

DYNAMICS OF FRINGE DEVELOPMENT OF ROORKEE

A DISSERTATION

*submitted in partial fulfilment of the
requirements for the award of the degree
of*

MASTER OF URBAN AND RURAL PLANNING

By

LT. COL. K. M. PRASAD



DEPARTMENT OF ARCHITECTURE AND PLANNING
UNIVERSITY OF ROORKEE
ROORKEE-247 667 (INDIA)

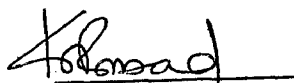
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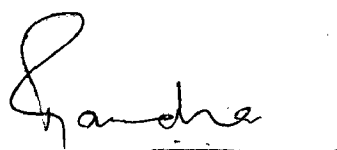
I hereby certify that the work which is being presented in the dissertation entitled DYNAMICS OF FRINGE DEVELOPMENT OF ROORKEE in the partial fulfilment of the requirements for the award of the degree of MASTER OF URBAN AND RURAL PLANNING submitted in the Department of Architecture and Planning, University of Roorkee, Roorkee is an authentic record of my own work carried out during the period from July 1992 to March 1993 under the supervision of PROF. RAKESH CHANDRA, Department of Architecture and Planning, University of Roorkee, Roorkee.

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

Place: Roorkee
Date : March, 1993


(K M PRASAD)
Lt Col

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


(RAKESH CHANDRA)
Professor
Department of Architecture and Planning
University of Roorkee
Roorkee - 247 667

A C K N O W L E D G E M E N T S

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- (d) Roorkee Municipal Board.
- (e) Roorkee and Nanson Block.

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Lt. Col.

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CHAPTER 1
INTRODUCTION

INTRODUCTION

1.1 INTRODUCTION

The meanings of word 'fringe' as given in the Oxford English Dictionary are, 'border', 'outskirts', 'area or part of minor importance'. Perhaps the meaning 'area of minor importance' has weighed more heavily in the minds of planners that over the years, the process of development and changes taking place in the inner parts of cities and towns have received more than their due share of attention and have been subject matter of large number of studies by the planners and geographers. However, when we come to the other two meanings of the word 'fringe', namely 'border or outskirts' rural urban fringe belt around may existing city or town, also falls within the ambit of urban planning.

Changes in land use and population on fringes of any existing city or town has remained and will continue to be so, a long outstanding feature stimulated by high value of land in central areas. Though changes on periphery of a town are less pronounced and not concentrated initially and involve less dramatic social issues, these are of much greater importance since a considerable area of land is involved. As the time passes, more and more people are likely to be affected by these changes. While attention is given to provide community facilities, utility services and civic amenities within the city limits and towns,

the country side virtually does not have any organisation with necessary infrastructure and resources to meet these requirements.

Many development changes at the urban fringe are linked with land uses from rural to urban, agricultural to residential/commercial or other uses, which may be more fundamental alteration than usual changes of land use taking place in urban areas. Interaction between rural and urban is thus quite significant at the outer edges of existing cities and towns. There is thus need to give due attention to growth on fringes of any city or town.

1.2 IDENTIFICATION OF PROBLEM :

The underdeveloped or undeveloped space into which a city or town expands in circumstantial, radial, finger shaped or any other pattern has remained a neglected field of study. Whatever thought the planning fraternity has given in this direction has been restricted to metropolitan cities or larger cities, possibly because, problems created due to fringe growth has been more pronounced in such cities, reasons for which can be easily attributed to initial neglect of unregulated development in the fringe belt. The phenomenon, however, is a common feature of any smaller city or town which has the potential of growth because these smaller cities towns grow in to larger ones with passage of

time. In fact, it would be more appropriate to understand urbanization as a fringe phenomenon, Lack of concern towards growth of such smaller cities and towns, presents a scenario of urban chaos which we find in most of our cities and towns today.

With this background in view, Roorkee town on threshold of staking its claim to be categorised as a Class I town/city in official records has been selected as subject matter of this dissertation wherein attempt has been made to study and analyse the growth and development on the fringes of the town for understanding and interpreting its features with a view to apply a planners method of study for its orderly growth in future.

1.3 AIM AND OBJECTIVES :

1.3.1 Aim :

Aim of this dissertation is 'to study the growth pattern of fringe developments of Roorkee urban Agglomeration, to include physical aspects and their likely influence on the socio economic life of Roorkee in future.

1.3.2 Objectives :

With the aim in view, the following set of objectives have been identified for this study :

1. To study the causes of fringe development in case of Roorkee.
2. To know the mechanism of the fringe development.

3. To identify the drawbacks of present developments on Roorkee fringe.
4. To visualise the impact of fringe development on overall development of Roorkee U.A.
5. To find out scope for improvement in the present pattern of developments on the fringe and suggested planning measures.

1.4 SCOPE AND LIMITATIONS ;

1.4.1 In a study like this, it becomes very difficult to define the scope of study due to fluid nature of urban fringe belt. Smaller towns existing or growing closer to any bigger town or city have its own influence on the main town and can also be argued to form part of the urban fringe. The scope of this study will cover the fringe belt continuous to existing administrative boundary of Roorkee Urban Agglomeration.

1.4.2 There are few smaller towns, viz., Mangalaur, Narson, Landhaura, falling within the Roorkee Tehsil having linkages with Roorkee U.A., but not contiguous to it. Though this study will primarily focus its attention to immediage fringe belt, some of these smaller towns may find mention in this study and after a few decades may even get integrated into Roorkee U.A.

LIMITATIONS:

1.4.3 A study of this magnitude requires a team of surveyors and staff for collection of basic data and requires sufficient time. This study started with a basic handicap on this account apart from many other limitations. Some of the major limitations faced are given below :

1. Non existence of any master Plan for Roorkee or even an accurately surveyed map of the town.
2. Non publication of District Census Report, 1991 till final stages of this study.
3. Study primarily based on secondary data and information extracted out of old records from various sources.
4. Due to limitation in carrying out detailed survey and collecting data from primary sources at individual level, the study has been based on personal observation and information along with some data collected during course of informal discussions within the town and peripheral areas.
5. Reluctance and hesitation on the part of persons including private developers active in the fringe belt to divulge complete and correct information.
6. Lack of infrastructure and paucity of time to collect information from primary sources by detailed survey.

1.5 METHODOLOGY :

Methodology adopted to fulfill the objectives as identified earlier covers the following stages :

1. Study of evolution and growth of Roorkee with its historical background.
2. Identification of the fringe belt and problems related to existing town.
3. Literature survey and Parallel study carried out earlier for another similar town to draw out relevance to this study.
4. Analysis of demographic characteristics and growth pattern.
5. Mechanism and dynamics of fringe development in respect of Roorkee U.A.
6. Analysis of causes of fringe development.
7. Identification of drawbacks of present growth pattern in the fringe belt with suggested planning measures.

The methodological sequence as emerged from the methodology adopted has been depicted diagrammatically in the Flow Chart as shown in Fig. 1.1.

METHODOLOGICAL SEQUENCE

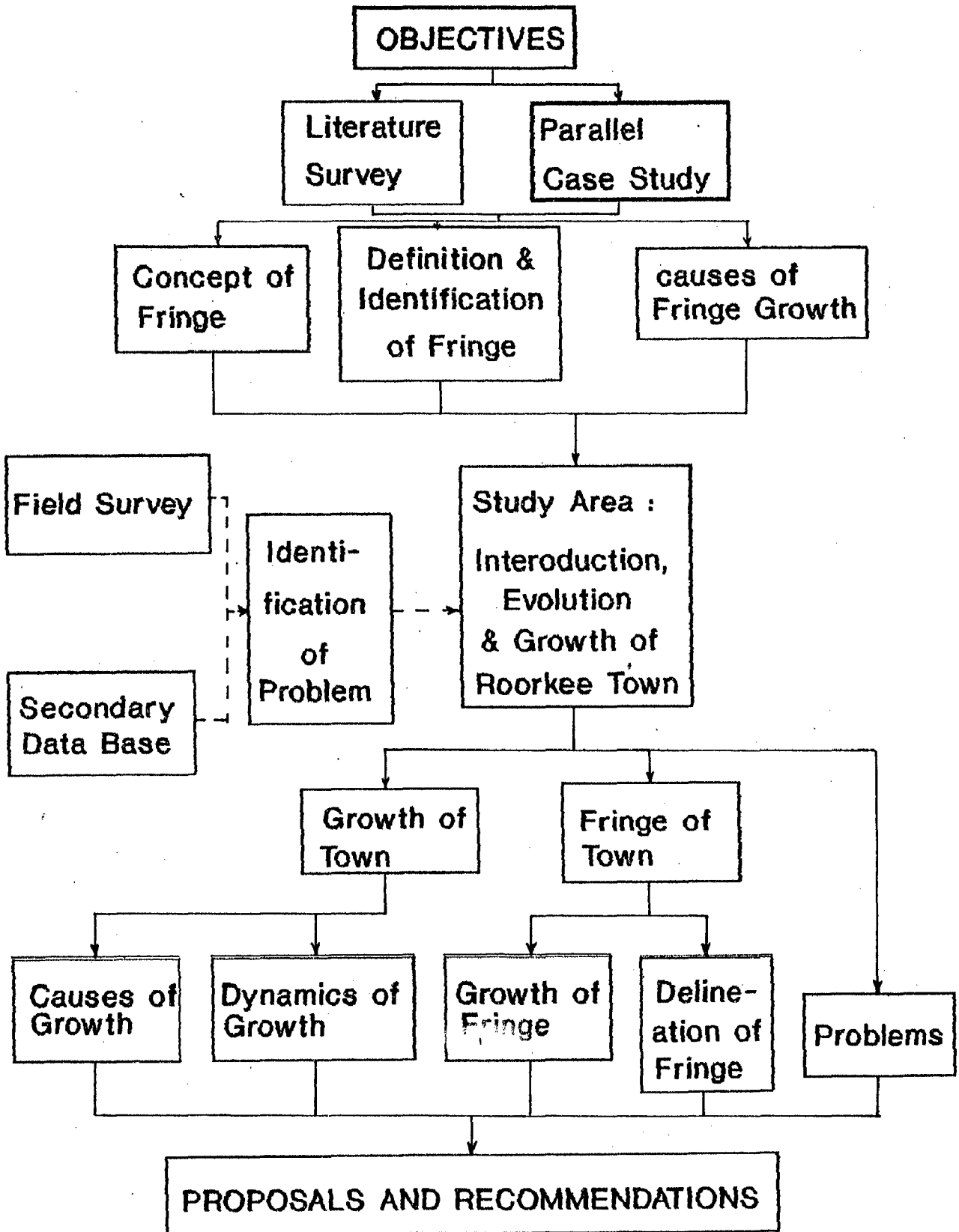


FIG 1.1

CHAPTER 2
LITERATURE SURVEY

LITERATURE REVIEW

2.1 CONCEPT OF URBAN FRINGE

2.1.1 Origin of Fringe Phenomenon and Concepts :

An important development in urban settlement during past several decades has been the rapid expansion of population into unincorporated areas surrounding our large cities and into their unincorporated suburbs. A number of studies carried out in this direction trace their origin during 1940s when the attention of geographers and planners was drawn towards the problems of growing rural urban fringe. Different geographers and planners have tried to conceptualize and define the urban fringe as per their own perceptions. However, no universally accepted precise definition has emerged as yet.

As brought by H.Lal in his study "City and Urban Fringe"¹, the use of term urban fringe for the first time can be attributed to T.L. Smith (1937) who defined it as "built up area just outside the corporate limits of the city". This definition, primarily concerned with demographic characteristics, presented a general rather than specific conceptualisation of the fringe.

1. H.Lal, "*City and Urban Fringe*", Concept, New Delhi, 1987, p.19.

In one of the most excellent studies titled "The Rural Urban Fringe", Wehrwein (1942) ², conceptualised fringe as the area of mixed land uses lying beyond those sections of the city that are customarily serviced by urban utilities and transport system.

He defined rural urban fringe as an area of transition between well recognised urban land uses and the area devoted to agriculture". According to him "urban problems, crying for direction, planning, and social controls are thrust upon rural governments; yet these units of government are not designed for or are incapable of furnishing direction, plans, or controls. Unguided 'settlements' premature sub divisions, and unwise expansion of public utilities with increased expenditure for local government have resulted in tax delinquency and suburban slums.

R.B. Andreews (1942) brought in a new dimension to explain fringe phenomenon by introducing two distinctly different areas which he named as 'urban fringe' and 'rural urban fringe', the former being the active expanding sector of the compact

2. George S., Wehrwein, "*The Rural Urban Fringe*", in Harold M. Mayer and Clyde F. Kohn (Ed), 'Readings in 'Urban Geograpby'. The University of Chicato Press, Chicago, 1959m pp. 533-543.

economic city and later as the area lying adjacent to periphery of the urban fringe"³.

During the subsequent periods, there has been many attempts to define urban fringe as per different concepts such as ; evolving the term "limited fringe" and "extended fringe" by McKain and Burnight in 1953, "suburban fringe zone" and an "outlying adjacent zone" by Reinemann in 1960, an entirely different version to sub divide the fringe between "rural non farm" and "rural farm" by Duncan and Reiss in 1956 and a distinction between "true fringe" and partial fringe by Myers and Beegle (1947)⁴.

Keeping in view the great diversity in the concept of the term rural urban fringe by different propounders, Pryor (1968)⁵, tried to resolve the differences in perceptions and eliminate the ambiguities. He felt that the rural urban fringe may be subdivided into an "urban fringe" and "rural fringe" on the basis of land use composition. He defined rural urban fringe as zone of

3. Lal, op cit.

4. C.S. Yadav, "*Perespectives in Urban Geography :Vol. 9: Rural Urban Fringe*", Concept, New Delhi, 1987, p.3.

5. R.J. Pryor, "*Defining the Rural Urban Fringe*", in 'Social Forces', Vol. 47, 1968, pp 202-15.

transition in land use, social and demographic characteristics lying between, the continuously built up urban and sub urban areas of the central city and the rural hinterland, characterised by the almost complete non farm dwelling occupations; and incomplete range and penetration of urban utility services; unconditioned zoning or planning regulation; areal extension beyond although contiguous with the political boundary of the central city and an actual and potential increase in population density, with the current density above that of surrounding rural districts but lower than the central city". This definition, therefore, essentially leads to the conclusion that rural urban fringe is really an extension of the city itself.

The two sub divisions thus can conveniently be identified as distinct separate zones; the "urban fringe" exhibiting a density of occupied dwellings higher than the medium density of the total rural urban fringe and a higher rate of increase in population, density, land use conversion and commuting in comparison to a low density and lower rate of increase exhibited by the "rural fringe".

