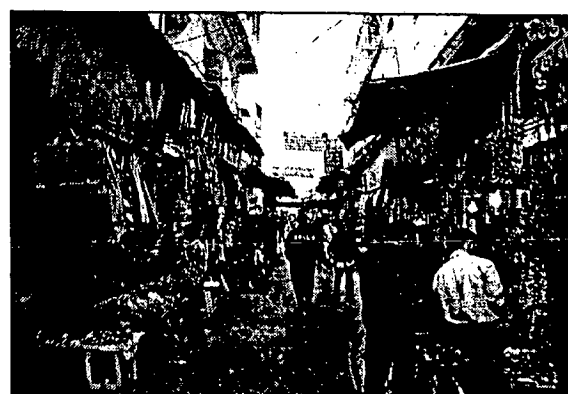
1. Traffic congestion in main areas of the city.
2. Roads accidents are increasing.
3. Absence of an efficient public transport system.
4. No fixed fare structure of IPT modes specially cycle-rickshaw.
5. Absence of proper parking facilities in main areas of the city.
6. No signaling system to control the traffic flow.

## 9.2 STUDY OF PROBLEMS AND THEIR CAUSES

In general, the causes of the all major problems associated with the Haridwar Traffic and Transportation are as follows:

- Due to the physical barrier like Shivalik Hill Ranges in the North West and river Ganges in the South East, the city has expanded linearly from Dudhadhari to Jawalapur area. This leads to haphazard linear land use development and has posed the special problems of accessibility among various pockets of the city.
- All major roads radiate from the principal road corridor of NH-58 at the staggered locations creating traffic congestion
- Development of mixed land use along the major arterial roads like Station road adds more problems to the city traffic.
- Due to mixed traffic pattern, narrow road width and emergence of informal sector along the main road sides, city roads have become congested.
- The poor public transport system and rapid increase of personalized vehicles has resulted into dominance of Intermediate public transport (IPT) modes. This enforced dependency on slow speed and low capacity modes has resulted into serious traffic problems and inefficient utilization of the transport infrastructure.
- Due to missing links among the between Roorkee Road, Nazibabad Road and Rishikesh Road, through traffic is disturbing the local city traffic.
- There is no signaling system in the city to control the traffic flow.

- Lack of parking space, especially in market area, encouraging on-street parking causing bottlenecks in the narrow roads.
- The Bus terminal (ISBT) is situated in the core area of the city and creating intensive congestion. This immediately needs to be relocated.
- There is a lack of coordination among various organizations handling road network system. It warrants immediate attention for better planning and development of the road network system.



**Figure 9.1 Traffic and Transportation Problems in the City**

Source: Photographs taken by the Author (March 2006).

## CHAPTER 10

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# TRAFFIC PROJECTIONS / FORECAST

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### 10.1 POPULATION PROJECTION

Initially, the city of Haridwar concentrated around Har-ki-Pauri and gradually spread along the western bank of river Ganga and Ganga canal in linear form. In the post-independence period, the city has been growing with a slow and heterogeneous growth rate and great deviation indicating poor correlation in the growth pattern of population. Just after independence, 1951-41 shows abnormally high population growth in the city due to partition of the country. Then, till 1971, the economic base of the city pertained mainly to pilgrimage and tourism industry besides agriculture. Due to its unique character, large number of hotels, restaurants and shops have come up in the city. This has strengthened the business and other commercial activities in the city. After 1971, there has been fast industrial development which contributed to the workforce share as well as economic prosperity of the city. Presently, in the new century, due to the progressive industrial policy of the government in this new state, the city can grow much faster than before.

There are several methods available for population projection. Here, the methods used for the population projection are (a) Arithmetical increase method, (b) Geometrical increase method and (c) Incremental increase method.

#### (a) Arithmetical increase method –

This method is based on the assumption that the population is increasing at a constant rate. This method is useful for smaller design period or for old and very large cities which have practically reached their maximum development.

The population of the Haridwar urban agglomeration in 2001 was = 1, 76, 909

Projected population at the end of year 2011 = 1, 76, 909 + 15,131.2  
= 1, 92, 040

Projected population at the end of year 2021 = 1, 92,040.2 + 15,131.2  
= 2, 07,171

(b) Geometrical increase method –

This method is based on the assumption that the percentage increase in population remains constant. This method is useful for the young cities which at present are expanding at faster rate.

The population of the Haridwar urban agglomeration in 2001 was = 1, 76, 909

Projected population at the end of year 2011= 1, 76, 909 + (22.08 % \* 1, 76, 909)  
= 2, 15, 971

Projected population at the end of year 2021= 2, 15, 970.51+ (22.08 % \*  
2, 15, 970.51)  
= 2, 63, 657

(c) Incremental increase method –

This method is a combination of the above two methods. In this method, average increase per decade is added with the average of the net incremental increases of the past decades. This method is considered to be the best for any city whether old or new.

The population of the Haridwar urban agglomeration in 2001 was = 1, 76, 909

$$\begin{aligned} \text{Projected population at the end of year 2011} &= 1,76,909 + [15131.2 + 2757]*1 \\ &= 1,94,797 \end{aligned}$$

$$\begin{aligned} \text{Projected population at the end of year 2021} &= 1,94,797.2 + [15131.2 + 2757]*1 \\ &= 2,12,685 \end{aligned}$$

**Table 10.1**

YEAR	POPULATION	DECADAL GROWTH	GROWTH RATE (%)	INCREMENTAL INCREASE
1901	25,597	-	-	-
1911	28,682	3,085	12.05	-
1921	30,764	2,082	7.26	-1003
1931	33,287	2,523	8.20	441
1941	40,823	7,536	22.64	5013
1951	57,338	16,515	40.46	8979
1961	59,960	2,622	4.57	-13893
1971	79,277	19,317	32.22	16695
1981	1,15,513	36,236	45.71	16919
1991	1,49,011	33,498	28.99	-2738
2001	1,76,909	27,898	18.72	-5600
	Average per decade	= 151312/10 = 15131.2	=220.82/10=22.08	=24813/9=2757

**Population Projections by Various Methods**

Source: Prepared by the Author.

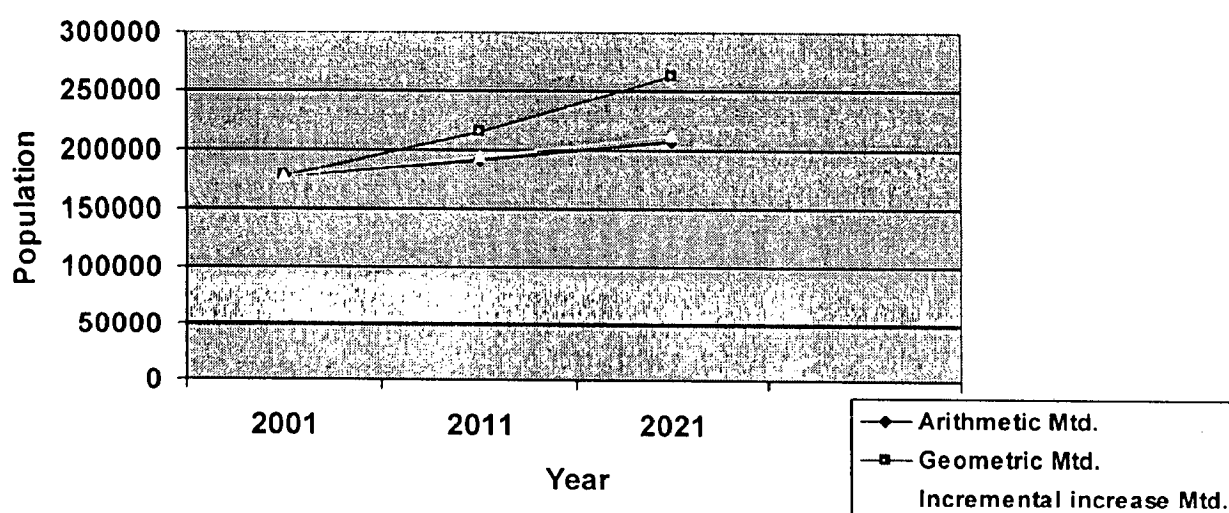


Figure 10.1 Population Projections by Various Methods

Source: Prepared by the Author.

## 10.2 TRAFFIC FORECAST

In the traffic forecast, Geometrical increase method has been used because only this method gives realistic projections of traffic. Since, traffic is a very dynamic entity and it always grows fast with the factors like time, development, economy, social upliftment etc.

**Table 10.2**

Year	Total no. of vehicles regd.	% increase
2001	6530	
2002	7725	18.3
2003	10017	29.67
2004	14905	48.79
2005	14091	-5.46
		Average = 22.83%

Source: R.T.O., Haridwar 2006.

### Traffic Projection by Geometrical Increase Method

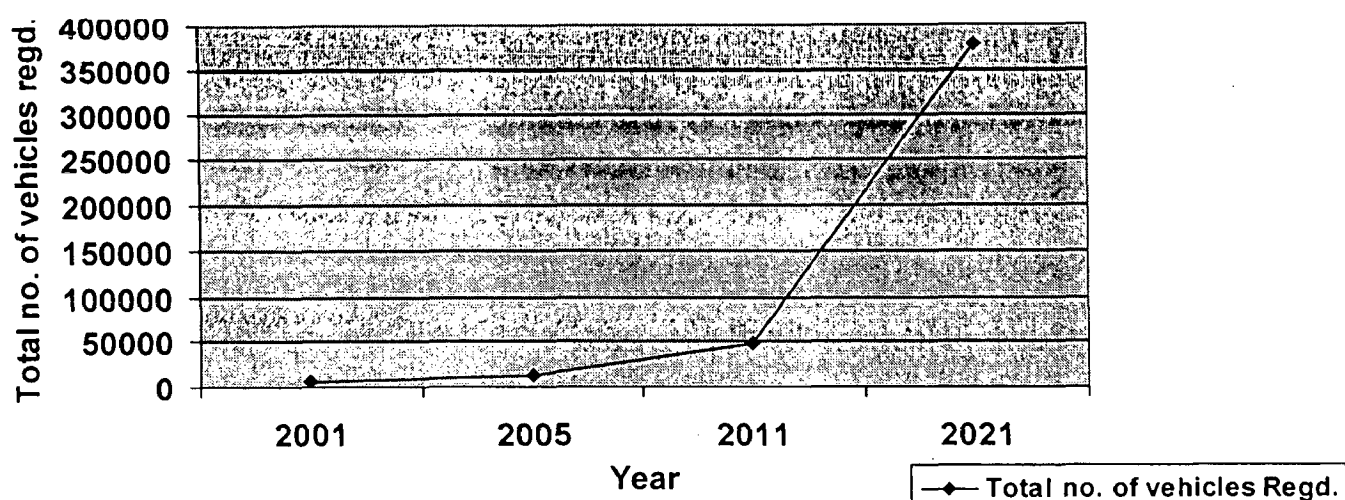
Total no. of vehicles registered in the year 2011

$$= 14091 [1 + 22.83\%]^6 = 48391$$

Total no. of vehicles registered in the year 2021

$$= 14091 [1 + 22.83\%]^{16}$$

$$= 378280$$



**Figure 10.2 Traffic Forecast by Geometrical Increase Method**

Source: Prepared by the Author.