Blizzard and Anderson (1952) have tried to be more specific in defining the rural urban fringe as "that area of mixed urban and rural land uses between the point where full city

services cease to be available and the point where agricultural land uses predominate"⁶.

2.1.2 Indian Context :

Concept of rural urban fringe as perceived by Western geographers and planners, however, may not exactly fit into Indian scenario due to poor civic services and community facilities which apart from being poor are even none existent in some parts of the city proper^{or} town itself in most cases, particularly, in poorer residential areas. If Western criterion are applied to identify the fringe zone, many parts of the city of town itself may have to be included within the fringe. Thus some Indian geographers and planners have tried to conceptualise rural urban fringe suited to cities/towns in India most appropriate amongst which propounded by R. Ramachandran has been brought out subsequently in this Chapter under brief review of the specific publications/articles.

There are perhaps no literature or reference material available which pertain to study on fringe development in respect of a growing town with a population of approximately 1,00,000. Some of the literature and references which could be

-
6. S.W. Blizzard and W.,F. Anderson, "*Problems in Rural Urban Fringe Research* ", Progress Report no 89 The Pennsylvania State College of Agricultural Experimentation, State College, Pennsylvania, 1952, p, 11.

collected, highlight the fringe growth phenomenon existing in metropolitan or very large cities. Reviews of some of these literature highlighting the salient aspects dealing with identification, causes and problems of fringe development, which are considered relevant to this study are brought out hereafter under the specific headings of the publications/title with author's name and other details.

2.2 SENGUPTA, Smita, "Residential pattern of Suburbs" (New Delhi, Concept Publishing Co., 1988) :

The authoress in her study has attempted to understand the pattern of residential areas which evolves in suburbs of Indian cities. The study area covers some of the residential suburbs of Ahmedabad city.

Salient aspects of the study are given in succeeding paragraphs :

2.2.1 Main Findings :

1. The study formulated a generalised model of step wise migration of sub urban population through different stages migration within the city.
2. Contrast in socio economic status and housing between the core village (traditional) and housing societies (modern) but with similarity in traditional behavior and life style.

3. The study has formulated three dimensional parallelepiped 'socio demographic model' to depict study area and found the life style and behavior of sub urban population takes longer time to change but external factors like housing, education, income change faster.
4. Slopes of morphological factors formulated for the study revealed the linkage of accessibility with residential area density, land value and density of population per room.
5. Central portion of study area with mixed type of residential pattern showed transitional nature of various morphological factors.

2.2.2 Problems :

1. Due to lack of single administrative authority in the suburb, growth is neither continuous nor uniform.
2. Loss of fertile agricultural land lost by conversion to residential land use.
3. Decrease in productivity of fertile agricultural land due to mixed land use and land purchased by speculators but lying vacant creating artificial scarcity of land increasing the prices.
4. Urban Land Ceiling Act 1976 found to be ineffective to stop speculation beyond 5 Kms. of periphery, the limit

prohibiting conversion of agricultural land to any other use.

5. Acute infrastructural problem related to housing, transportation, shopping, medical, educational, as the residents not paying any tax to Municipal Authorities due to area falling beyond the Municipal limits.
6. Poor conditions of roads, water logging, lack of transportation facilities.
7. Non existence of basic utility services and community facilities in core villages which after their integration into the city limit will develop as urban slums.
8. Lack of social interaction between original population of core villages and new settlers from outside.

2.2.3 Policy Strategies :

The following rigid action plan has been suggested on the basis of the study :

1. Revenue villages with growth potential be administered by a single authority.
2. Rigid implementation of land use acts.
3. Control by a Government Department of all Government land.
4. Close watch by administrative authority on suburban growth.

5. Phase wise development of sub-urbs depending on distance from city limit.
6. Encouragement to voluntary public involment for rigid implementation of plans.

2.3 Centre for Rural Development, 'Workshop on Planning issues in Metropolitan Frfinge Areas : Background Materials' -(New Delhi, Department of Rural Development, School of Planning and Architecture, January 30-321, 1992).

This background material as a prelude to the Workshop contains a few chapters and articles taken from selected books and journals in India and other countries. The contents are more applicable to metropolitan fringes but do help in understanding the phenomenon for smaller cities and towns and a very brief review of some of the articles is being given.

2.3.1 The first article, 'City Sprawl and the Early Response by Martin J. Elson' has taken the case of urban sprawl in cities of U.K. and covers the significance of 'Green Belt' concept leaving a strip of green belt around the cities not only to control the urban sprawl but also for conservation of environment and to preserve the countryside.

2.3.2 In another relevant article 'Rural Urban Fringe', the author Mr. R. Ramachandran' has tried to identify the rural urban fringe in the context of Indian Metropolitan cities. He has defined the rural urban fringe as 'an area of mixed rural and urban population and land uses, which begins at the point where

agricultural land uses appear near the city and extends upto the point where villages have distinct urban land uses or where some persons at least, from the village community commute to the city daily for work and other purposes'. The variables used to determine the outer boundaries of rural urban fringe for Delhi and Bangalore metropolises as brought by him are :

1. Population density : 400 persons per Sq.Km.
or more
2. Population growth : 40% or more
in preceding decade
3. Sex Ratio : 800 or less females per
1000 males
4. Workers in non agri- : 50% or more
cultural pursuits
5. Outer limit of city bus services or local train
services.

The author has also explained various conceptual notions like urban corridors, satellites and suburbans, green belts, new towns and urban counter magnets. The article ends by highlighting the problems related to lack of civic services and administration in fringe areas.

2.3.3 The Article, 'Rural Urban Continuum in Metropolitan Regional Development' by Prof. R.C. Gupta highlights the importance of continuum planning approach in Metropolitan regional Planning to ensure balanced growth and development which will help it tackling the fringe growth problems.

2.3.4 Management of Urban Fringe, the article by Sarup Singh has identified the characteristics of fringe in star or finger shaped form of development, dynamic land use pattern, obstacle to planned expansion, attitude of 'no man's land' towards fringe, easy fragmentation of agricultural land for urban uses and intermixture of different socio economic group of urban and rural, rich and poor. Management measures suggested by the author include :

1. Legal control like 'urban Fringe Areas Development and Control) Act.
2. Rigid and Strict Enforcement mechanism or body with default powers.
3. Measures to enhance financial resources of urban administration.
4. Mandatory place in administrative set up for experts in town and country planning and removal of multiplicity and duplicity of administrative control.
5. Altitude of neglect towards fringe areas to be dispensed with and efforts for rationalisation of existing fringe area developments.
6. Generation of general awareness among masses and their involvement to remove ill effects of unorganised developments.

2.4 Centre for Training and Research in Municipal Administration, 'Administration of the Urban Frifnge : Proceedings of the Seminar' - (New Delhi, The Indian Institute of Public Administration, November 29-30, 1968) :

This publication containing summary of the seminar proceeding in which experts in administration, geography, planning and economic fields deliberated on the problems of urban fringe. The points emerging out of the deliberations of the seminar can be summarised as :

1. Fringe growth like a cancerous disease if not cured in the primary stage, can only be cured with difficulty in secondary stage and leads to only death in the final stage.
2. The city itself does not have adequate civic services and conditions in fringes are still worse.
3. Continuous fringe growth leads to traffic congestion in city centers.
4. Preventive measures should include delimitation of urbanizable areas around the town with appropriate control measures.
5. In certain cities of India, fringe belt has rich spacious bungalows at the same time slums and shacks are also existing.
6. Major problems is to provide civic amenities.

7. Fringe belt is dynamic in nature and there is need to keep a watch over fringe development in future by Town and Country Planning Authority.
8. Imposition of taxes on fringe residents would help in generating finances for development of fringe areas.

2.5 KABRA, Kamal Nayan, 'Developing on Urban Fringe : Blue Print for Voluntary Action' - (New Delhi, Indian Institute of Public Administration, 1980) :

The author feels that urbanization in India is by and large still a fringe phenomenon. The transitional flux character combined with lower and inadequate level of integration and development of the urban fringes, is the major source of problems facing urban fringes. The author argues that every town or city has a fringe. But fringe does not become problem area, if the core city or town is a slow growth area.

While considering social and economic flows, according to the hypothesis, it is felt that problems of the fringes and core may relate to some large common factor, but the position of the fringes owes heavily to out flows extracted from them by the core.

The author after studying the urban fringe of Taj Ganj in Agra, highlights the role of voluntary agencies as a prime mover to stimulate community self help for improvement of conditions in slums.

2.6 Paper presented in Workshop held on "Planning Issues in Metropolitan Fringe Areas" under the aigies of Centre for Rural Decelopment, Department of Regional Planning, School of Planning and Arch8rteecture, New Delhi, on January 30-31, 1992 :

A brief review of some of the papers presented during the workshop are given in preceding paragraphs. :

2.6.1 Urban Fringe Approaches and Policy Options
by R.L.P. Sinha :

The issues identified through this paper include, accommodating surging mass in city and towns, intensive utilisation of urban space including over and under utilization in different parts, haphazard expansion of urban areas, re-organisation of city limits in view of population pressure and future requirement of urban space. The spotty developments in fringe areas are wasteful and substandard. The paper highlights the need of introducing periphery control regulations to restrict peremature conversion of agricultural land and regulate activities of private development. Taxes on transfer of land to check speculation has also been suggested in the paper.

2.6.2 Metropolitan Fringe : Issues, Prospects and Policies
by Prof. R.C. Gupta

Apart from faulty policies, 'No Man's Land treatment to fringe areas, is also seen as a cause of the problems of metropolitan fringes in this paper. Need for better appreciation

of fringe phenomenon as a part of total development process, rather than isolated remedial measures has to be realised.

Concern for the fringe phenomenon as generally viewed because of concern for the city, which is purely passive and negative approach to the fringe development process, whereas a positive view point would emerge if seen from regional angle as a buffer between the urban and rural countryside. Due to dynamic nature of the fringe, because of its close proximity to urban zones, futility of any amount of controlling devices needs no emphasis unless channelisation of the development process away from fringe into the outer region takes place. More realistic approach may be to relate the fringe settlements located along lines of communication to the future urban forms of the city. The author suggests embracement of fringe zone into the administrative jurisdiction of city development authority. The paper concludes by emphasising the need to recognize fringe belt as integral, physical social and economic entity requiring unified planning, development and management actions.

2.6.3 Approaches and Policy Options for Development of Fringe Areas by G.D. Mathur :

The problems as seen in this paper are : restriction on achieving desired quality of urban environment in cities due to unplanned and haphazard growth in urban fringe, mixture of non conforming land uses, sub standard construction, ill conceived plot sub division, lack of infrastructure and civic amenities,

difficulty in up gradation of such clusters subsequently turning into slums. Causes of fringe development identified are, high cost of land in city because of inadequate supply of developed land at reasonable prices, failure of development authorities to meet housing needs, lack of political will, non accountability of enforcement machinery/development authorities, lack of long range perspective plan with proper phasing of developing programmes at 5 years intervals, preparation of detailed development area plans for each local development area including rural settlements, plan to promote economic activities in rural settlements, encouragement to cooperative effort for socio economic development of fringe areas, elimination of multiplicity of controls, uniform building by laws for entire rural urban fringe with strict control and enforcement infrastructure.

CHAPTER 3
CASE STUDY: BAREILLY

CASE STUDY : BAREILLY

(City and Urban Fringe : A Case Study of Bareilly by H. Lal.)

3.1 INTRODUCTION :

The lack of control and proper planning on expansion of cities result in a variety of problems. As the city grows outwards , it usurps the territorial limits of the city. Peripheral or fringe growth brings in variety of other requirements which if not met with result in chaos. Bareilly is one of the cities which has also witnessed significant fringe growth beyond its administrative boundary.

This case study is based on a study of Bareilly Urban Fringe carried out by a geographer, Mr. Hira Lal of Gorakhpur University (U.P.). The study highlights the problems created due to unregulated growth outside the municipal limits and has made useful recommendations for planning of Bareilly city and its fringes.

3.2 CRITERIA FOR SELECTION OF CASE STUDY :

Bareilly was selected to get an idea of problems created due to fringe development in a city. As brought out earlier, almost all the studies carried out on fringe developments and related problems has been in respect of larger or metropolitan cities due to magnitude of the problem in such cities. One hardly finds any such study having been carried out for smaller

cities or towns. Bareilly perhaps is the only city with a population of 3,86,734 (town only) as per 1981 census report, in which a study on its urban fringe has been undertaken.

No study appears to have been taken up in case of smaller towns. Though Bareilly is a much bigger city than Roorkee, there are many similar features between Bareilly and Roorkee. The reasons for selecting Bareilly for the case study are given below

1. Non availability of directly relevant parallel case study of any of town of size of Roorkee.
2. Bareilly like Roorkee is situated in the Indo Gangetic Plains over looked by the Central Himalayas with similar topographical and geoclimatic conditions.
3. Similarity because of location of military cantonment, and institutions like Rohilkhand University and, Indian Veterinary Research Institute.
4. The growth of the Bareilly like Roorkee is generally restricted in few directions viz., north east, north and north west due to barriers imposed by river Narkatia (east), cantonment (south), and Ramganga River (south and south west).
5. Personal familiarity of the author with Bareilly city having stayed there for three years.

3.3 STUDY AREA :

3.3.1 Geographical Location :

Bareilly (28 deg. 22 Min. N and 79 deg. 24 Min. E) is Divisional Headquarters of Rohilkhand^{division} and District Headquarters of Bareilly district. It is located 255 Km. from Lucknow and 252 Km. from Delhi and lies almost in centre of Upper Gangetic Plain. The city is well connected by rail and road to Nanital, Pilibhit, Shahjehanpur, Badaun, Rampur and Moradabad. Topography of the town is flat with fertile agricultural land. Climate of Bareilly is similar to other sub Himalayan districts. Bareilly city is one of the five cities which have been selected to act as a counter magnet to national capital outside NCR.

3.3.2 Population Trend :

In the year 1991 population of Bareilly city was 6,11,513 registering a growth of 36.07% from 1981 population. Table 3.1 and Fig. 3.1 show the growth of population of Bareilly town group since 1901. From the population growth trend, it is seen that the city has registered a decadal growth of 37.82 and 36.02 percent during last two decades which is quite high compared to increase of 24.19% in respect of the whole district.

Table 3.1

GROWTH OF POPULATION : BAREILLY TOWN GROUP

Census year	Population	Net variation	Percentage variation
1901	1,33,167	-	-
1911	1,29,462	(-) 3709	(-) 2.70
1921	1,29,459	(-) 3	(-) 0.00
1931	1,44,031	(+)14572	(+) 11.26
1941	1,92,688	(+)48657	(+) 33.778
1951	2,08,083	(+)15309	(+) 7.99
1961	2,72,828	(+)64745	(+) 31.11
1971	3,26,106	(+)53278	(+) 19.53
1981	4,49,425	(+)123319	(+) 37.02
1991*	6,11,513*	(+)162088	(+) 36.07

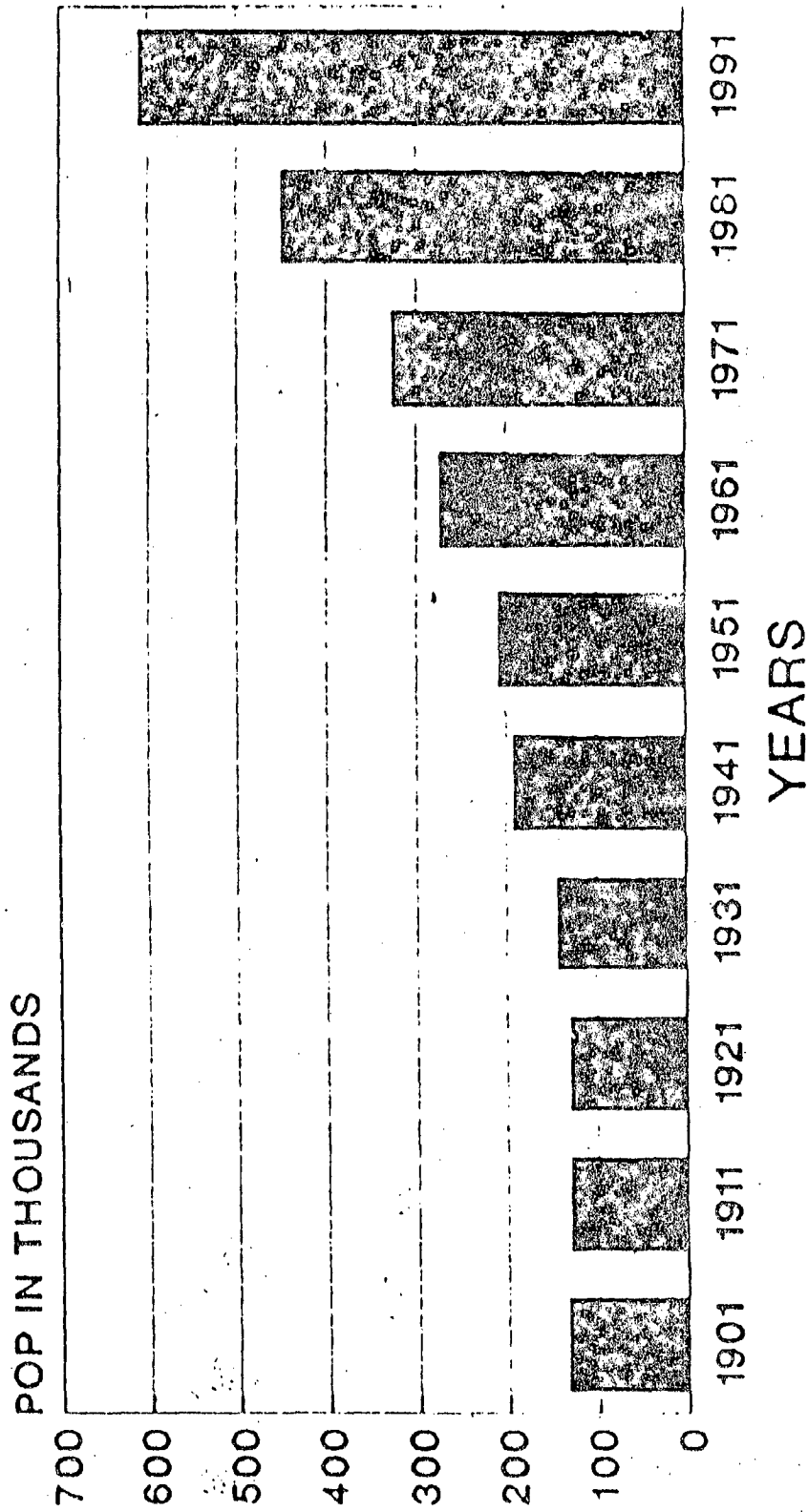
* Provisional figures for 1991

Source : Census Records

3.3.3 Land Use :

During the period of study in 1974-75, a considerably high percentage 41.9% of the land was underdeveloped or undeveloped which was located on periphery of city limits. Functional land use of the city in 1971 is shown in Fig. 3.2. Land use break up of the city as existing in 1971 is given in Table 3.2.

POPULATION OF BAREILLY GROWTH



Source : District census handbook 1981

FIG 3.1

TABLE 3.2
EXISTING LAND USE BREAK UP OF BAREILLY CITY : 1971

S.No.	Land use	Area in Ha.	% of total developed area
1.	Residential	732.1	53.30
2.	Commercial	58.6	4.30
3.	Industrial	53.9	3.90
4.	Govt. Offices	65.6	4.80
5.	Recreational Play grounds	42.5	3.10
6.	Public Utilities and services	7.5	0.50
7.	Transport	103	7.5
8.	Public and Semi Public facilities	213.8	15.6
9.	Major roads	95.8	7.0

3.4 SALIENT ASPECTS OF PARALLEL STUDY

3.4.1 Delimitation

After a detailed study of the concept of rural urban fringe and various criterion applied to identify the fringe belt by different propounders, the following determinants were adopted by the author Mr. Lal during the course of the study to delimit the rural urban fringe of Bareilly :

1. Spatial factor comprising of area of further possible extension of the town took into consideration physical barrier to growth and cardinal directions in which growth was possible.
2. Occupational Determinant adopted comprised of ratio of non agricultural workers. For this villages in which percentage of workers engaged in non agricultural pursuits found to be higher than percentage of whole Tehsil, were considered as urban fringe.
3. Population density of 2 persons per acre was taken as lower limit for delimitation as it was higher than mean rural density of 1.67 persons per acre on the basis of 1971 census data.
4. Rate of change in density during past decade was taken as index of measurer of influence of the city. The villages showing mean change of density more than that of the region (26.3) were taken to determine the fringe, belt under transition from rural to urban.
5. Average rate of growth of population equal to or more than that of the Tehsil i.e. 25% during past decade was considered as another important criteria to delineate the fringe boundary.
6. Sex composition of the area was considered as another determinant in which male : female ratio of 1000 : 800 taken as the Yardstick and areas having higher male:

BAREILLY FUNCTIONAL LAND-USE: 1971

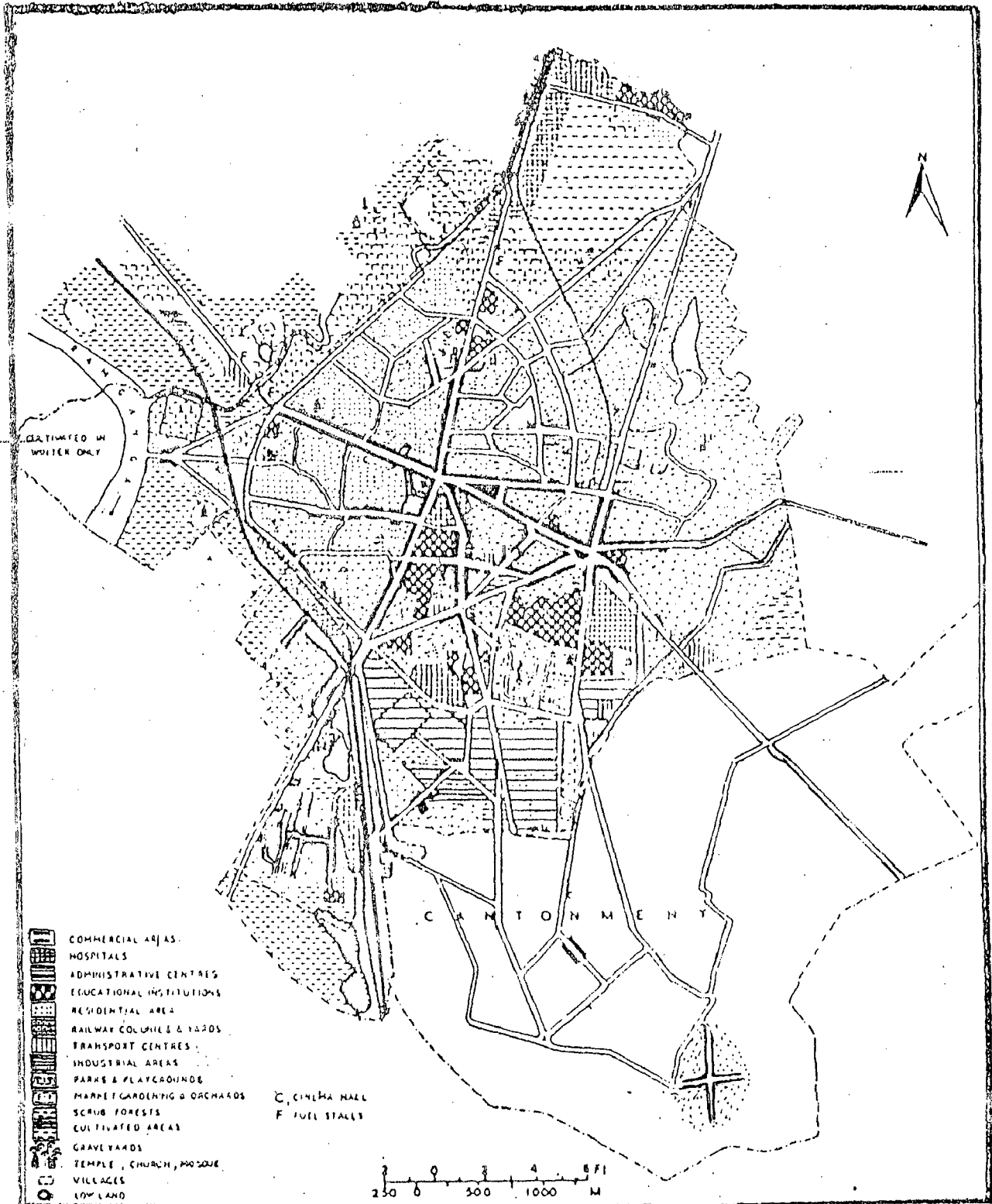


FIG. 3.2

female ratio were included in the fringe.

7. Literacy was considered as another parameter to delimit the fringe and areas having higher literacy rate than Tehsil average of 11% were included in the fringe belt.

All these determinants when plotted on separate maps of the area and super imposed on a base map provided satisfactory result showing the delineated fringe belt. The zone in which most of these variables co-existed clearly gave the demarcation of the fringe limit and all those villages in which at least three determinants coincided and were contiguous to the city were finally considered to delimit the fringe.

The urban fringe so demarcated was further divided into primary and secondary fringes. Primary or true fringe included only those villages having more than 30 percent of their working force engaged in non agricultural pursuits and fulfilling at least three of the determinants. The primary and secondary fringe delineated by adopting this method comprised of 24 and 43 villages respectively. The urban fringe of Bareilly showing the structural zones as finally demarcated by the author is shown in Fig. 3.3.

3.4.2 Demographic Characteristics :

Demographic characteristics analysis in the study revealed following aspects :

1. The growth rate of Bareilly increased from 19.53% during 1961-71 to 34.25% during 1971-81, where as the growth percentage in fringe was 31.05% during 1961-71.
2. Distribution pattern of population showed significant change particularly in two directions south and west.
3. Average population density of Bareilly U.A. in 1971 was 7170 persons per Km. and it was much higher 21825 persons per sq.km. in built up area varying from ward to ward. In the fringe belt the average density was 8.32 persons per hectare.
4. Density of city had been continuously increasing in every decade and during 1981, it was 9012 persons per sq.km. In the fringe belt the maximum density was found in south and west directions in areas which fall along transport routes and were nearer to Municipal limits.
5. Pattern of occupational structure revealed percentage of non - agricultural workers was higher than Tehsil average.

3.4.3 Pattern of Settlement

Salient aspects of pattern of settlement noticed during the study are as given below :

1. Average house density of 98.8 houses per sq.km. rising to as high as 334 in case of some villages. It helped

Urban Fringe of Bareilly: Structural Zones

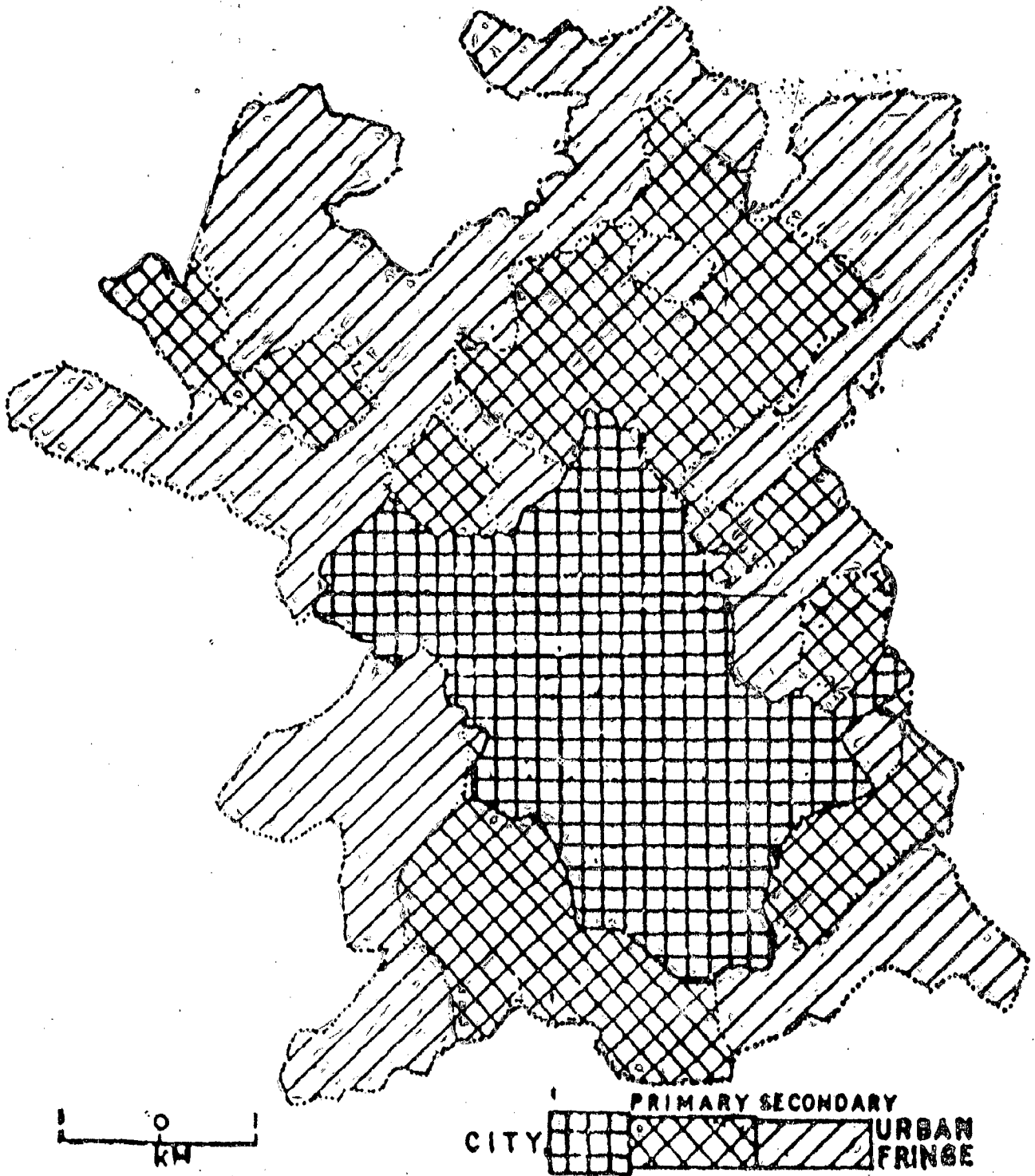


FIG 3.3

to establish relationship of density to distance from city centre.