**Table 10.3 Total Number of Vehicles Registered with RTO**

Type of vehicle	2001	2002	2003	2004	2005
Truck/Trailors	44	10	53	39	83
Bus	23	27	15	28	46
Car/Taxi/Jeep	775	906	1035	1236	1191
3- Wheeler	29	41	52	107	62
2- Wheeler	5161	6388	8459	9739	11751
Tractor	493	350	394	508	554
Total	6530	7725	10017	14905	14091

Source: R.T.O., Haridwar (2006)



## CHAPTER 11

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# KUMBH MELA STUDY

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### 11.1 KUMBH MELA SCENARIO

Haridwar is regarded as one of the most sacred pilgrimage centres of India. It has a very special character of being the holy city of Hindus where a large number of pilgrims and tourists come every year. Haridwar is one of the four places on the earth where world famous Kumbh mela celebrated after every 12 years and Ardh Kumbh after every six years. It is said that drops of Amrit (*Elixir*) fell in to the Brahmkund of Har-Ki-Pauri, therefore believed that a dip in the Brahmakund on this particular day which is very auspicious and when Jupiter (*Brahaspati*) comes to the sign Aquarius (*Kumbh*) once in every twelve years. During these festivals, the city becomes the focal point of so many sadhus, pilgrims, sanyasies etc. The main bathing days are Somvati Amavasya, Basant Panchami, Maha Shivratri, Chaitra Amavasya, Nav Samvatsar, Ram Navami, and Mesh Shankranti arid Poornima. All these bathing days fall in the months of February, March and April every year. On an average, every year 40 to 50 lakh pilgrims and tourists come to the city which poses the most difficult challenge for the administration.

In the Ardh-kumbh Mela 2004, about 1.50 crore pilgrims visited Haridwar which is even far more than the population of the Uttaranchal (84.89 lakh) and took bath on main bathing days. According to Mela Report, The highest volume of pilgrims was 35 lakh on main bathing day i.e. Mesh sankranti day. Out of this, 6 lakh came by railways and 4 lakh pilgrims already stayed in the city. Rest 25 lakh have come by five regional approach roads and around 30 % came by Roorkee road through Bahadrabad.

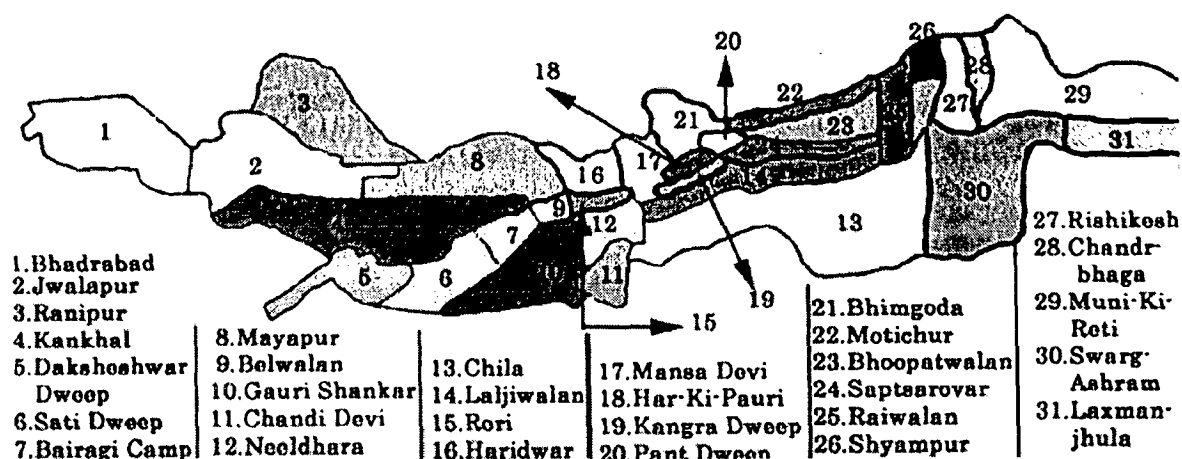
It becomes a very great problem for the administration to control such a huge congregation of people and manage the services as well as their mobility for taking bath at Har-ki-Pauri. For the safe operation and to avoid any mishap, the whole administrative machinery is geared up to arrange various facilities and utilities for the pilgrims. A large temporary urban infrastructure and facilities including several over bridges are constructed and a huge amount of money is spent within a few days. Still the occurrence of any mishap remains doubtful adding to the fear. Therefore, it necessitates of a well planned traffic management plan particularly circulation plan and parking for the future.

## 11.2 TRANSPORT NETWORK

The city of Haridwar is well connected by roads and railways to the rest of the country. Here, railways share very nominal part of regional traffic and roads serve the major portion of inter-city traffic. There are four major radial corridors namely Roorkee Road (NH-58) from west side, Laksar Road from south side, Nazibabad Road from South-East side and Rishikesh Road from north side.

The land use under transport sector in the city is just 6.5% of the developed area which is highly insufficient to meet the travel demands of the city particularly during Mela seasons. The urban roads including junctions are very *poorly designed* causing traffic jams and unsafe travel conditions in the city. The limited road space is drastically reduced to 10.0 m to 15.0 m right-of-way where in Master Plan; it is proposed to be 30 ms. This problem is degrading the functional performance of the city day by day and degenerating the vehicular roads to pedestrian streets like Upper Road. So, it can be noticed that the urban transport network is not able to capacitate the city traffic and putting a big question mark for the travel needs during Kumbh Mela.

It has been observed that the access to Har-ki-Pauri is very poor and even during normal days, the traffic hazards and chaos can be visualised on Upper Road and Station Road due to intensive encroachments and during Kumbh Mela, the problem of accessibility is tremendous. So, the administration has to formulate certain strategy for safe access of Har-ki-Pauri.



**Figure 11.1 Kumbh Mela area divided into 31 Sectors**

Source: Mela Bhawan, Haridwar 2005

### 11.3 CRITERIA FOR TRAFFIC MANAGEMENT PLAN FOR KUMBH MELA

1. It is observed that the 60% of total traffic occurs on main bathing day of the mela i.e. Mesh Sankranti (peak day) which is the most crucial day for the authority. The other main bathing days also experience very high volume of traffic. So these days are considered as peak days of Kumbh Mela during the months of March and April. Accordingly, the traffic management plan has to be prepared in various alternatives keeping in mind these factors.

2. It can be clarified that during main bathing days of Kumbh Mela, the main city area should not be disturbed and the regional traffic should be segregated from the city. Therefore, traffic coming from major road corridors of Roorkee Road, Laksar Road, Nazibabad Road and Rishikesh Road should not be allowed to enter in the main city area during peak days of mela.
3. It is also observed that only road for through traffic is Bypass Road and at the same time from Bahadradabad to Rishikesh, it is totally covered by mela activities. Hill Bypass is not suitable for traffic. So through traffic should be diverted from Muzaffar Nagar to Luxur Road or from Roorkee to Dehradun during the period of peak days.
4. The regional traffic approaching to Kumbh Mela on main corridors have to be stopped at the points where the normal functioning of Kumbh Mela is started and parking lots have to be provided at these points.
5. The regional vehicular traffic has been divided according to their respective originating road corridors. They are not allowed to mix with other regional traffic flow or bypass from one corridor to other.
6. The incoming and outgoing traffic flow of pilgrims has to be segregated to the best possible extent.

## CHAPTER 12

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# TRANSPORT DEVELOPMENT PROPOSALS AND STRATEGIES

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### 12.1 IN GENERAL

Haridwar city has witnessed a remarkable growth in the last three decades due to its special character of being a famous and important pilgrimage centre. Apart from the pilgrimage and tourism, the city has witnessed a rapidly growing industrial and commercial sector. At the same time, provision of infrastructure facilities including transportation system did not keep pace with the ever increasing demand and the existing traffic pattern is characterized by congestion on roads, traffic delays and increase in accident rates.

So, in order to make transport system efficient, there is a continuous need to maintain compatibility between the travel demand and supply of transport facilities in the city. Therefore, the envisaged transport development proposals and strategies can be sub-divided into the three heads, namely –

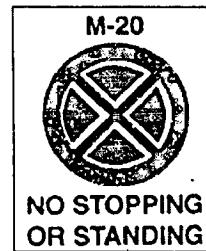
- i) Short Term Proposals
- ii) Medium Term Proposals
- iii) Long Term Proposals

### 12.2 SHORT TERM PROPOSALS

The short term proposals are aimed at solving the traffic and transportation problems by making optimum use of existing roads and other facilities in central business district and other busy areas. These solutions are low cost measures meant for immediate implementation like intersection improvements, parking, speed control and other regulatory measures.

### **Road Network Improvements**

1. First of all, Traffic signs and road markings must be provided as per I.R.C. standards and specifications to improve the traffic flow along the major roads namely Station Road, Kankhal Road, Rishikesh Road, Bypass Road and Hill Bypass Road.



2. One of the most problematic aspect which endangers the safety of road users is the frequent median gaps in the central verge of the road. These median gaps tend to result into uncontrolled traffic flow leading to jamming chaos and accident prone conditions. The Station Road has a few dangerous median gaps which should be closed. A median gap can be provided, if necessary, after the minimum interval of half Km.

### **Intermediate Public Transport (I.P.T.)**

1. Rationalization and augmentation of circulation pattern for I.P.T modes by fixing routes and restriction of entry in certain areas.
2. Regulation of fare structure.
3. Enforcement of traffic control measures by traffic police.
4. Restriction on the increase of in the IPT population.
5. Restrictions on waiting and parking
6. Designating the stops for boarding.

### Improvements for Parking Facilities

1. On-street parking should be regulated without disturbing the capacity requirement of the arterial roads. For example, Station Road from Kotwali Chowk to LaltaRao Chowk can be developed for on-street parking for two-wheelers.

2. Loading and unloading operation of goods vehicles in the city specifically in CBD area should be restricted from 8 A.M. to 7 P.M.



3. The loading and unloading bays should be provided.
4. Parking fees in critical areas for passenger as well as goods vehicles should be introduced.
5. Bus stop clearway should be provided.

### Improvement of Pedestrian Facilities

1. Clearance of encroachment from foot paths.
2. Provision of zebra crossings on the road junctions.
3. Installation of proper road signs and markings for movement of pedestrians.
4. Restriction of vehicle entry in heavy pedestrian areas like Upper road from Lalta Rao Chowk or Kotwali to Bhimgoda Chowk.

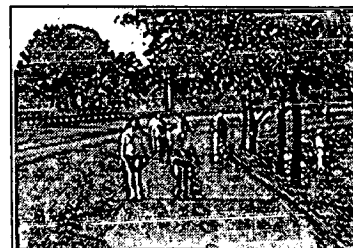


## 12.3 MEDIUM TERM PROPOSALS

Medium term proposals cover the measures to be taken up between 2-5 years by employing traffic engineering measures.

### Physical Improvement of Road Network

1. Widening of carriageway generally within the available right-of-way.
2. Introduction of central verge for segregating directional traffic flows.
3. Improvement of street lighting system.
4. Provision of bus bays and relocation of bus stops and auto bays at least 50 ms away from the road junctions.
5. Provision of footpaths and pedestrian ways in the existing road network system.



On priority basis, the road sections to be considered for medium term improvement are **Station Road** from Kotwali to Jawalapur, **Rishikesh Road** from Bhimgoda to Dudhadhari Chowk, **Kankhal Road** from Shankracharya Chowk to Kankhal Chowk and **Desh Rakshak Road** from Surprise Hotel to Kankhal Chowk.

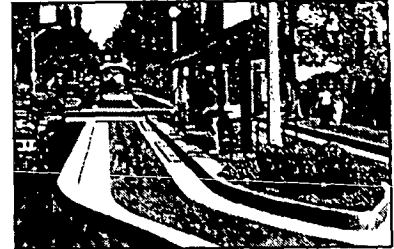
### Improvement of Public Transport

1. Based on the desire lines of travel demand, the city bus route system should be planned and regularized.
2. Accessibility for the passengers to bus stand should be improved by rationalization of routes.