2. The percentage of built up area to total area was found to be highest in the inner ring on immediate periphery of periphery of municipal limits.
3. The distribution pattern of the settlements reflected marked variation with the high frequency of new settlements in areas with adequate transport facilities.
4. The core villages have traditional pattern of settlements but new settlements near the city limits and along transport routes reflect mixed rural urban type of settlements.
5. Landuse is continuously changing from rural to various urban uses in fringe belt in varying degrees depending upon accessibility and proximity to the city.

3.4.4 Finding of the Study :

After carrying out study of demographic characteristics, functional land use pattern of settlement and public utility services, the following problems were revealed in the findings :

1. Concentration of economic activities within core of the city, led to creation of traffic problems.
2. Peripheral wards displayed poor housing conditions.

3. Many of the settlements in fringe belt were found in slum like conditions.
4. Urban sprawl beyond corporation limits, due to lack of any controlling agency, would create slums in future.
5. General lack of community facilities and utility facilities all over the urban fringe.
6. Increased air pollution was caused because of increasing vehicular movements towards the city and industries set up in fringe belt.
7. Increasing awareness of people and authorities to these problems.

3.5 RECOMMENDATIONS OF THE STUDY

3.5.1 Recommendations :

By carrying out critical review of the Bareilly Master Plan (1971 - 96), the following suggestions were made on the basis of the study :

1. Development of few residential neighbourhoods in the fringe.
2. Fixation of life of existing slum type houses by regulation, demolition after expiry and ban on construction in space left by strict regulation.
3. Long term planning for improving main business through fares.

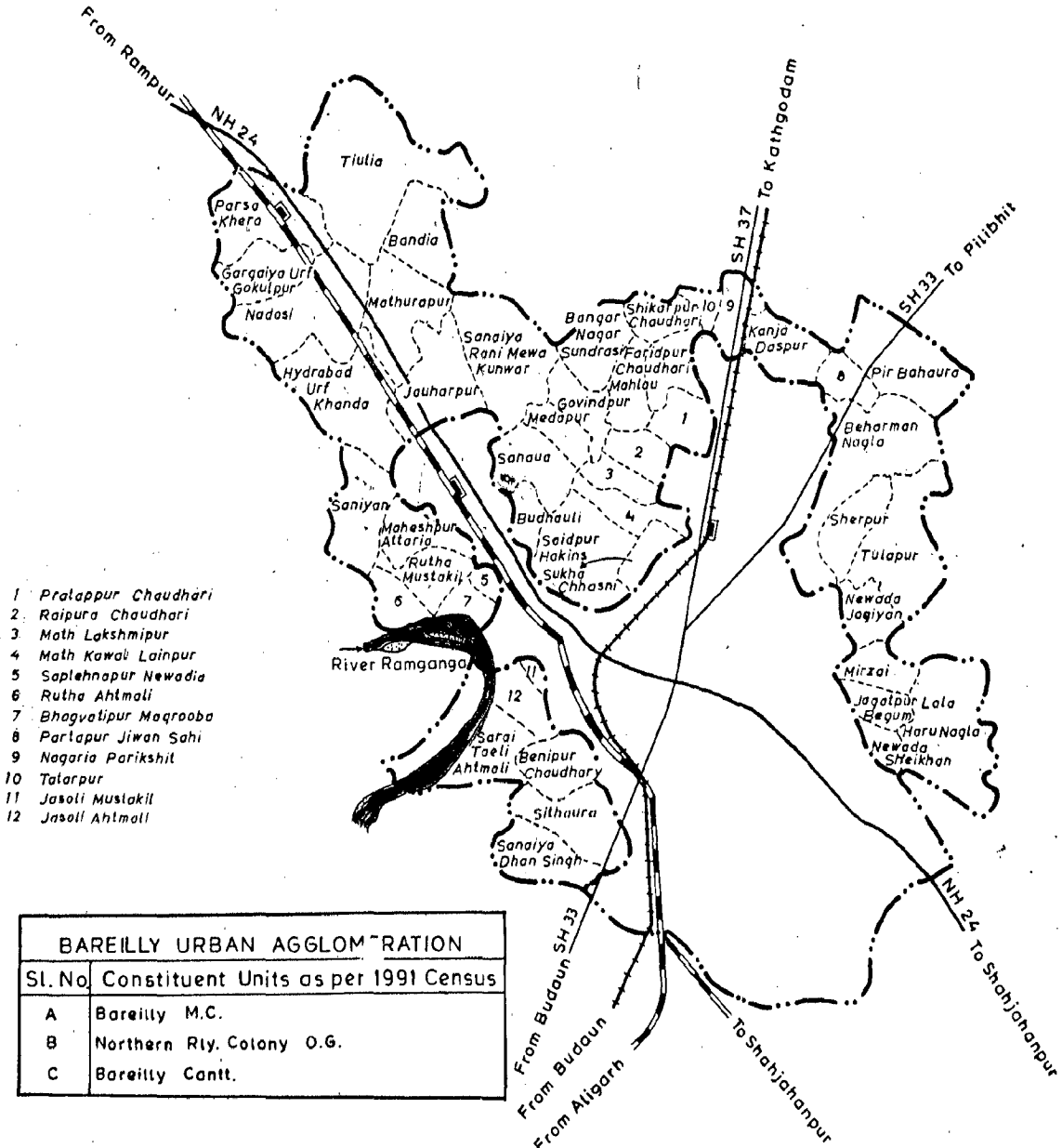
4. Establishment of local shopping centre in fringe areas and within city limits on the boundary.
5. Separation of manufacturing and industrial zones from residential zone and locating in suitable areas in the fringe.
6. Proposal for construction of three ring roads and few by passes to divert vehicular traffic from main through fares.
7. Proposal to construct a number of link roads between fringe and city.
8. Efforts to maintain pattern of original land use in the fringe and maximum utilisation of the fertile agricultural land by commercial agriculture like market gardening.

3.5.2 Conclusion :

The findings and recommendations of the study help in drawing general conclusions for any city for town which would be of similar nature as in case of Bareilly, differing only in physical aspects. Importance and relevance of the study can be gauged by the fact that during 1991 census the limits of Bareilly Urban Agglomeration has been considerably extended to include a large number of revenue villages which were delineated within the urban fringe during the study as seen in Map 3.4.

BAREILLY URBAN AGGLOMERATION

AREAL SPREAD 1981 & 1991



- 1 Pratappur Chaudhari
- 2 Raipura Chaudhari
- 3 Math Lakshimpur
- 4 Math Kawal Lainpur
- 5 Saplehnapur Newadia
- 6 Rutha Ahtmal
- 7 Bhagvatipur Maqrooba
- 8 Parlapur Jiwan Sahi
- 9 Nogarja Parikshit
- 10 Tatarpur
- 11 Jasoli Mustakil
- 12 Jasoli Ahtmal

BAREILLY URBAN AGGLOMERATION	
Sl. No	Constituent Units as per 1991 Census
A	Bareilly M.C.
B	Northern Riv. Colony O.G.
C	Bareilly Cantt.

BAREILLY URBAN AGGLOMERATION IN 1981
 AREA ADDED IN 1991

BOUNDARY: URBAN AGGLOMERATION 1991 ...	
BOUNDARY: URBAN AGGLOMERATION 1981...	
BOUNDARY: VILLAGE..	
HIGHWAY: NATIONAL, STATE...	NH 24, SH 33
RAILWAY: BROAD GAUGE, METRE GAUGE ...	
RIVER AND STREAM ...	

FIG 3.4

CHAPTER 4
STUDY AREA: ROORKEE

STUDY AREA : ROORKEE

4.1 INTRODUCTION TO STUDY AREA

Though classified as Class II town in the District Census Hand Book, Roorkee enjoys a unique place of distinction not only in its home state U.P. but also in India and outside due to its pioneer educational and research institutions in the field of technical education and research. Location of Roorkee on Map of India is shown in in Gig. 4.1.

4.1.1 Deriving its name from RURI, the wife of a Rajput Chieftain, the history of Roorkee as it stands today can be traced back to 1840, when it existed as a mud built village situated on the elevated ridge on the southern bank of Solani river, when the town was adopted by the British Indian Government with commencement of the construction work on famous Ganga canal. The town has since been growing with establishment of Government Canal Workshop, Thomason College (now Roorkee University), Roorkee Cantonment, opening of various Institutions, Government offices and creation of infrastructural facilities.

4.1.2 The growth, development and sustenance of the town is thus closely linked to its institutions which stimulated the growth of settlements to accommodate the employees of these establishments/institutions and supporting service population.

4.1.3 Significant growth during the last two decades (1971 - 91) has been witnessed in open agricultural land on fringes, due to enormous growth of population leaving hardly any scope for development within the present Municipal limits as most of the vacant land within the town has already been brought into use.

4.2 LOCATION, GEOGRAPHICAL AND CLIMATIC FEATURES

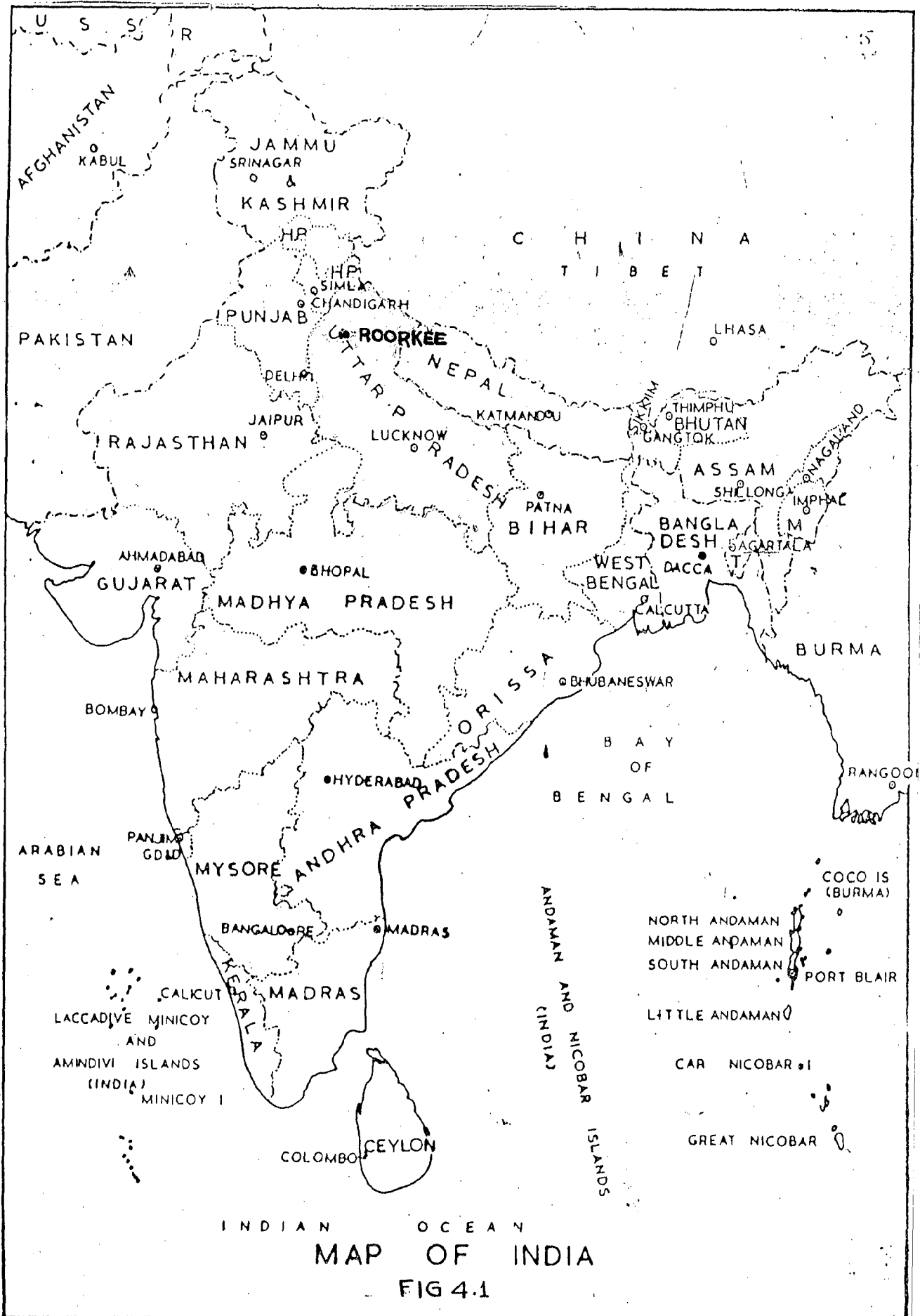
Roorkee is the SubDivisional (Tehsil) Headquarters of Tehsil having same name of newly constituted (1988) Hardwar District under Meerut Division falling in Western Economic Region of U.P. State as per 1991 census. It enjoyed same status as part of neighbouring Saharanpur District even earlier. Roorkee Tehsil is further divided into three community development Blocks, Bhagwanpur, Roorkee and Narson. Maps of U.P. State, Hardwar District and Roorkee Tehsil are given in Figs. 4.2, 4.3 and 4.4.

4.2.1 Location :

1. Latitude : 29 deg.51 ^{min}. North
2. Longitude : 77 deg.53 ^{min} East
3. Elevation : 274 m above M.S.L.

4.2.2 Topography :

Laying in the Indo Gangetic plains belt overlooked by Himalayan ranges, Roorkee is located within highly fertile agricultural belt. Average rainfall recorded is 1016 mm.





Based upon Survey of India map with the permission of the Surveyor General of India

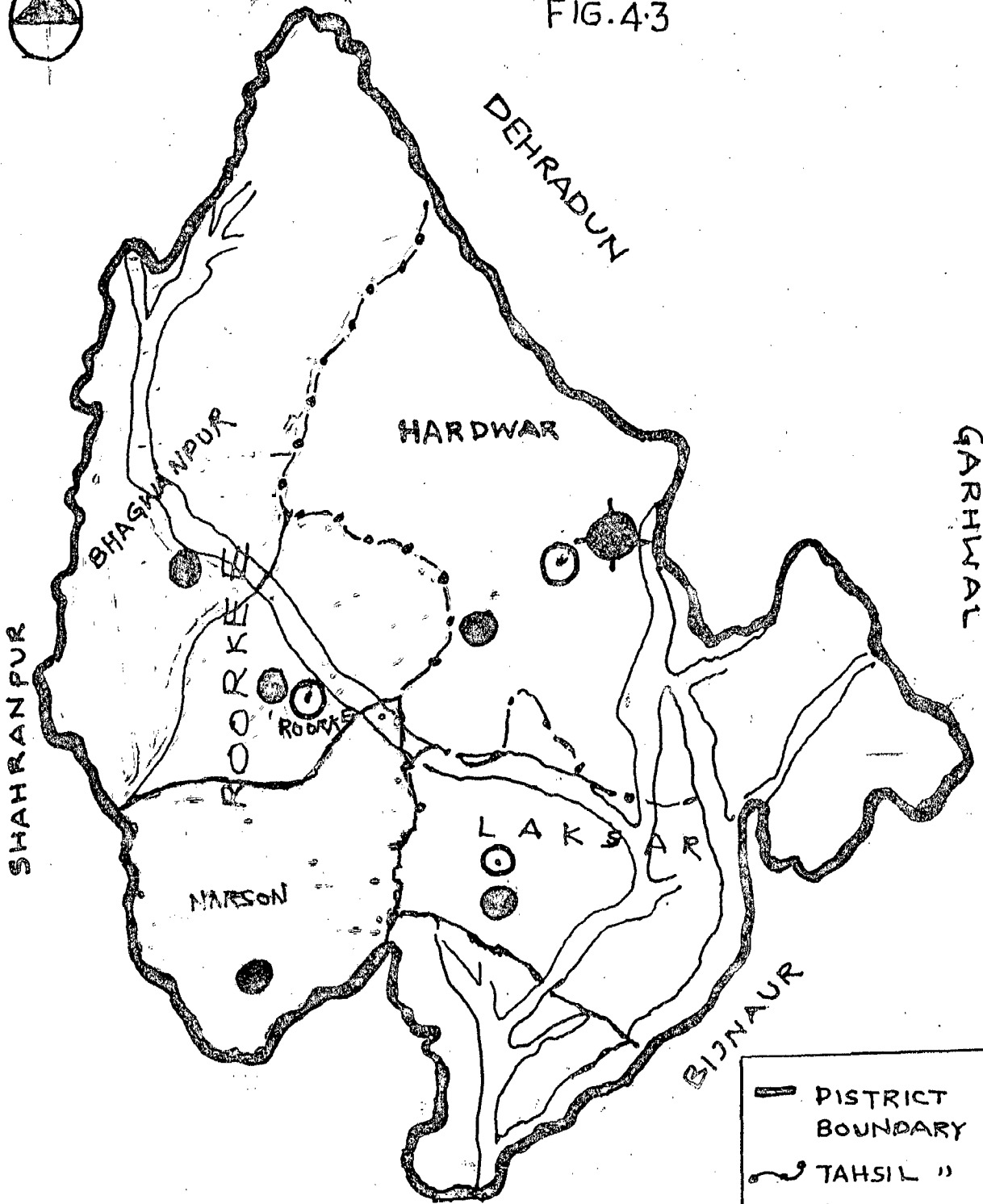
(C) Government of India Copyright, 1997







FIG 4.2

HARDWAR DISTRICT

SCALE - 1" = 4 MILES

FIG. 4.3

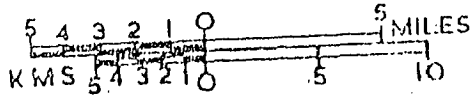


-  DISTRICT BOUNDARY
-  TAHSIL "
-  BLOCK "
-  DST. H.Q.
-  TEHSIL H.Q.
-  BLOCK H.Q.

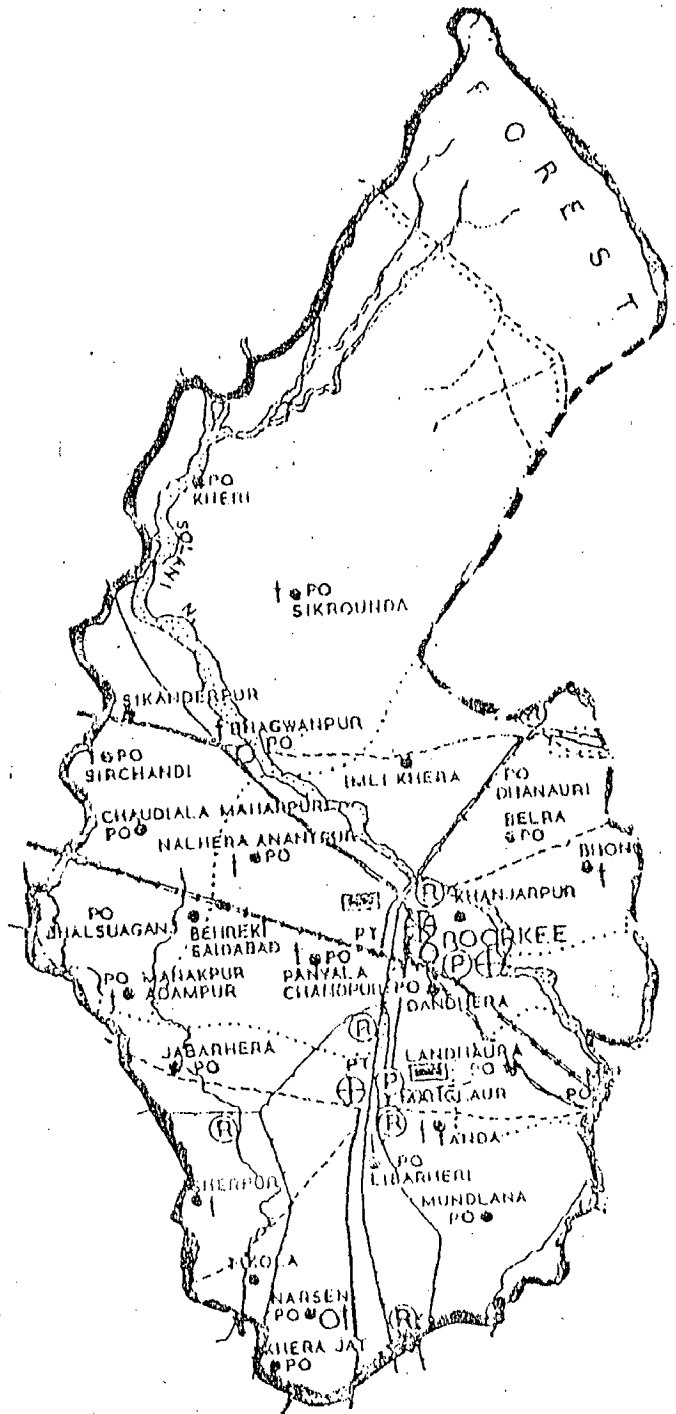
MUZAFFAR NAGAR

SOURCE: HARDWAR DISTT,
STATISTICAL REPORT
1989

TAHSIL ROORKEE



S A H A R A N P U R



TAHSIL HEADQUARTERS	
BLOCK HEADQUARTERS	
DISTRICT BOUNDARY	
TAHSIL BOUNDARY	
BLOCK BOUNDARY	
RLY. LINE WITH STATION B.G.	
STATE HIGHWAY	
LOCAL ROAD METALLED	
LOCAL ROAD UNMETALLED	
RIVER	
CANAL	
REST HOUSE	
POLICE STATION	
POST OFFICE	
POST & TELEGRAPH OFFICE	
HOSPITAL	
DISPENSARY	
MUNICIPAL TOWN	
VILLAGE WITH POP 2000-5000	
VILLAGE MARKET	

FIG 4.4

4.2.3 Climate :

Having tropical climatic similar to other parts of northern India, salient climatic features are :

- | | | |
|----|--------------------|--------------------------------|
| 1. | Winter temperature | 1.3 deg.C. to 34 deg.C. |
| 2. | Summer temperature | 13 to 45 deg. C |
| 3. | Hottest months | May-June |
| 4. | Winter | Severe during December-January |

4.2.4 Relative humidity :

- | | | |
|----|--------------------|--------|
| 1. | Summer (May) | 42% |
| 2. | Monsoon (August) | 85% |
| 3. | Winter (Nov.-Jan.) | 79-86% |

4.2.5 Rainfall :

- | | | |
|----|----------------------|------------|
| 1. | Summer (May) | 19.3 mm |
| 2. | Monsoon (August) | 28,5 mm |
| 3. | Winter (Nov.-Jan.) | 58-42.4 mm |
| 4. | Mean Annual Rainfall | 2183.5 mm |

4.2.6 Wind :

Mean monthly wind speed and direction as given on next page prevail in Roorkee :

Month	Wind speed	Wind direction	
	Kmph	Morning	Evening
May	5.15	SE	NW
			SE
August	3.22	SE	NW
			SE
November	2.90	NW	NW
January	1.61	NW	NW

4.2.7 Physical Features :

Solani river forms the northern of the town, while eastern boundary of University in the east, Cantonment and railway line in the south and outer boundaries of some revenue villages form its Municipal boundary. Ganges canal running from north to south cuts the town in the two distinct parts. The eastern side has the cantonment, the University various research institutions, Govt. offices and Civil Lines complex, whereas the western side of the canal encompasses the old town, most of the private residential areas, few institutions and offices, railway station, industrial estate etc. While the eastern side gives look of a better planned township, the western side particularly, the old bazar area is heavily congested and presents look of a

traditional Medieval Indian town. Canal, the most important feature in the townscape, though adding to the beauty of the town, acts as a physical barrier between the two parts. These physical features have imposed their own limitations on expansion of the town in certain directions, viz., Solani river in the north the University in the east and Cantonment and railway line in the south act barrier to growth.

4.3 ROORKEE IN THE REGIONAL CONTEXT

4.3.1 Location, Linkages and Importance in the Region :

Roorkee, the largest Tehsil of Hardwar District because of its institutions, the cantonment, vast tracts of fertile land, strategic location with well connected communication linkage with all important towns and cities in the region, commands a significantly important place in the region. It falls en route to road route from Delhi to important pilgrim and tourist places. Its convenient connection by road and rail with a large number of towns and cities all round in the region has added to importance of Roorkee in the region. Table 4.1 shows communication linkage of Roorkee with some important places.

Apart from the places shown in the Table, Roorkee is also connected by road and rail to many important places in Haryana, Punjab, J&K and some of which include Yamuna Nagar, Jagadhari, Ambala, Chandigarh, Patiala, Ludhiana etc. Its fertile land produces variety of crops and vegetables, which not only meet the

requirements of Roorkee but are also being exported to other places. There are two big sugar mills near Roorkee because of sugar cane growing agricultural belt around. Roorkee is looked with pride as a place of learning in the field of technical education and research particularly in the subjects related to irrigation, hydrology and hydel power engineering, water resources development and earthquake engineering, many of which are not available at other places. Solani aquaduct constructed more than 150 years ago to cross the Upper Ganga Canal across Solani river is less than 2 km. towards north and is even now considered an engineering feat. A new twin aquaduct is under construction on its eastern side. In spite of being a Class II town, Roorkee due to these reasons, can not be compared with any other town of same size and magnitude and stands out distinctly apart.

TABLE - 4.1

COMMUNICATION LINKAGES FROM ROORKEE

Sl.No.	Name of Place/town	Importance	Distance in Kms.	
			road	rail
1.	Delhi	National capital	170	217
2.	Lucknow	State Capital	538	491
3.	Dehradun	Famous district HQ	70	97
4.	Mussoorie	Hill Resort	100	-
5.	Paonta Sahib	Famous Sikh Pilgrims age Centre in H.P.	110	-
6.	Saharanpur	District HQ town	46	36
7.	Hardwar	Hindu Pilgrimage/ Tourist Centre and District HQ	31	46
8.	Rishikesh	Hindu Pilgrimage and Tourist Centre	55	70
9.	Badrinath	Famous Hindu Pilgrimage	300	-
10.	Kedarnath	-do-	200	-
11.	Hemkund Sahib	Famous Sikhs Pilgrimage Centre	250	-
12.	Piran Kaliyan	Important Muslim Religious Centre	8	-
13.	Mangalour	Mandi town	8	-
14.	Muzaffarnagar	MainMani town Centre and HQ of neighbouring Ditt.	52	92
15.	Meerut	Divisional HQ within NCR	104	148

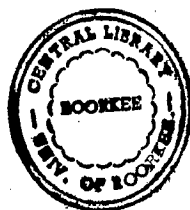
4.3.2 Economy and role of Roorkee in the Regional Setting of the Town :

The economic base of the town is provided by its institutions, cantonment and Govt. offices with a large proportion of the white collar employees. Though the town is famous for its drawing, survey and mathematical instruments and electronic industries on small scale, it can only be categorised as Institutional town. It has well connected net work of road and rail linkages with all the important cities and town including Delhi, Meerut etc. in the region and falls enroute to important pilgrimage and tourist centres like Hardwar, Rishikesh, Dehradun and Mussoorie etc.

Though Roorkee does not have any apparent sound economic ore industrial base in the traditional mould, it has shown significant growth particularly during last few decades. Apart from its well connected linkages in the region, healthy climate, overall environment, the growth potential of the town can be attributed to the educated elite population, who constitute sizable proportion of its population.