3. Passenger waiting time should be minimized by ensuring the required frequency of bus trips.

4. For mobilization of resources for city bus transport, the administration may consider to privatize the operation but strictly under the control of the local government body.



5. Bus stand for regional buses should be shifted to some where to Bypass Road of the city and the present Bus Stand should be utilized for local bus service. At the maximum the regional Bus Service from Rishikesh can also be retained as local bus service.

6. Four transit points for bus passengers should be developed namely at Bahadrabad Chowk, Singh Dwar Chowk, Chandi Ghat and Dudhadhari Chowk. This will help to interchange buses for intra-city and inter-city passengers.

### **Landuse Control Proposals**

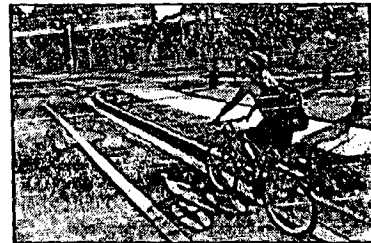
Since, traffic is a function of landuse, therefore many of the problems can be solved by controlling land use planning and developments.

1. The direct access of the commercial buildings to the main roads should be restricted.
2. The problematic landuses like vegetable market, bus stand, auto repair market etc. should be shifted to off-road locations to well planned markets.

3. The multi-storey buildings and other commercial buildings should be enforced to provide parking facilities for the vehicles.
4. The problematic landuses like vegetable market, bus stand, auto repair market etc. should be shifted to off-road locations to well planned markets.
5. Ribbon development along the major road corridors specifically along Bypass should be controlled.
6. The overall landuse activities should be controlled by providing footpaths with strong railing along the roads.

### **Improvements for Cyclists**

1. Proper segregation of the cyclists and cycle rickshaws especially along the major corridors like Bypass Road from Sarai Chowk to Dudhadhari Chowk, Roorkee Road from Sarai Chowk to Bahadrabad Chowk, Luxur Road and Rishikesh Road.
2. Cycle stands should be provided at critical locations integrated with public transport system like Bus stands, Railway stand and on major transit points.



## **12.4 LONG TERM PROPOSALS**

Long term proposals are capital intensive and are mostly in terms of providing infrastructure facilities i.e. provision of flyovers, new terminal facilities etc. to meet the future travel demand of the study area.

### **Land Use Proposals**

1. The central part of the city i.e. around Har-ki-Pauri should be totally banned for any type of further commercialization or construction of multi storey commercial houses and should be decentralized by promoting commercialization in the outer cordon areas.
2. Major localities specifically the conventional as well as unauthorized ones should be undertaken for urban renewal projects.
3. The Transport Nagar area should be planned keeping in mind the existing transport network, parking and circulation pattern of the city.
4. New bus terminals should be planned and developed on outer cordon areas like Luxur Road for intercity bus service in order to decongest the central core area.

### **Road Network Proposals**

1. All the major roads have to be planned and redesigned as per the requirement of the future travel demand and have to be improved by removing all bottlenecks as well as by improving geometric design of such roads like Station Road from Pul Jatwara to Kotwali Chowk, Kankhal Road from Kankhal Chowk to Shiv Murti Chowk, Rishikesh Road from Bhimgoda to Dudhadhari Chowk, Bypass Road and Hill Bypass.
2. All the missing links in the road network have to be identified and have to be abridged for better accessibility and mobility.

3. In order to generate smooth and efficient traffic flow and to provide safe and convenient travel conditions, some narrow bridges have to be widened and some new bridges have to be constructed.

### **Proposals for Pedestrians and Cyclists**

1. Some streets have to be declared as fully pedestrianized along with the construction of some new footpaths.
2. All important facilities for the pedestrians have to be provided by the local authority.
3. All corridors having high cyclist volume, either separate cycle path or mixed cycle track have to be provided.

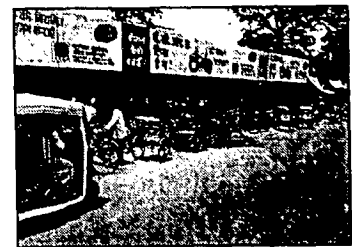
### **Improvement of Public Transport System**

1. To control the severity of the traffic congestion and to satisfy the future travel demand of the city, the development of mass transport system is highly desirable. Mass transport includes city bus service and local railways. These have to be provided as per the traffic study i.e. modal share, trip interaction, traffic volume etc. on all major roads.
2. Intra-city and inter city bus service should be planned and developed by augmentation of terminal facilities and management policy, by broad route plan and by developing bus transport infrastructure.
3. Mobility of passengers has to be improved by introducing local railways.
4. IPT terminal facilities have to be provided in relation to the public transport system and these modes should be used as feeder system mainly.

5. New technological improvements have to be considered for the Buses and IPT.

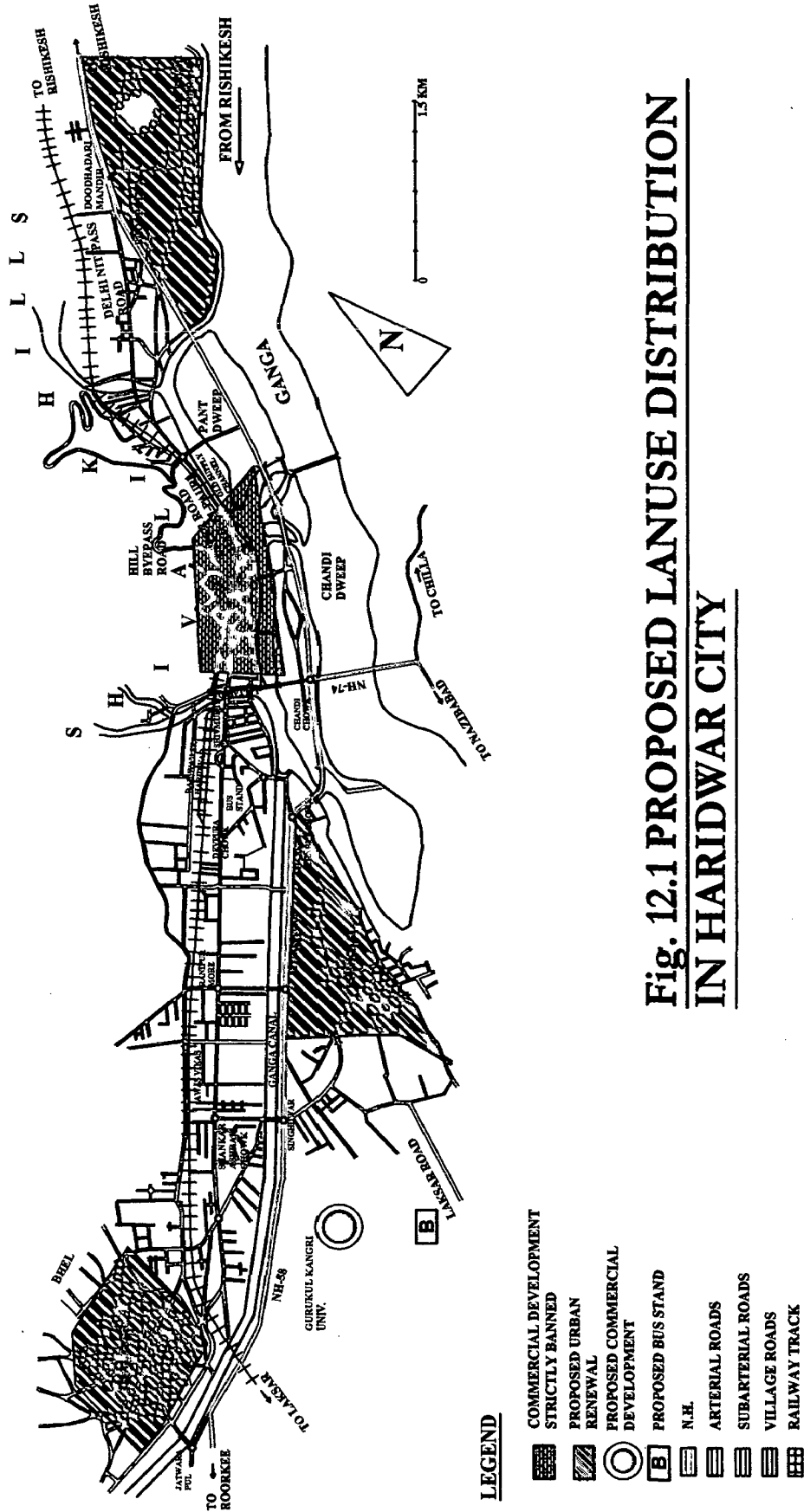
### **Improvement for Parking**

1. Some off-street parking lots have to be considered to solve the problem of parking.
2. Some policy guidelines regarding time limits and charging for on-street parking should be introduced.



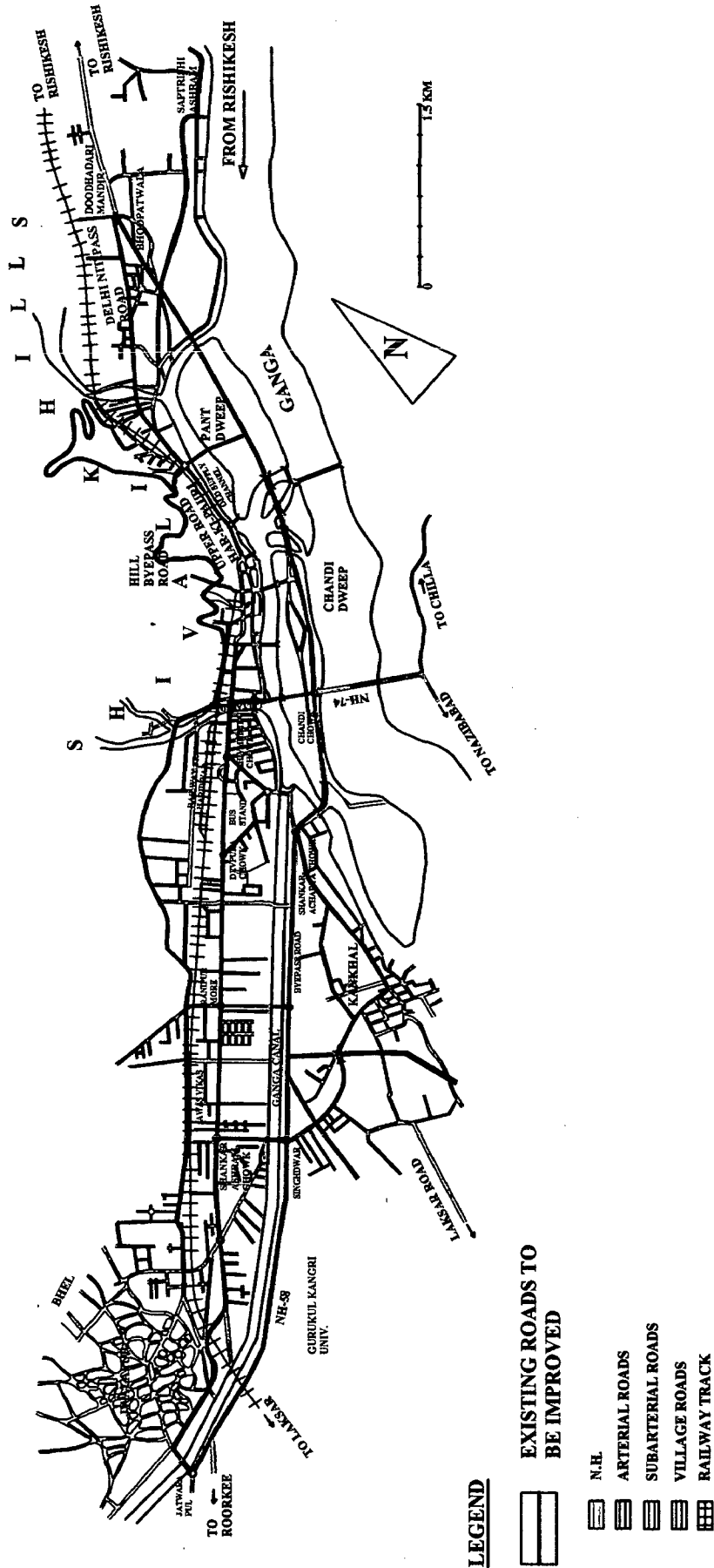
### **Improvement of Goods Transport System**

1. Transport Nagar area has to be developed in the outer cordon areas with all facilities and amenities. A Transport Nagar has already been proposed at Jawalapur.
2. Transshipment facilities to CBD areas from Transport Nagar have to be provided.
3. Goods transport facilities should be synchronized with the road/railways network.