4.3.3 Neighbouring Towns :

There are few smaller towns in the close vicinity of Roorkee town namely ; Jhabrera (21 Kms.), Mangalaur (10 Kms.), and Landhoura (8 Kms.) which fall within Narsaon Community Development Block of Roorkee Tehsil. Another newly created town



246031

in 1991 census Laksar till constitution of Hardwar district (1988) was part of Roorkee Tehsil under Saharanpur District. Laksar now constituted a separate Tehsil of Hardwar district. Apart from being an important railway junction, it plays an important role in the region because of its recent past association with Roorkee, close linkages by road and railway with both Hardwar, Roorkee, Najibabad and other places. Status of all these smaller neighbouring towns showing their distances from Roorkee and 1991 population are given below :

	Status Class	Distance Km.	Population
1. Landhaura T.A.	IV	8	12195
2. Mangalaur M.B.	III	10	34161
3. Jhabrera T.A.	V	21	7633
4. Laksar T.A.	IV	25	15622

All these four towns have close interaction with Roorkee and people in large numbers commute daily to Roorkee for various socio economic needs Landhaura and Mangalaur because of their close proximity and keeping in view the developments taking place in the fringe areas around Roorkee, may either merge into Roorkee town and get integrated into Roorkee U.A. maintaining their separate status.

4.4 DEMOGRAPHIC CHARACTERISTICS

4.4.1 Population Trends :

Population of Roorkee town (M.B.) in 1991 as per 1991 census report is 80262 and that of the cantonment is estimated as 19919. The total population of 1991 of Roorkee U.A. thus comes to 100181 justifying up classification of the town group of Roorkee town Group since 1908 as given in Table 4.2, it is seen that population of Roorkee town has shown an increase of approximately 30% during last two decades as compared to 15.64% including project population till 2011 in respect of Roorkee Cantonment. The population of the Roorkee U.A. has shown an increase of 21.06% during the last decade (1981-91). Projected population of Roorkee town for 2001 and 2011 are 104086 and 135025 and that of Roorkee U/A, 127120 and 161665 respectively. Trend of population growth and bar graph of population growth of Roorkee U.A. are shown in Figs. 4.5 and 4.6 respectively.

4.4.2 Occupational Structure :

Occupational structure of Roorkee shows that main workers constitute 25.44% of total population, out of which approximately 39% are engaged in other services. If percentage of cantonment is taken into consideration the percentage will increase further because approximately 70% serving army personnel stay single. Occupational structure of Roorkee town is reflected in Table 4.3 and drawn as pie chart in Fig. 4.7.

TABLE : 4.2

POPULATION GROWTH ROORKEE TOWN GROUP : 1901 - 2011

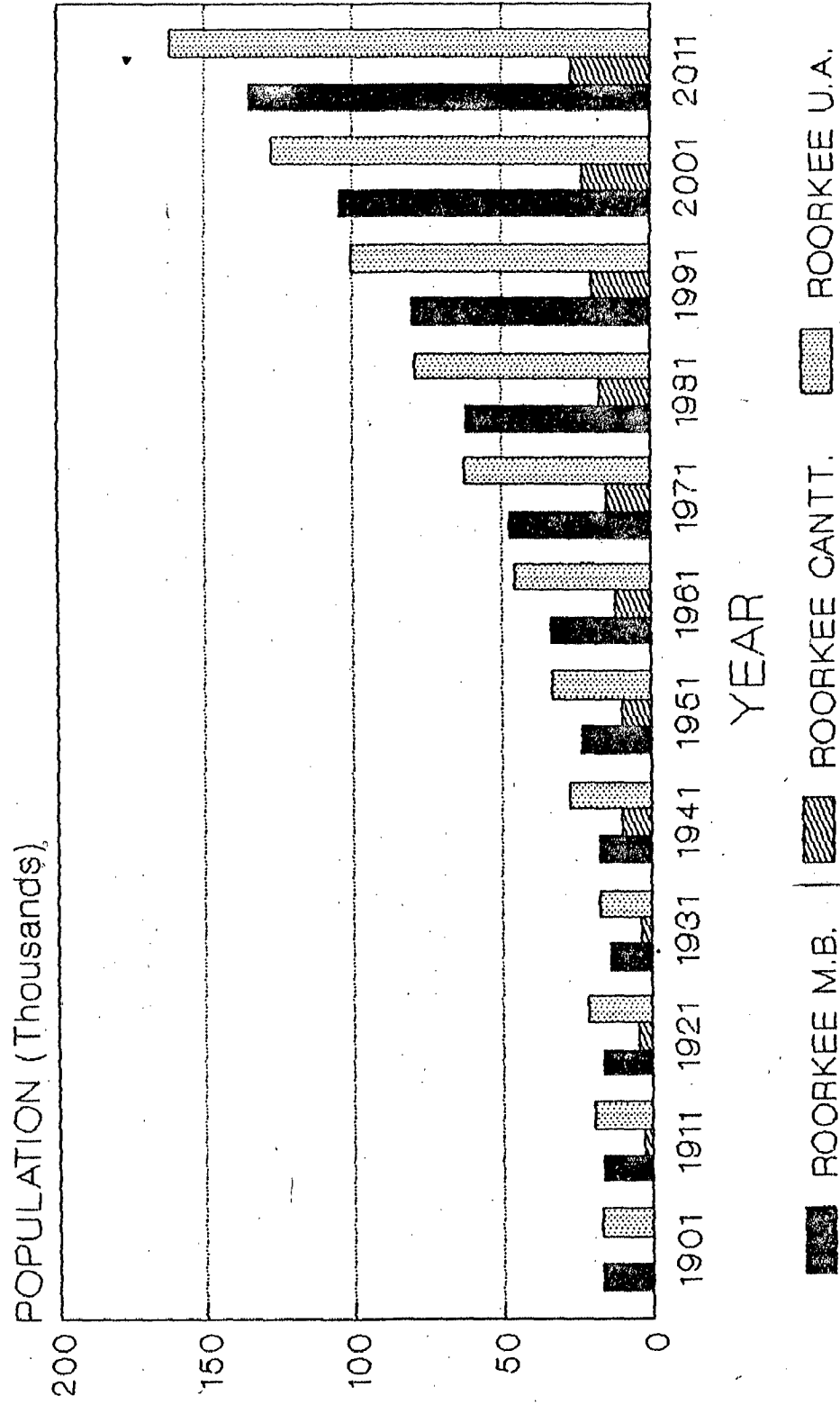
Year	ROORKEE M.B.		ROORKEE CANTT.		ROORKEE U.A.			
	Status	Area Population	% varia- tion	Status	Area Popu- lation	% Deci- nnial varation	Popula- tion	Decadal variation
1901	-	17148	-	-	-	-	-	-
1911	-	16584	(-) 3.29	-	2734	-	19318	(+) 9.70
1921	-	16716	(+) 0.80	-	4470	(+) 63.50	21168	(+) 9.70
1931	-	13944	(-) 16.58	-	3532	(-) 20.80	17476	(-) 17.50
1941	-	17334	(+) 24.31	-	10030	(+) 183.98	27364	(+) 56.58
1951	-	23239	(+) 34.07	-	9853	(-) 1.76	33093	(+) 20.93
1961	M.B.	23651	(+) 44.80	C.B.	12150	(+) 23.31	45801	(+) 38.40
1971	M.B.	47561	(+) 41.34	C.B.	14895	(+) 22.59	62456	(+) 36.36
1981	M.B.	61851	(+) 30.05	C.B.	17225	(+) 15.64	79076	(+) 26.61
1991	M.B.	80262	(+) 29.77	C.B.	19919*	(+) 15.64	100181	(+) 21.06
2001	-	104086@	(+) 29.72	C.B.	23034@	(+) 15.64	127120@	(+) 21.19
2011	-	135025@	(+) 29.72	C.B.	26640@	(+) 15.64	161665@	(+) 31.37

Source : Census Reports 1981 and 1991

* Estimated through Population Co. Per 1991 Census in 10877 and Figures have been

@ Projected verified from Cantonment

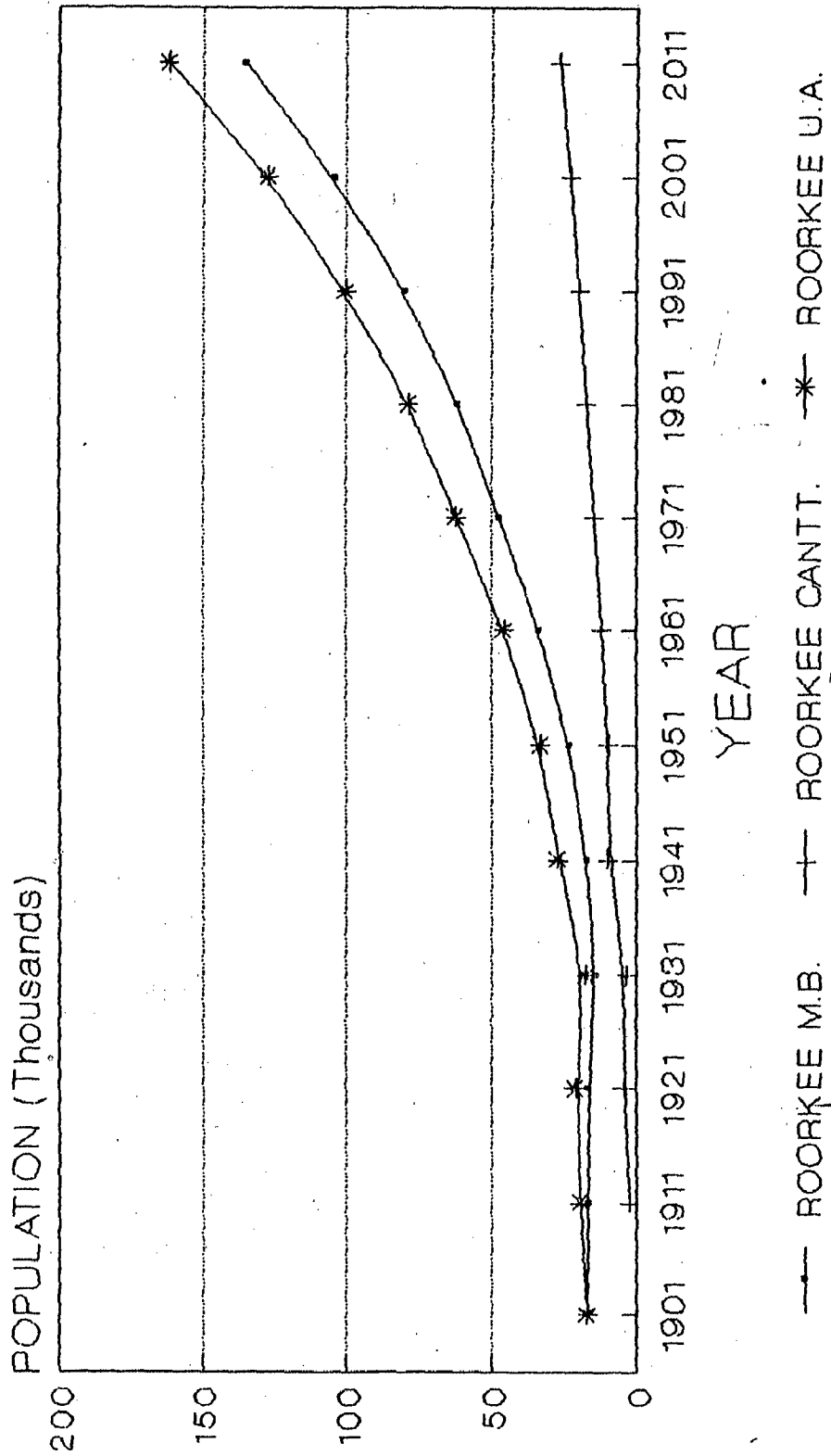
POPULATION GROWTH BAR GRAPH ROORKEE : 1901 - 2011



SOURCE : CENSUS DATA 1981 & 1991
CANTONMENT AUTHORITIES

FIG. 4.5

POPULATION GROWTH ROORKEE TOWN GROUP 1901 - 2011

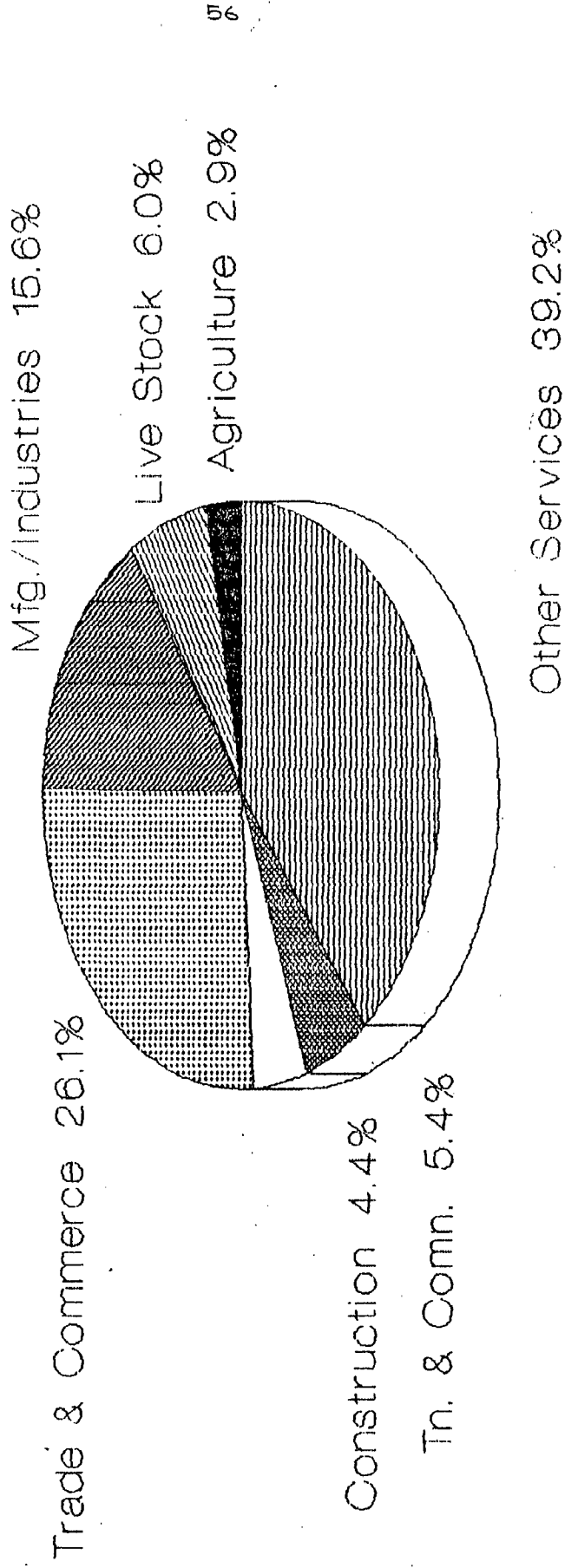


SOURCE :CENSUS DATA 1981 & 1991
CANTONMENT AUTHORITIES

FIG. 4.6

OCCUPATIONAL STRUCTURE : 1991

ROORKEE TOWN



SOURCE : CENSUS DATA 1991

FIG. 4.7

TABLE 4.3

OCCUPATIONAL STRUCTURE OF ROORKEE TOWN ; 1991

S.No.	Occupation/Profession	Percentage
1.	Agriculture including agri/ workers	2.86
2.	Live stock and Allied Activities	6.02
3.	Mining and Quarrying	0.35
4.	Manufacturing/Industries	15.65
5.	Trade and Commerce	26.13
6.	Construction	4.19
7.	Transportation and Communication	5.40
8.	Other services	39.20
Total		100.00

Source : Census Data 1991

4.4.3 Educated Elite Content :

One of the major attractions of this town is elitist and intellectual environment due to considerably high proportion of town populace comprising of this segment. Establishment wise service group in Roorkee U.A. is reflected in Table 4.4. When the total population after taking into consideration their

families is worked out, the percentage of elite element would come to approx. 40% which is quite high for any town of its size by any standards. Even the business community and other occupational groups of this town have been greatly influenced by the elitist environment.