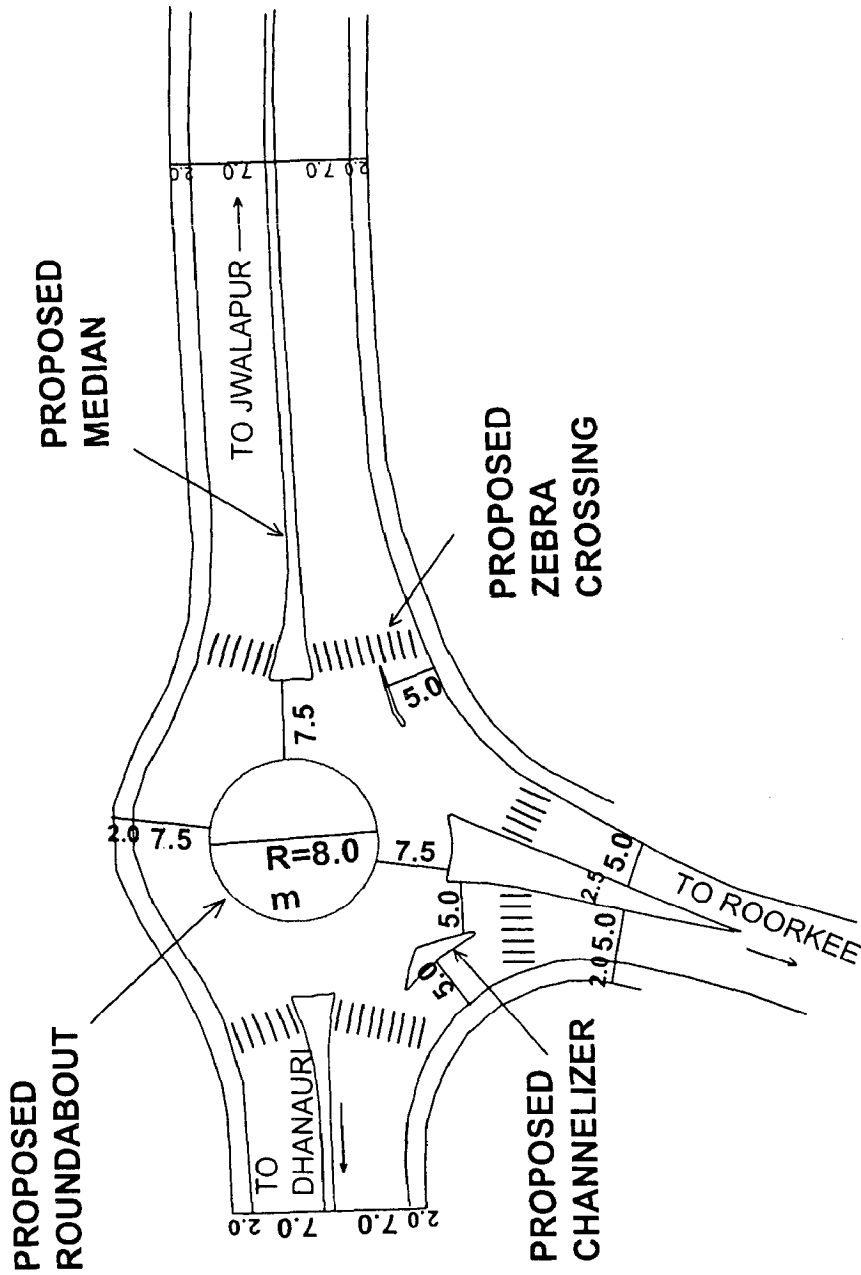
**Fig. 12.1 PROPOSED LANUSE DISTRIBUTION IN HARIDWAR CITY**

Source: Author



**Fig. 12.2 IMPROVEMENT OF EXISTING ROADS IN HARIDWAR CITY**

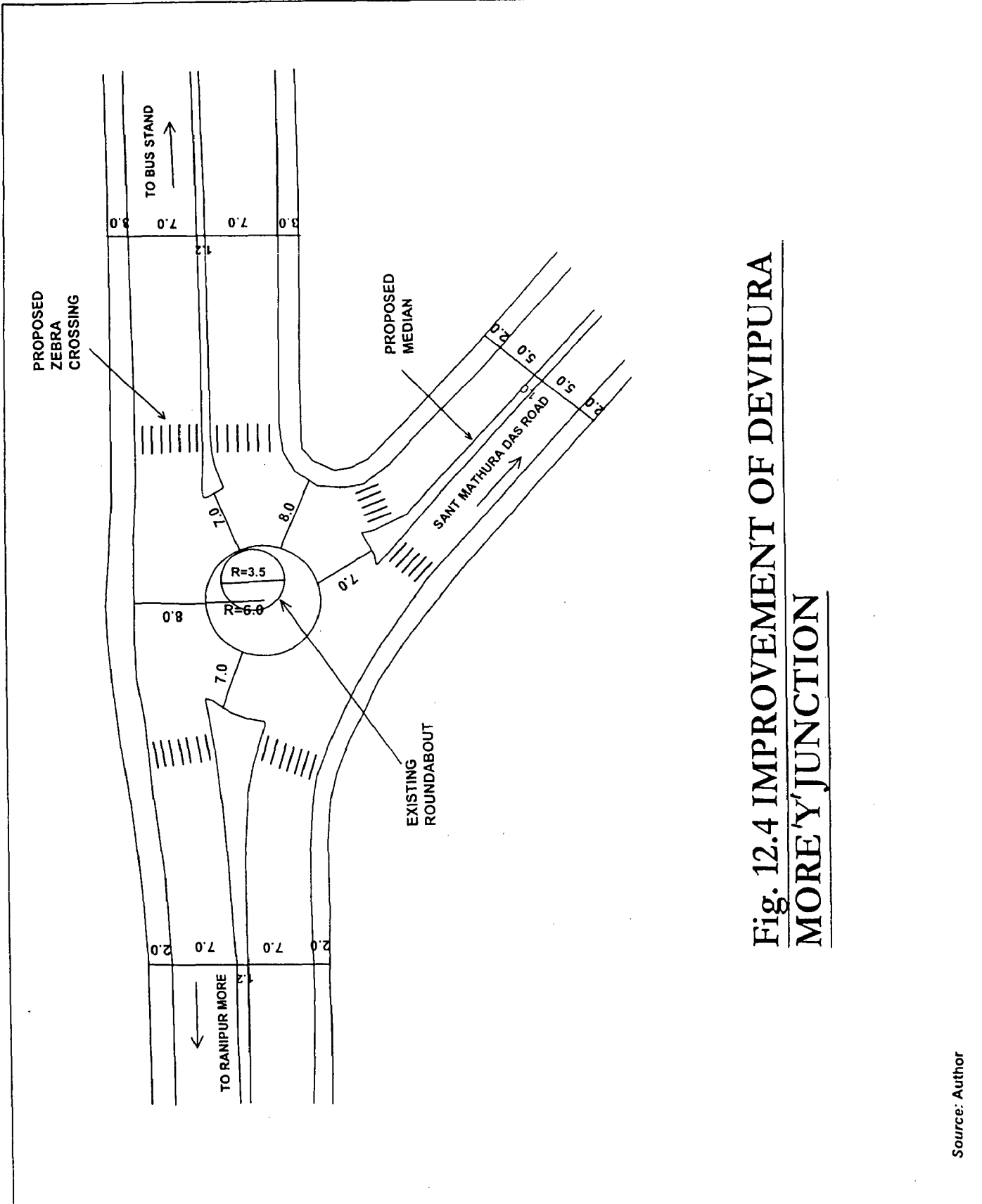
Source: Author



**Fig. 12.3 IMPROVEMENT OF BAHADRABAD 'Y' JUNCTION**

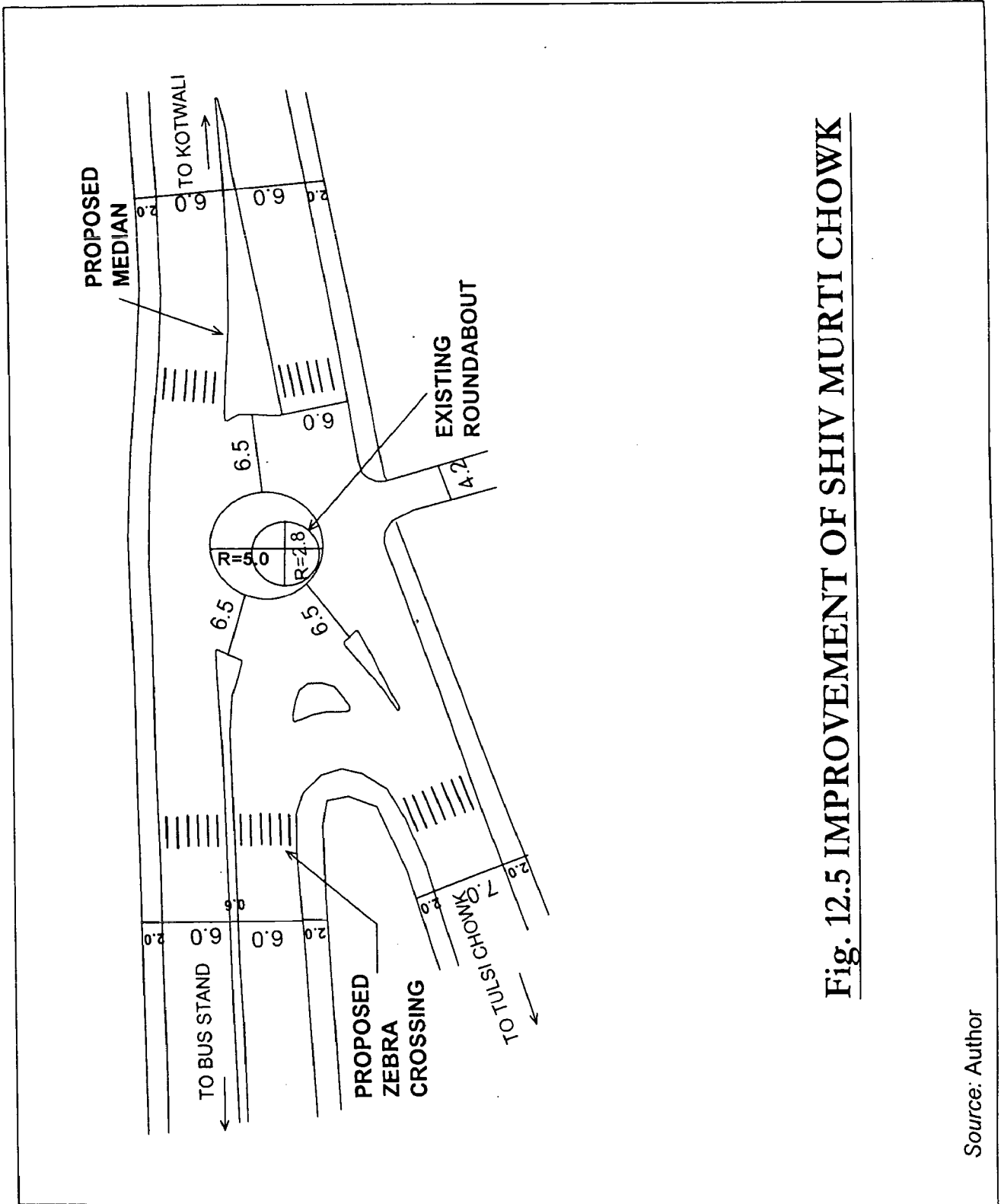
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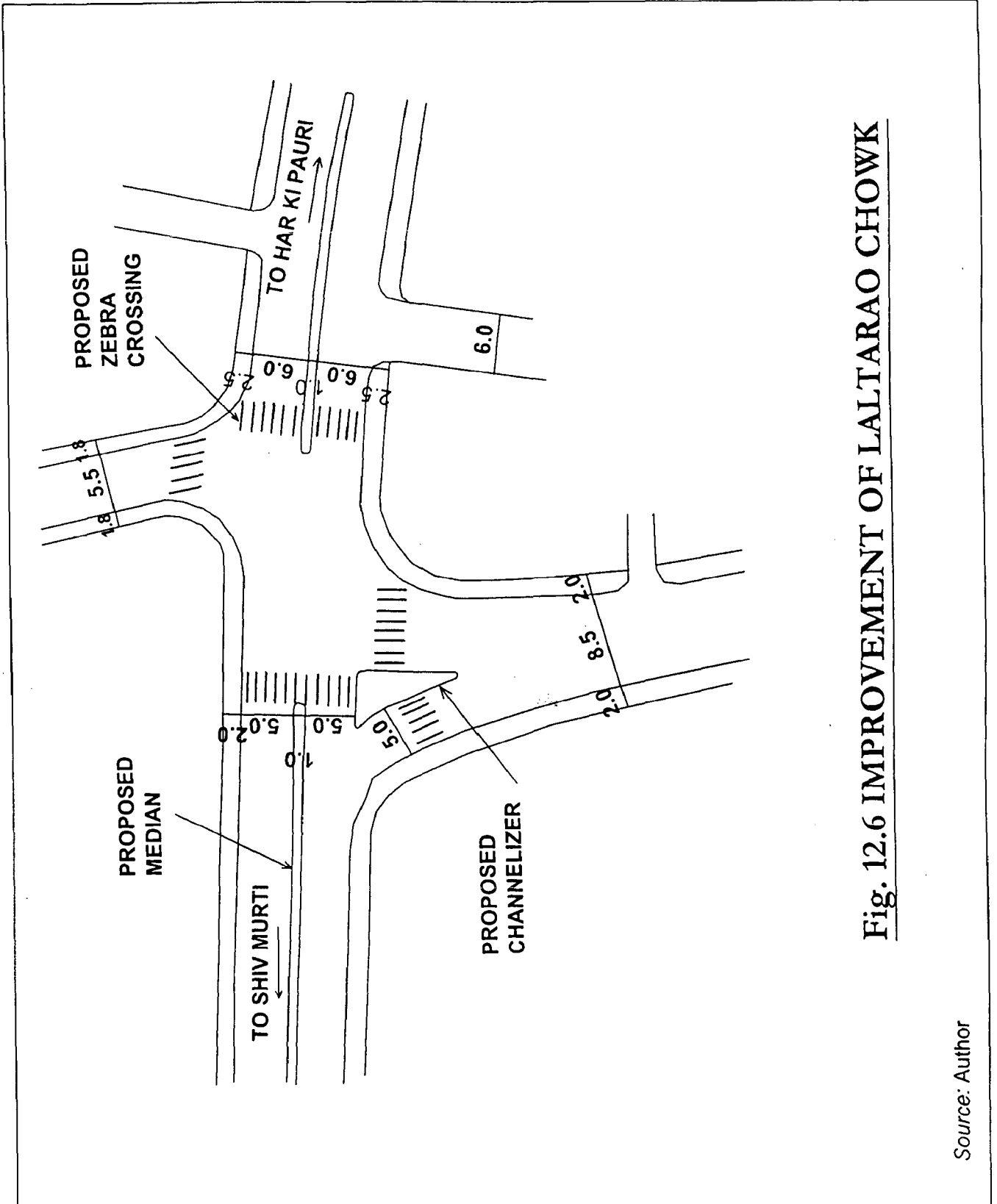
**Fig. 12.4 IMPROVEMENT OF DEVIPURA  
MORE 'Y' JUNCTION**

Source: Author



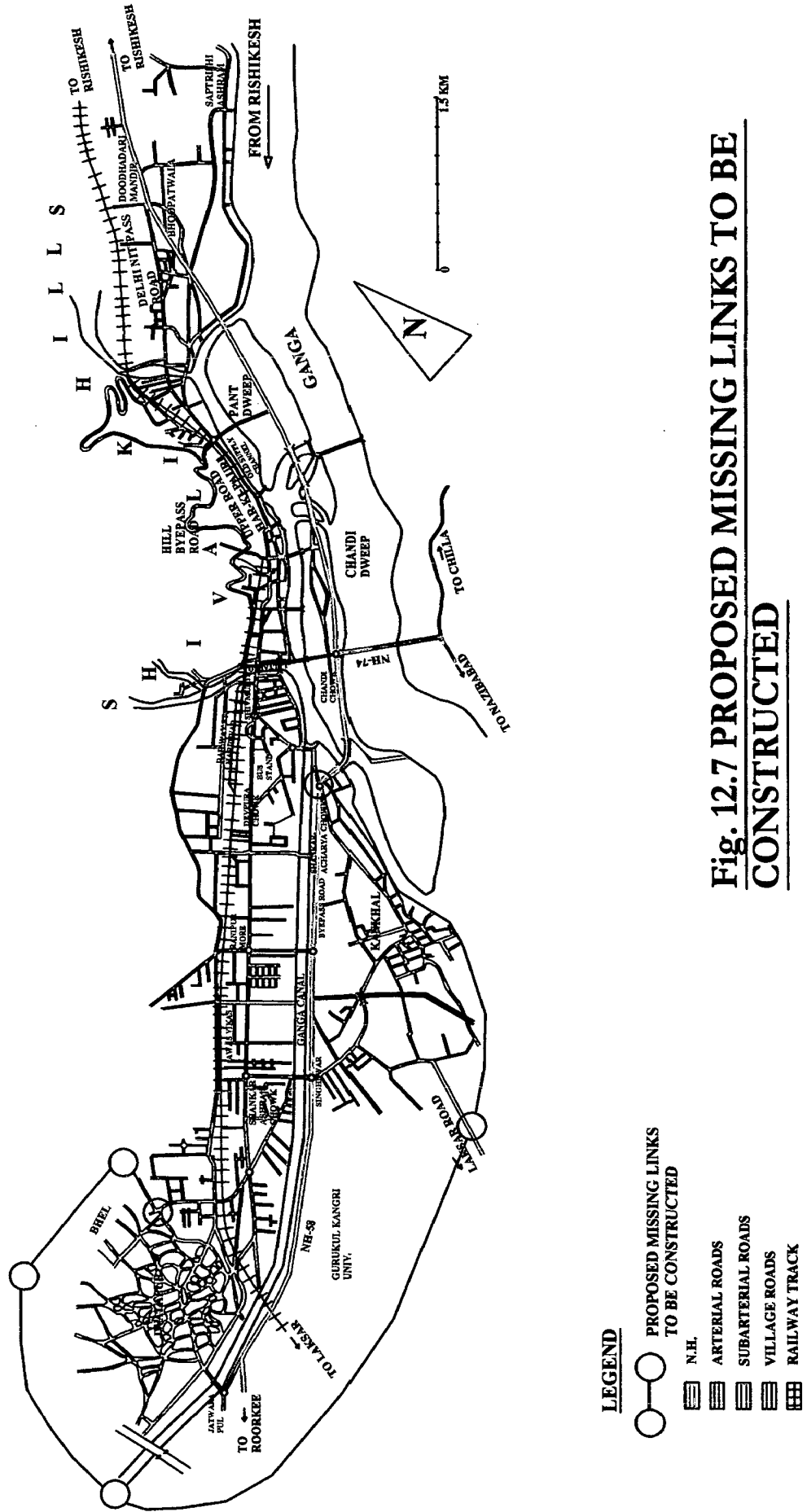
**Fig. 12.5 IMPROVEMENT OF SHIV MURTI CHOWK**