4.4.4 Literacy : Roorkee Town :

The literacy rate of Roorkee town has constantly been much higher than the national and U.P. State literacy rate. Literacy State of the town from 1971 to 1991 is given in Table 4.5.

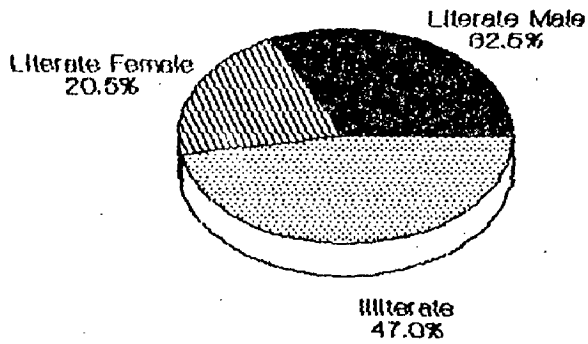
The figures reflect a very high percentage of 58.50 in 1971, 67.92 in 1981 and 68.38% in 1991. The high literacy reflects the institutional character of the town and has greatly influenced the rural areas in the sub region, particularly, the peripheral villages. This factor has played significant role in changing the character of the fringe belt.

Comparative Urban and Rural Literacy in the region :

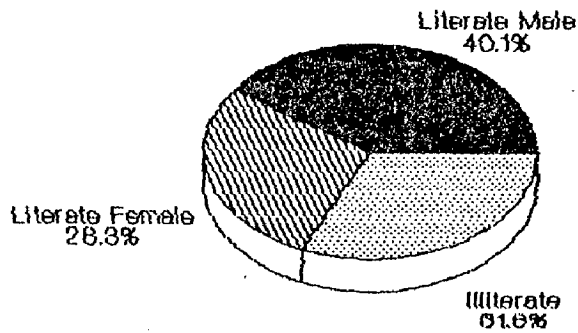
Percentages of male and female literates urban areas of (59.7%) in Hardwar district and Roorkee Tehsil (53%) are quite high, though Roorkee town has significantly higher % of literates both male and female as reflected by 1991 census figures. Comparative Urban Literacy of Roorkee Tehsil, Roorkee (M.B.) and Hardwar district are as shown in Fig. 4.8. Comparatively rural (29.79%) is slightly higher than that of Hardwar District

LITERACY URBAN

ROORKEE Tehsil



ROORKEE M.B.



HARIDWAR Distt.

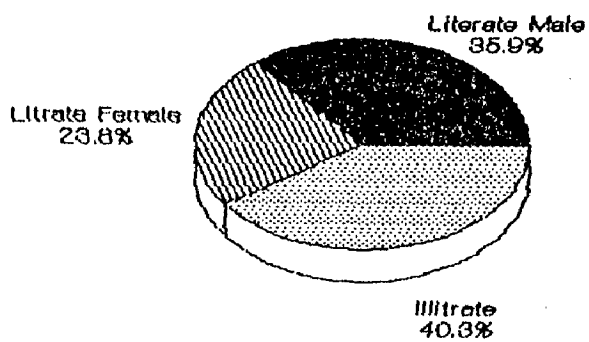


FIG 4.8

(29.,58%) comparative Rural and Urban literacy in 1991 is given in Table 4.6.

TABLE 4.4

ESTABLISHMENT WISE SERVICE GROUP IN ROORKEE U.A.

Establishment	Officers category	Class		Total
		III	IV	
1. Cantonment	325+902	14000	1500	16727
2. University	546	887	755	2188
3. C.B.R.I.	200	342	134	678
4. I.R.I.	475	413	142	1040
5. Irrigation/ Hydel and other Govt.Dept. Offices *	200	600	540	1340
6. Banks, Ins- uranceand other agencies *	150	300	200	650
7. Teachers of other schools and colleges *	350	150	100	600
8. Retired personnel *	250	600	300	1250
Total@	3500	17292	3681	24473

* Estimated figures

@ Figures do not include 2934 students of Roorkee

University and compiled by the author and are approx.

TABLE 4.5
NUMBER OF LITERATES - ROORKEE TOWN

	1971	1981	1991
Total Population	47,566	61,851	80,262
Literates :			
i. Male	17,225	25,834	32,190
Percentage	36.21%	41.77%	40/11%
ii. Female	10,601	16,177	22,691
Percentage	22.29%	26.15%	28.27%
Total Literates :	27,826	42,011	54881
Percentage of Literates	58.50%	67.92%	68.38%

Source. : Census Report

TABLE 4.6
LITERACY URBAN AND RURAL : 1991

Urban	Population Literates			
		Male	Female	Total
1. Hardwar	348142	124918	82914	207832
	%age	35.88	23.82	59.70
2. Roorkee	145128	47150	29761	76911
Tehsil	%age	32.50	20.50	53.00
3. Roorkee	80262	32190	22691	54881
Town	%age	40.11	28.27	68.38
Rural :				
1. Hardwar	776346	169032	60618	229650
District	%age	21.77	7.81	29.58
2. Roorkee	447703	97433	35923	133356
Tehsil	%age	21.77	8.02	29.79

4.5 LAND USE PATTERN

Due to existence of University and Cantonment occupying most of the area on eastern side of the Ganga Canal, comparatively smaller area of Civil Lines is only available on this side of canal which is primarily in residential and commercial use. On the western side of the canal old town area due to concentration

of shops and Mandi has predominantly commercial character mixed with residential use. In most other parts of the town commercial developments are in the form of ribbon development along the road. Except Roorkee University and a few schools existing on eastern side, most of the schools and colleges are situated on the western side like a cluster within a small radius of approximately two kms.

Most of the balance area is in residential use with small pockets under different land uses. There are no major industrial activities within Roorkee town and industrial activities are restricted to small scale manufacturing activities. District Industries Centre of Hardwar district is located in Roorkee just outside its Municipal limits adjoining Ram nagar south ward of the town U.P. Government workshop is located towards North on the eastern bank of the canal. Other industrial activities are restricted to small scale manual turing assembly of drawing and survey instruments within household in different areas of the town.

Land use pattern of Roorkee town thus shows institutional, residential, and strips of commercial use. Break down of land uses giving total area of the town and developed area have been tabulated in Table 4.7 and also shown in Fig. 4.9. Existing landuse Map of Roorkee town is given as Fig. 4.9.1. Maximum population density of approximately 700 persons per hectare

LANDUSE BREAKDOWN ROORKEE TOWN

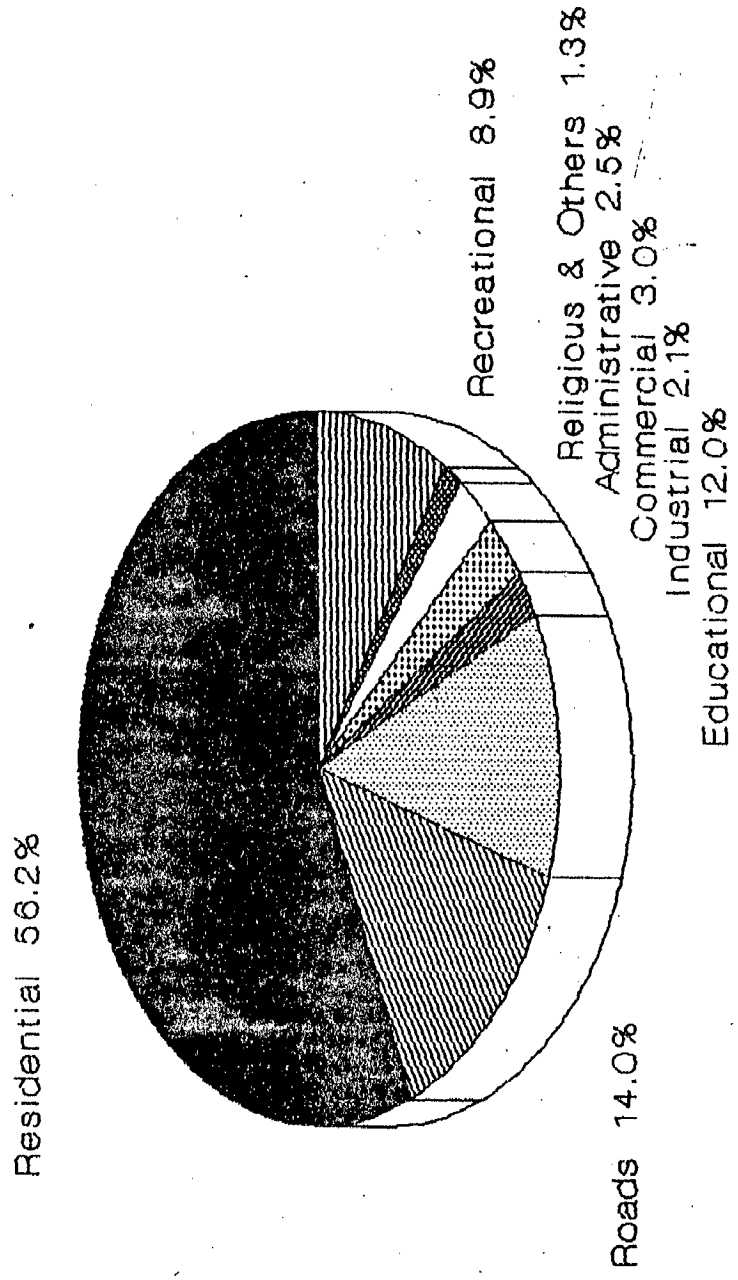
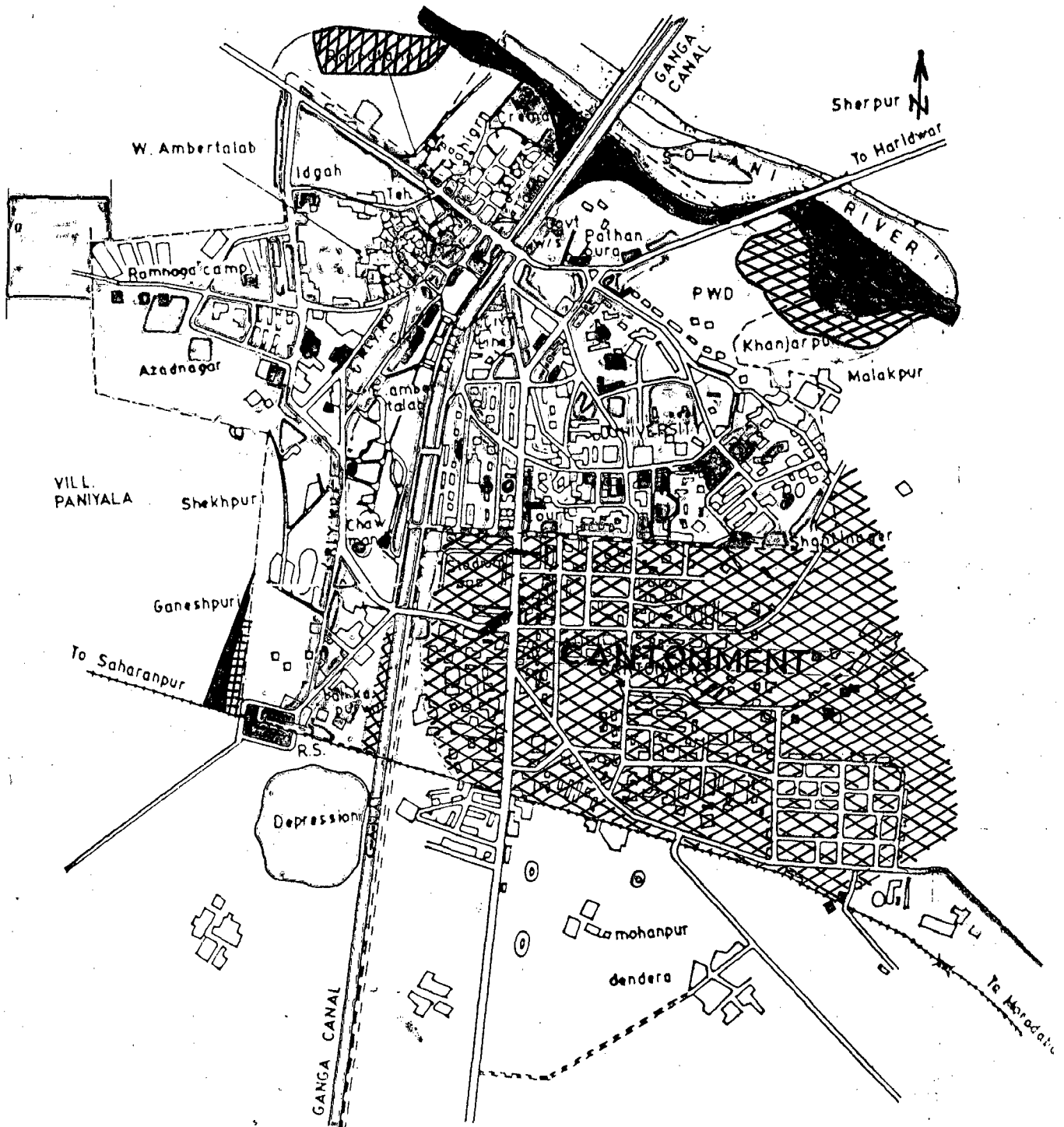


FIG. 4.9

PLAN OF ROORKEE TOWN - LAND USE : EXISTING



LAND USE	LOW	MED	HIGH
RESIDENTIAL	[White box]	[Light hatched box]	[Dark hatched box]
COMMERCIAL	[White box]	[Light hatched box]	[Dark hatched box]
PUBLIC	[White box]	[Light hatched box]	[Dark hatched box]
RECREATIONAL	[White box]	[Light hatched box]	[Dark hatched box]
INDUSTRIAL	[White box]	[Light hatched box]	[Dark hatched box]
USE UNDEFINED	[White box]	[Light hatched box]	[Dark hatched box]
AGRICULTURAL	[White box]	[Light hatched box]	[Dark hatched box]

SCALE - 1:37500

FIG 4.9.1

exists in some areas in old town, where as Cantonment and Roorkee University areas have very low population density of 10 to 80 persons per hect.