Source: Author

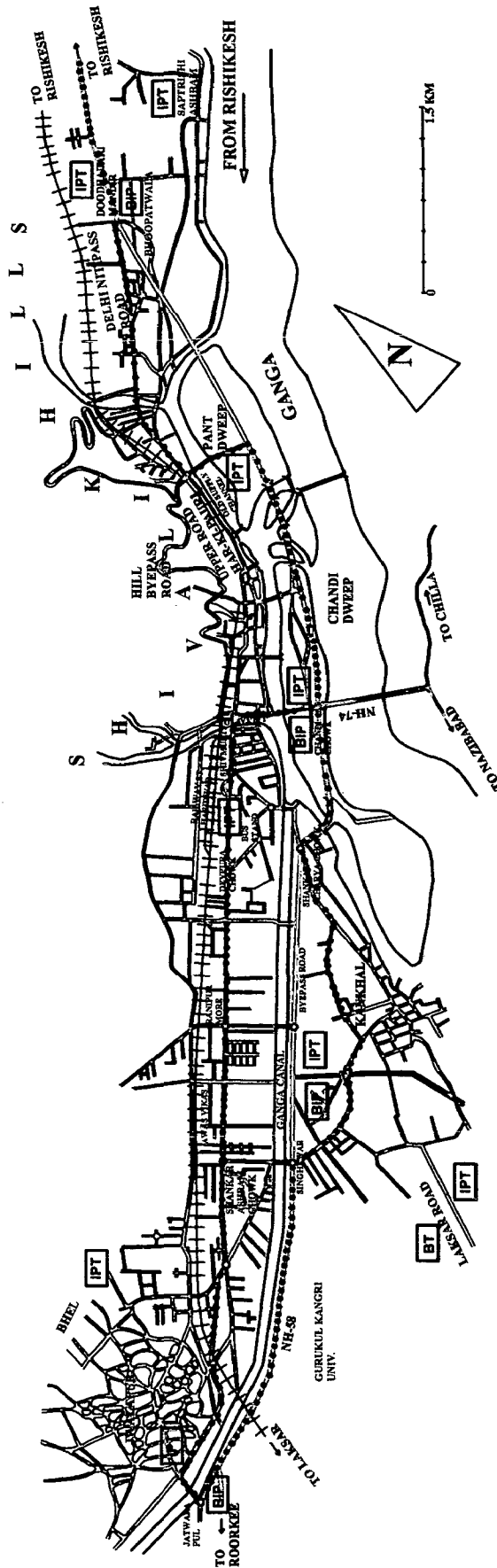


**Fig. 12.6 IMPROVEMENT OF LALTARAO CHOWK**

Source: Author



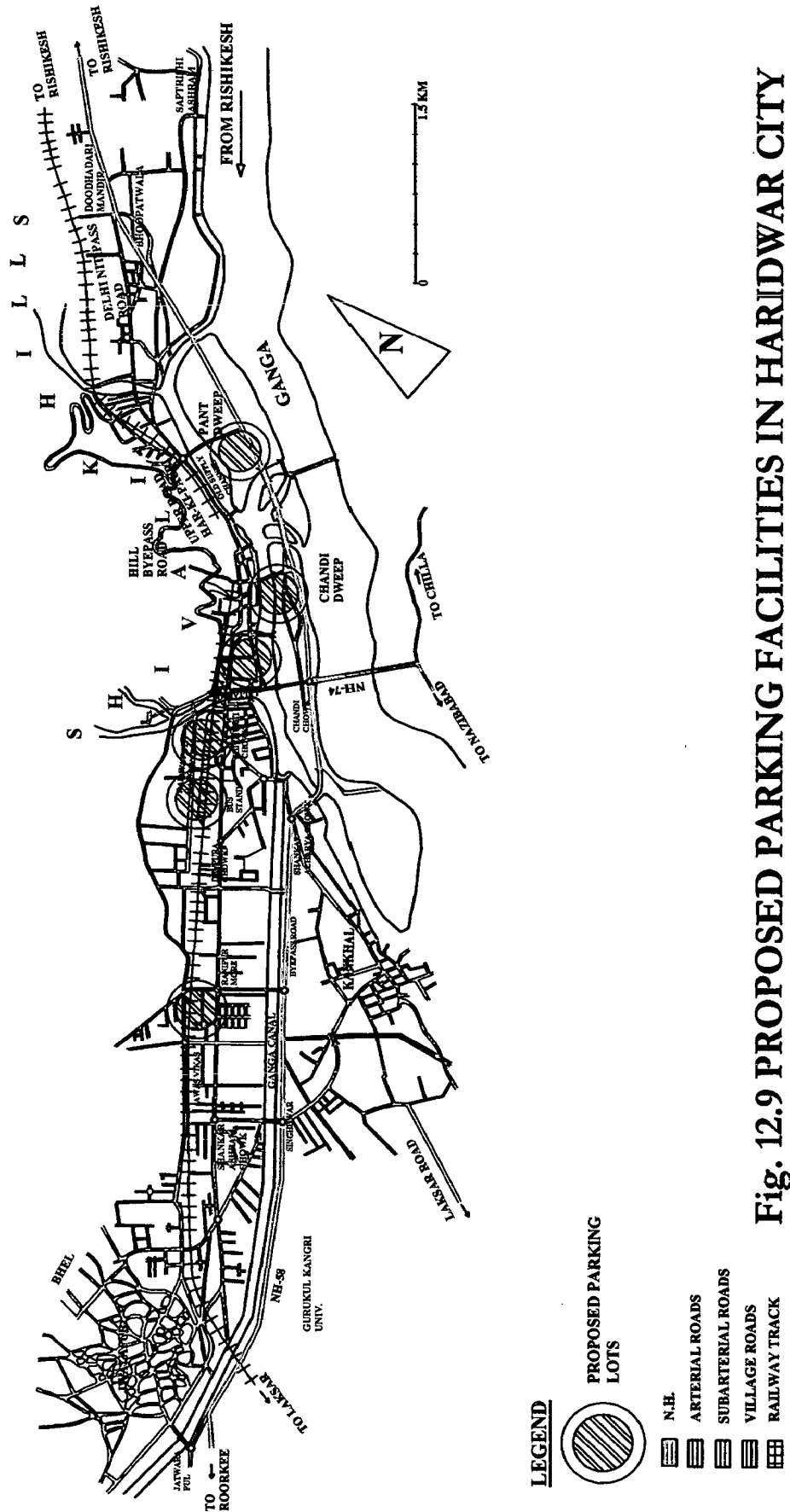
Source: Author



**Fig. 12.8 PROPOSED CITY BUS ROUTES AND  
TERMINAL FACILITIES IN HARIDWAR CITY**

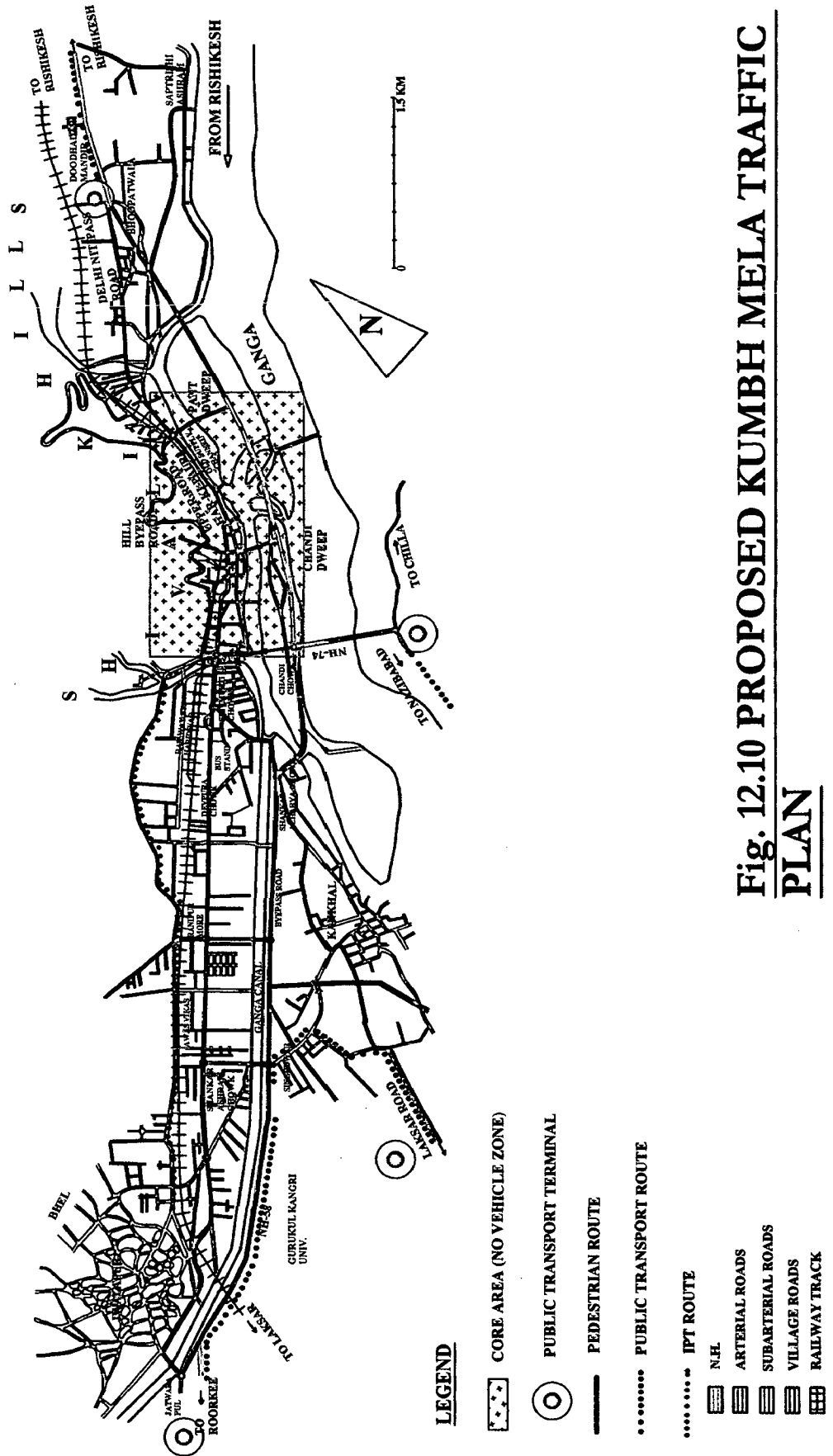
- LEGEND**
- ..... CITY BUS ROUTE
  - BT BUS TERMINAL
  - IPT IPT TERMINAL
  - BIP BUS INTERCHANGE POINT
  - N.H. NATIONAL HIGHWAY
  - ARTERIAL ROADS
  - SUBARTERIAL ROADS
  - VILLAGE ROADS
  - RAILWAY TRACK

Source: Author

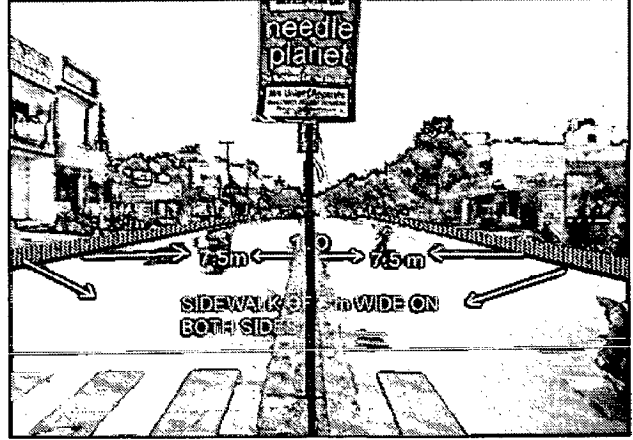


**Fig. 12.9 PROPOSED PARKING FACILITIES IN HARIDWAR CITY**

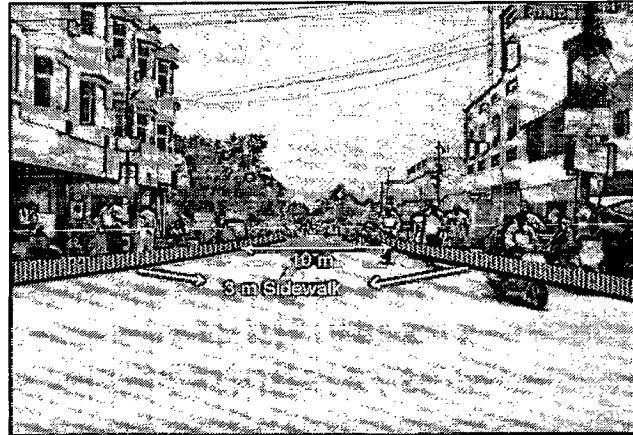
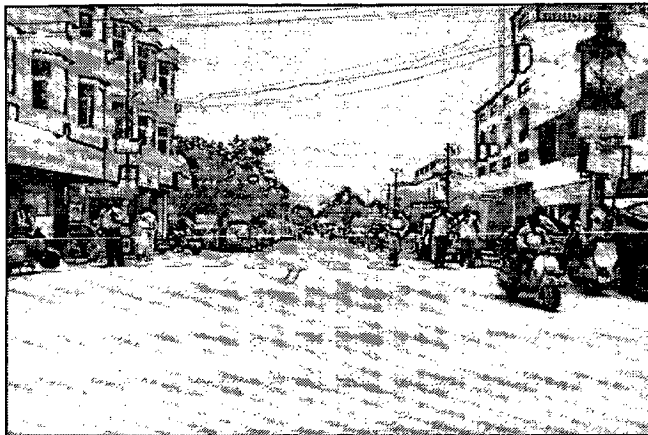
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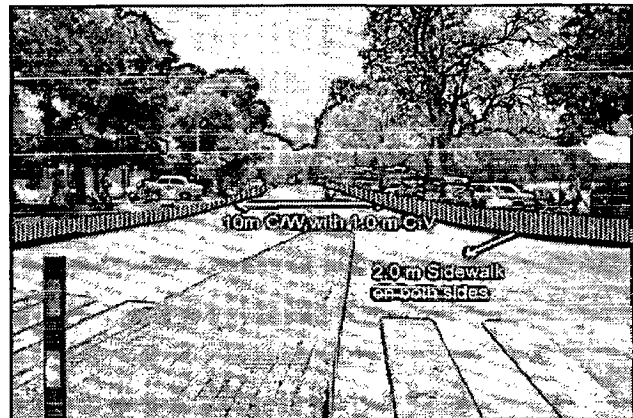
Source: Author



Before After  
Road Section view from Ranipur more towards Devipura Chowk

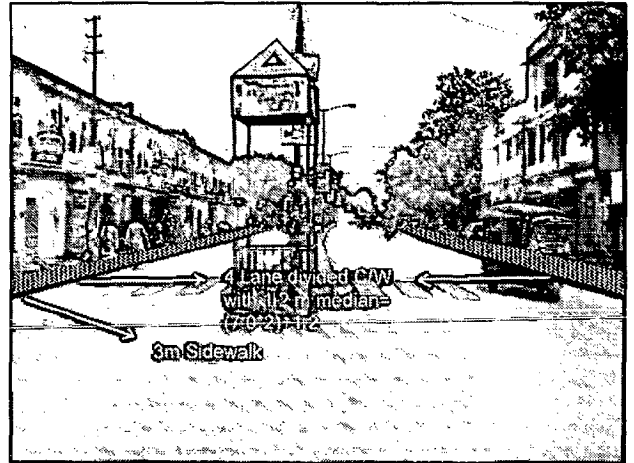


Before After  
Road Section view from Ranipur more towards Prem Nagar Ashram Chowk



Before After  
Road Section view from Devipura Chowk towards Nagarpalika office

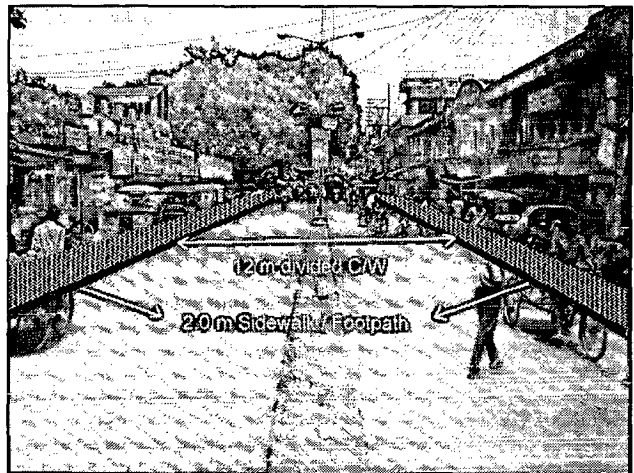




Before

After

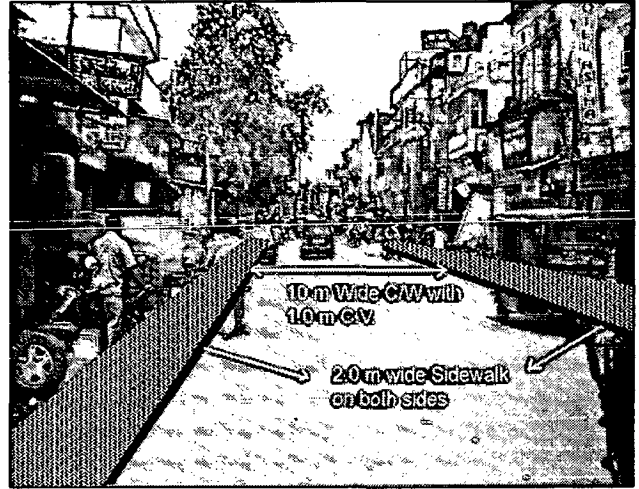
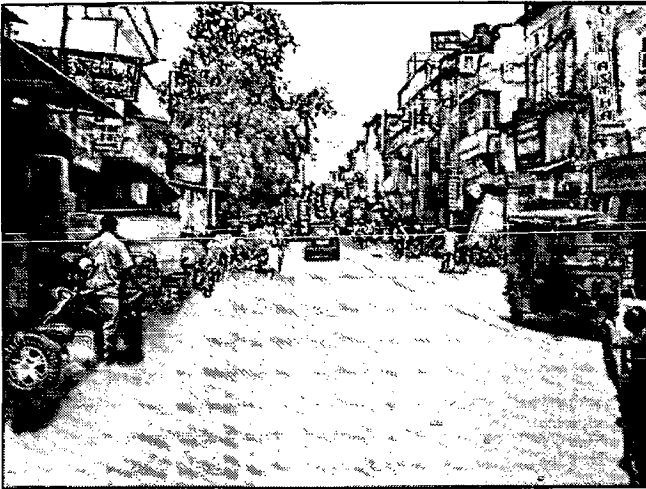
Road Section view from Devipura Chowk towards Shiv Murti Chowk



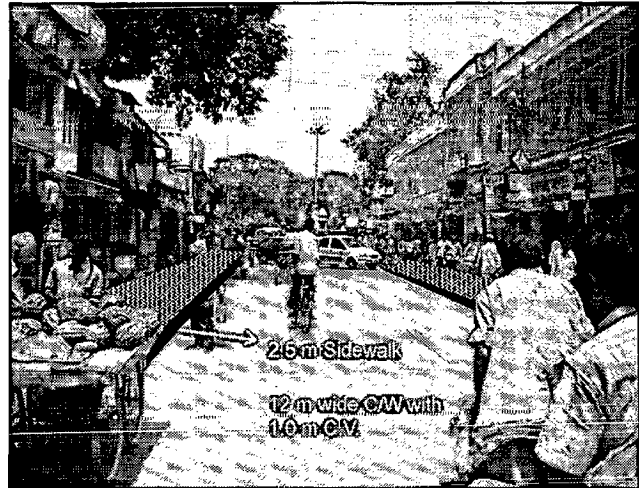
Before

After

Road Section view from Bus stand towards Shiv Murti Chowk



Before After  
Road Section view from Shiv Murti Chowk towards Lalta Rao Chowk



Before After  
Road Section view from Lalta Rao Chowk towards Kotwali

**Figure: 12.11 Improvements of Various Road Sections**

Source: Author

## CHAPTER 13

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# POLICY GUIDELINES, CONCLUSIONS AND RECOMMENDATIONS

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### POLICY GUIDELINES

For the development of an efficient transport system, the following policy guidelines are considered –

1. Road network system should be modified to improve the accessibility.
2. To gear up the process of public transport supply, the local government should take the responsibility to ply buses on main arterial roads as per the route proposed.
3. The CBD area should be decongested by shifting some of the non-conforming activities from the CBD and by promoting the development in the outer areas as per the given proposals.
4. Slow moving as well as low capacity modes should be phased out gradually.
5. Modal mix should be oriented to a cost-effective and integrated transport system.
6. Modal share should be self-oriented spontaneously achieving the targeted share of transport demand.
7. Considering the degree of severity of traffic congestion, the use of personalized transport modes should be discouraged and high capacity

fast transport system i.e. public transport or mass transport system should be developed.

8. Considering the shape of the city as well as over capacitated road network, the high capacity local railway system should be introduced in due course of time.
9. Public transport should operate along the principal corridors and intermediate public transport system should function as supplementary or feeder system to it.
10. The share of intra-zonal trips will increase due to higher self containment level in different zones. The possibility of linking the central-and peripheral parts of the city by bus as well as rail transport should be explored.
11. To decongest the central area of the city, an appropriate area licensing system should be introduced in due course.
12. Licensing should be restricted to control the phenomenal growth of three wheelers and cycle rickshaws
13. For integrating the transport system in the city, a unified transport authority should be formed.
14. The area under transport sector should be increased to facilitate a safe and efficient movement pattern in the city.
15. All planning strategies should be formulated without disturbing the character of the city.
16. There should be a proper coordination between various departments in the city in order to improve the road network system

## **CONCLUSIONS AND RECOMMENDATIONS**

The question of providing an efficient transport network for sustaining the socio-economic activities of the Haridwar city is a complex issue in the face of ever-increasing demand for such a system. A long term solution to the problems existing in this vital sector requires the urgent attention and concredited action plan consisting of various social and economic factors which are equally important and play an active role in solving the problems. Apart from mobilizing vast resources to be pumped in this sector over a long period of time where the returns are slow to show and take a long period of gestation, well planned activities at various levels have to be initiated to increase the awareness of the masses towards the seriousness of the problem.

As planning for traffic facilities is a never ending process, there is a need for continuing the studies in traffic and transportation of the city. In future, it is expected that with the development of SIDCUL (IIE) industrial area, the traffic conditions in Haridwar city would also be greatly affected (in line with the impact of BHEL). Presently, the problems related to the traffic and transportation of the study area have been identified and quantified along with the projections. The improvement strategies, variously categorized as management and engineering, short, medium and long term, must have to be taken up on a priority basis considering the seriousness of the issues involved.

It has been noticed that the high growth rate of motorized vehicles at the rate of 22.83 % per annum will heavily congest the roads of Haridwar. Therefore, an efficient public transport system must be provided by introducing city bus service along with terminal facility, broad route plan and management policy as per proposals given. Public transport should operate along the principal corridors and IPT should function as supplementary or feeder system to it.

Circulation pattern of the city has to be improved by joining the missing links and constructing new roads. The area under transport sector should be increased to facilitate a safe and efficient movement pattern in the city. Above all, for integrating the transport system in the city, a high power transport authority should be formed to handle the planning and investment decision in the sector and also for evaluation and monitoring of the traffic scenario of the city.

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called the **Road development committee** in 1927, popularly known as the Jaykar Committee. It is a major landmark in the history of roads in India. The committee was emphatic regarding the inadequacy of Indian road system and urged that further development of the system was desirable for the general welfare of the country as a whole for achieving some broad goals:

- a) For the better marketing of agricultural produce.
- b) For the social and political progress of the rural population, which will be advanced by the increased use of motor transport, and
- c) As a complement to railway development.

Subsequently, the Central Road Fund was formed in year 1929. Most of the recommendations of the Jaykar Committee were accepted by the government.

#### **2.3.2.2 THE INDIAN ROADS CONGRESS 1934**

Following the recommendations of Jaykar committee, a semi-official technical body known as Indian Roads Congress was formed in 1934. The Indian Roads Congress was established to provide a forum for regular pooling up the information, knowledge and experience for all matters relating to the planning, construction and maintenance of roads in India, to recommend standard specifications and to provide a platform for the expression of professional opinion on matters relating to road engineering, organization and administration. The Indian Roads Congress has played a vital role in the development of the three 20 year road development plans in India.

#### **2.3.2.3 NAGPUR PLAN (1943-1963)**

This is a major landmark in the entire history of road development in India, as it was the first attempt to prepare a coordinated road development programme in a planned manner. The main objectives of the Nagpur plan were as

12. Construction of missing links of National Highways and State Highways.
13. Replacement of busy railway crossing with over bridges,
14. Reconstruction of weak bridges.
15. Improvement of geometries.
16. Widening of narrow cross drainage structures.
17. Traffic safety measure
18. Upgrading the secondary and tertiary road network.
19. Needs of tourism, agriculture and industries sectors.
20. Upgrading and improvement of roads in urban areas.
21. Provision of wayside amenities, traffic posts, highway patrolling, trauma centers as an integral part of highway development.
22. Improvements on implementation front covering capacity building in government institutions, strengthening the consultancy sector, improving contracting industry, equipment supply and management and human resource development.
23. Increasing R & D efforts in the highway sector.

### **2.3.2.7 PRESENT SCENARIO**

India has 3.32 million kilometers of road network, which is the second largest in the world. Roads occupy an eminent position in transportation as they, as per the present estimate, carry nearly 65% of freight and 85% of passenger traffic. Traffic on roads is growing at a rate of 7 to 10% per annum while the vehicle population growth, for the past few years, is of the order of 12% per annum.

The total length of National Highways in the country at present is 65,569 km (which includes about 7457 km lengths of newly declared National Highways in February, 2004) and comprises only 2 per cent of the total length of roads in the country, but carries over 40 per cent of the total traffic across the length and breadth of the country. The National Highways is thus the lifeline of the country, connecting the farthest corners and the remotest border areas. The National Highways are

need for proper coordination among various departments of the city in order to improve the road network system.

### **5.9 FUNCTIONAL CHARACTER OF CITY**

The city of Haridwar is one of the most important pilgrimage centres of India. It is considered to be the most sacred place of Hindus where a large number of pilgrims and tourists come every year. Every evening, large gathering take a holy dip at Har-ki- Pauri and perform Pooja (Aarti) of goddess Ganga. After every six years, Ardh Kumbh or Poorna Kumbh melas are celebrated here. So the devotional thinking of the people towards the holy city of Haridwar named it as 'City of Hindu Pilgrimage'.

The city of Haridwar forms the gateway to the hill state of Uttaranchal and therefore the economic development of the hilly region is closely related to the development of the city. It is also emerged as a very important transit centre within the region for having a strategic location between plains and hills.

Table 6.1 Road Inventory of Road Network – Haridwar City

Sl. No.	Name of Road	ROW (m)	Carriageway (m)	Central Verge (m)	F. Path (m)	Shoulder (m) L/R	Land-use	Surface Cond.
1.	Pul Jatwara-jwalapur Chowk	24.7	10.7	0.7	—	6.8/7.2	Comm.	Poor
2.	Jwalapur Chowk- R.Bridge	15.0	9.0	0.7	—	3.0/3.0	Res.	Fair
3	Surprise Hotel-Ranipur More	24.0	10.0	0.7	—	8.5/5.5	Res., Comm.	Good
4.	Ranipur More-Devipur Chk.	25.0	10.0	0.7	—	7.0/8.0	Res., Comm.	Good
5.	Devipur Chk-Shiv Murti Chk	25.2	14.0	0.7	—	5.0/5.5	Comm.	Good
6.	ShivMurti Chk-Laltarao Chk	18.0	12.0	—	—	4.0/2.0	Comm.	Good
7.	Lalrao Chk-Kotwali	18.0	12.0	—	—	4.0/2.0	Comm.	Good
8.	Singh Dwar-Desh Rak. Chk	18.0	6.5	—	—	5.5/6.0	Res., Comm.	
9.	Sh.Charya Ckh-Sh.Tulsi Chk	10.5	7.1	—	—	18/1.6	Govt.	Good
10.	Sh.Tulsi Chk-Shiv Murti Chk	13.3	6.6	—	—	2.7/4.0	Res., Comm.	Poor
11.	Dudhadhari Ash-Bopatwala	25.0	9.5	—	—	9.0/6.5	Open, Res.	Good
12.	Singh Dwar-Sh Charya Chk	30.0	7.5	—	—	11.5/11.	Open	Fair
13.	Hill Bye Pass	25.0	3.5	—	—	—	Open	Poor
14.	Arya Nr. Chk-Rail: Phatak	20.5	7.0	—	—	7.5/6.0	Comm.	Poor
15.	Ranipur More-Tibri W. Works	29.7	7.5	—	—	11.2/11.	Comm.	Fair
16.	Devipur Chk-Sh. Tulsi Chk.	21.0	9.4	—	—	5.6/6.0	Res, Open, Go	Good
		12.0	7.5	—	—	3.1/1.4	Res.	Poor
17.	Kankhal Chk-R.K. Mission Chk	13.3	4.4	—	—	4.0/4.9	Res.	Poor

Source: Haridwar Development Authority and PWD, Haridwar (2006)

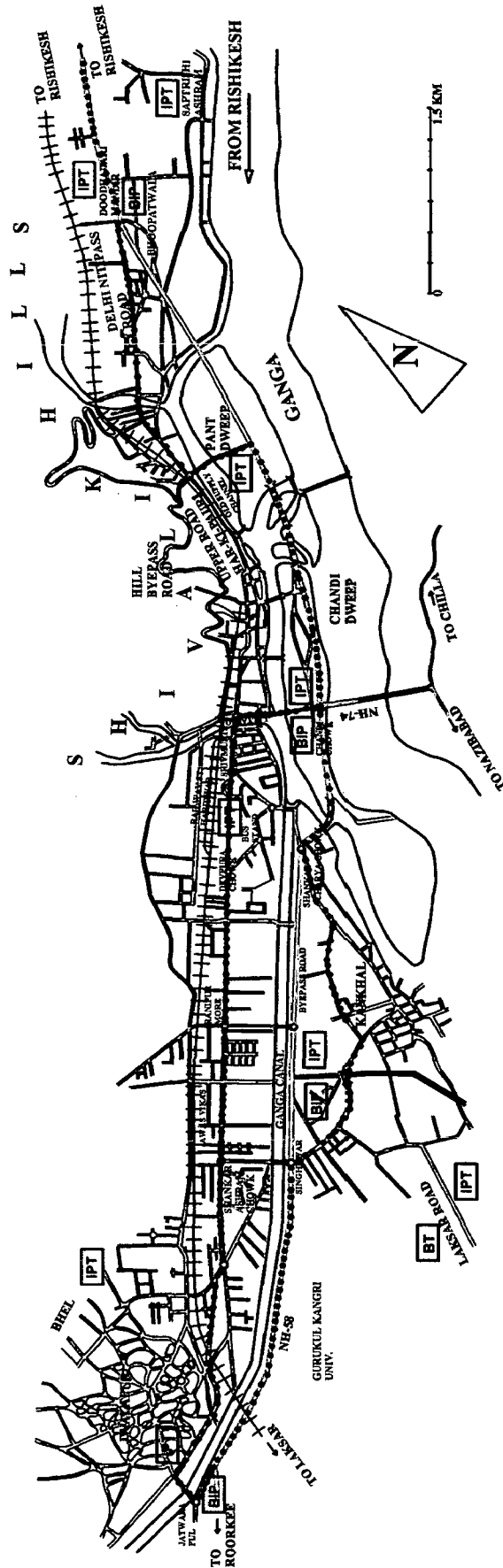
**Table 6.7 Status of the Roads Maintained by Nagarpalika**

Year	Motor road (km)	Pedestrians roads (km)	Kattcha roads (km)	Total (km)
2000-01	137.516	7.775	-	145.291
2001-02	137.516	7.775	-	145.291
2002-03	137.516	7.775	-	145.291
2003-04	146.636	9.655	-	156.291
2004-05	184.252	1.437	28.411	214.100

Source: Nagarpalika, Haridwar 2005.

**Table 6.8 Status of the Roads Maintained by Public Works Department**

Name of Road	Category of Road	Length of Road(Km)	Type of road layer	Surface condition
Delhi-Nitipass Road (NH-58)	National Highway	61	Bituminous	good
Nazibabad Road (NH-74)	National Highway	30	Bituminous	good
Jwalapur-Laltarao Marg	Other District Road (ODR)	4.705	Bituminous	Fair
Jwalapur Railwar feeder Marg	Other District Road (ODR)	0.515	Bituminous	Fair
Gurukul Kangri Univ. Road	Other District Road (ODR)	2.00	Bituminous	Fair
Sapt-rishi Ashram Road	Other District Road (ODR)	1.25	Bituminous	Fair
Hill Bypass Road	Other District Road (ODR)	6.38	Bituminous	Poor



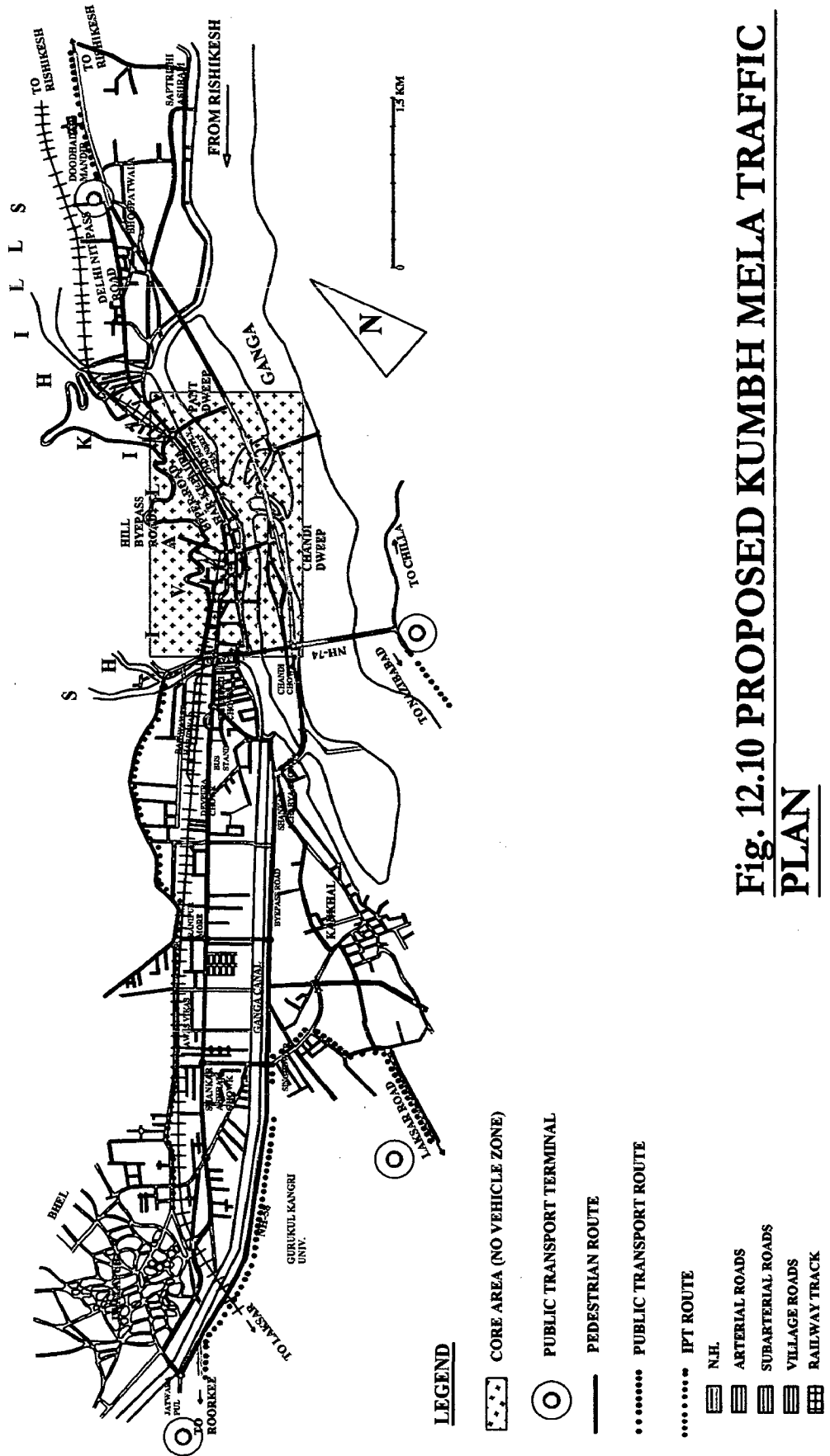
**Fig. 12.8 PROPOSED CITY BUS ROUTES AND  
TERMINAL FACILITIES IN HARIDWAR CITY**

**LEGEND**

- ..... CITY BUS ROUTE
- [BT] BUS TERMINAL
- [IPT] IPT TERMINAL
- [BIP] BUS INTERCHANGE POINT
- N.H. NATIONAL HIGHWAY
- [=====] ARTERIAL ROADS
- [=====] SUBARTERIAL ROADS
- [=====] VILLAGE ROADS
- [=====] RAILWAY TRACK

Source: Author





Source: Author