TABLE 4.7

LAND USE : ROORKEE TOWN

Total area of town	:	811 Hect.
Total developed area	:	714 Hect.
Percentage developed area to total	:	88%
Use	Area in Hect.	%age of Developed
1. Residential	401.08	56.20
2. Roads	99.91	14/00
3. Educational	85.64	12.00
4. Industrial	14.98	2.10
5. Commercial	21.41	3.00
6. Administrative	17.84	2.50
7. Religious and others	9.27	1.30
8. Open space, Parks, Recreational	63.51	8.90
	1768.00	100.00

CHAPTER 5
EVOLUTION
AND DYNAMICS OF
GROWTH OF ROORKEE

EVOLUTION AND DYNAMICS OF GROWTH OF ROORKEE

5.1 HISTORICAL EVOLUTION

5.1.1 History of Roorkee can be traced back to 12th Century when it existed as a village on the banks of Solani river. Establishment of Roorkee town, as it exists today, dates back to 19th century, when it emerged from a conglomeration of mud hamlets on the southern bank of Solani Rivers after its adoption by British Government with start of canal work.

Construction of the famous Roorkee canal was commenced in 1840. Due to its strategic location, a military cantonment was established in 1853 along with other developments such as opening of Government Workshop, establishment of Thomason College, many Government offices, development of rail and road linkages etc.

After Independence, Thomson College was upgraded as Roorkee University and many new organisations of national importance like Central Building Research Institute (C.B.R.I.), Irrigation Research Institute (I.R.I.), many central and State Government Offices were established.

5.1.2 Growth of Roorkee town :

The spatial growth of the town has been continuous since adoption of the town by the British. The main bazar (Old Market)

was constructed in 1848, Purani (old) Tehsil established in 1855, followed with linear growth along the present railway road, thereafter, Civil Lines, area on the eastern side of the canal started developing in 1898, followed by some specific growth beyond north of the main bazaar. Adjacent to cantonment area, a locality for service population with some shopping came up along the railway line. During the period from beginning of 20th century till Independence in 1947, some low lying areas along western side of the canal known as Amber Talab and B.T. Ganj were developed.

The developments which took place after independence include, Ram Nagar colony, Construction of some temporary shops along the canal bank for refugees from Pakistan, conversion of municipal Garden in low lying area long the canal into vegetable market, expansion of the University and Cantonment Central and State Government offices leading to growth of Civil Lines market along the State Highway.

Due to spurt in development activities after Independence, houses were built in extremely adverse circumstances and lacked basic requirements of light and ventilation. The Municipal Board had no comprehensive building regulations or development controls except some limited controls such as restriction on height of the buildings abutting on the main road. The Municipality gave free hand to the property owners to build houses of any dimension and

design so that they felt free from any restraint and thus get encouraged because of expectation of high returns on their investments.

With growth of the town and consequent improvement of civic annuities, the values of the land steadily started rising. Although the town grew very fast in all directions due to setting up of various organisations, the old part of the town remained static because of sporadic haphazard growth in the earlier periods of developments. However, it goes to the credit of the town that there are no classified slums existing in Roorkee.

5.2 PHASES OF DEVELOPMENT

5.2.1 It is revealed from the history of Roorkee town that it grew to house the supporting population for the Upper Ganges Canal Project, Workshop staff, Military Cantonment and Thomason College. With establishment of road and rail link, the commercial sector started developing and it also assumed the role of service centre for the rural sub region.

The town has been growing and expanding according to development of Government Institutions, educational establishments and military cantonment. In order to understand the growth pattern of the town, it is, therefore, essential to understand the important points of time (landmarks) when major development activities have taken place.

5.2.2 The growth of Roorkee as it exists today can be said to have started in 1840 till when it was only a mud built village on the southern bank of Solani River. Since construction of the Upper Ganga Canal in 1940 the town has been gradually expanding linked with various development activities, important amongst which are :

1. Construction of Upper Ganga Canal in 1840
2. Canal Workshop and Foundry during 1846
3. Thomason College in 1847
4. Roorkee Cantonment during 1853
5. Post Office in 1866
6. Roorkee Municipality in 1868
7. Railway line in 1886
8. Provincial Trunk Road 1907.
9. Power House during 1920
10. Up gradation of Thomason College as Roorkee University in 1947
11. C.B.R.I. in 1947
12. I.R.I. in 1953
13. Constitution of Roorkee Municipal Board in 1958
14. Many other technical and Research Institution and expansion of Roorkee University in Post Independence period.
15. Various Government offices such as Irrigation,

Hydel departments projects/offices after
Independence during 1950's

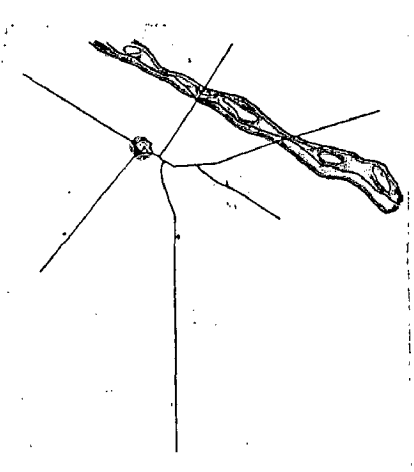
16. Expansion of the Cantonment after Independence and Chinese aggreswsion in 1962
17. Govt. Reserve Engineer Force (GREF) Centre which has since been shifted to Pune

(Source : Imperial Gazettier of India, Vol. XXI, 1908; K.V.Mittal, History of Thomson College of Engineering (1847-1949), University of Roorkee, Roorkee (India), 1986; Annual Reports of University, CBRI, Municipal Board, Records of the Organisations/ Establishment/ Municipality/ Cantonment, K.C.Kambo, "Roorkee and Environs : On Conceptual Heirarchy of Settlements", A Thesis for grant of Associate Membership of Institute of Town Planners, India, New Delhi, May 1968; Rakesh Chandra , "Planning and Development Strategy for future growth of Roorkee Town", A dissertation for award of M.Arch (T & V Plng.), University of Roorkee, 1968; and information collected personally through various sources).

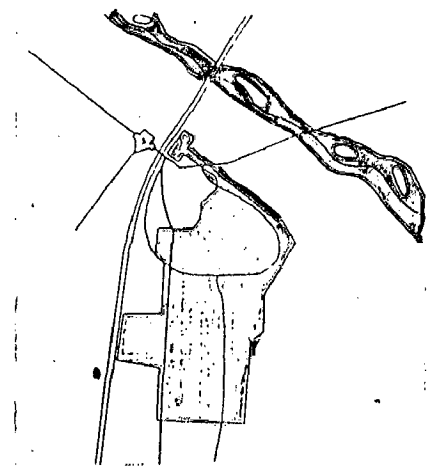
5.2.3 The spatial changes brought about by the above mentioned developments led to growth and development of various residential and commercial complexes to cater for needs of the increasing supporting population. The various complexes which were developed consequently include :

1. Main Bazar (old market) on western side of the Canal in 1848
2. Purani Tehsil in 1855
3. Commencement of some residential development in Civil Lines, during 1898
4. Amber Talab in 1920
5. B.T. Ganj in 1940
6. Ram Nagar Colony in 1947
7. Civil Lines Commercial Complex in 1960
8. Mixed developments all over the town within the Municipal limits during 1960-70.
9. Residential development on rural urban fringe of the town in Khanjarpur, Dhandera, Mohanpur Mohammadpur villages contiguous to the Cantonment 1960 onwards.
10. Development of Azad Nagar, Subhash Nagar and other residential areas on western side of the canal during 1970-81.
11. Development of Solanipuram Residential area on north eastern side of the University during 1980's.
12. Peripheral developments along and across Roorkee, Delhi highway, along with the canal south of railway line, Paniyala village area, Kashipuri on western fringe, Pathanpura and Adarsh Nagar during 1981-91.

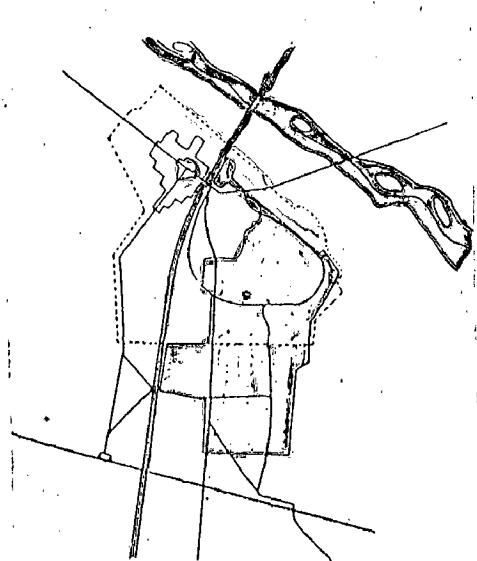
(Source : Vishwamitter and R.K. Jain, "Socio Economic significance of city Development : Identity culture and



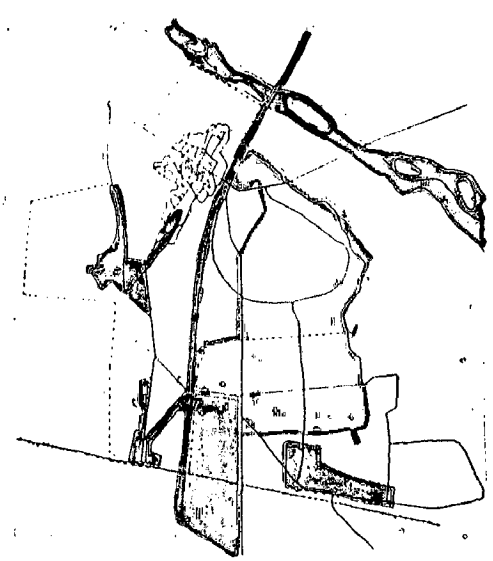
EARLIER SETTLEMENT
18th CENTURY



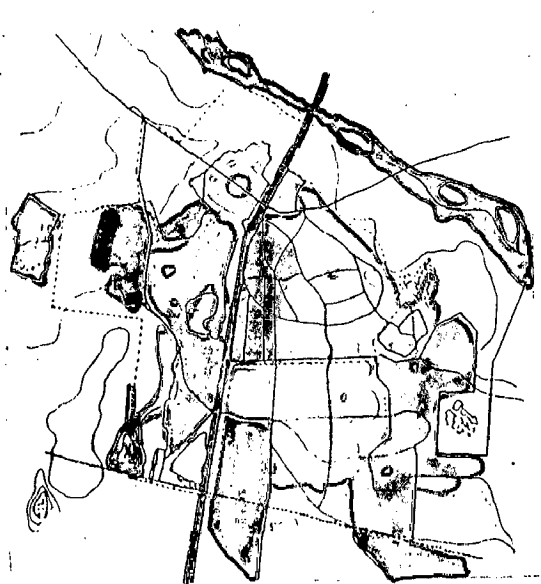
GROWTH UPTO 1856
- GANGA CANAL
- THOMASON COLLEGE
- CANTT



GROWTH UPTO 1891
- RAILWAY LINE



GROWTH UPTO 1951



GROWTH UPTO 1971

PROGRESSIVE GROWTH OF ROORKEE: 1840-1971

FIG 5.1

conservation", Paper presented at International Convencion on Urban Planning, Housing and Design, Singapore, July 1986 and information collected by the author through personal observations and inquiries)

5.2.4 Most of the developments taking place during last two decades have been taking place in open agricultural lands near existing villages. The progressive growth¹ of Roorkee through 18th century till 1971 are shown diagrammatically in Fig. 5.1.

Due to enormous growth of population of Roorkee, there is hardly any scope for development within the existing Municipal limits with most of vacant land brought into use and also due to physical limitations, as brought out in Chapter 4 and to some extent in south along and across Delhi road. Accordingly the unregulated growth has been taking place in the fringe belt, particularly, in those directions, where there are no barriers to further growth.

5.3 DYNAMICS OF URBAN GROWTH

5.3.1 There are three basic theories which have tried to explain the internal structure of cities with a view to analyse the pattern of growth as standard models as given on next page :

-
1. K.C.Kambo, "Roorkee and Environs : On Conceptual Heirarchy of Settlements", A thesis for grant of Associate Membership of Institute of Town Planners, India, New Delhi, 1968. p.70.

1. Concentric zone theory of Ernest W. Burgess as per which the pattern of growth of a city follows five concentric zones.
2. Homer Hoyt's Sector Theory in which entire city is seen as a circle and different sectors radiate from the Centre.
3. Multiple Nuclei Theory as per which the total land use pattern of a city is built around several discrete nuclei unlike one centre in other two theories.

Diagrammatic model of these theories are shown in Fig. 5.2. In this study an attempt has been made to analyse the growth pattern of Roorkee as per these theories so as to understand which of these models are relevant in case of Roorkee.

5.3.2 Growth in Concentric Zone :

Though Roorkee town has not grown in true concentric zones, it, however, has grown around one central nucleus of Civil Lines and old bazar commercial area which is quite akin to Central Business (CBD) District. Some of the outer concentric zones are found to be merging with the CBD. Conceptual model developed according to this theory is shown in Fig. 5.3.

5.3.3 Sectoral Development :

On examination of growth pattern and after analysis of internal structure of to see if it developed as distinctly separate sectors, it is observed that all sectors are not

THEORIES OF URBAN GROWTH

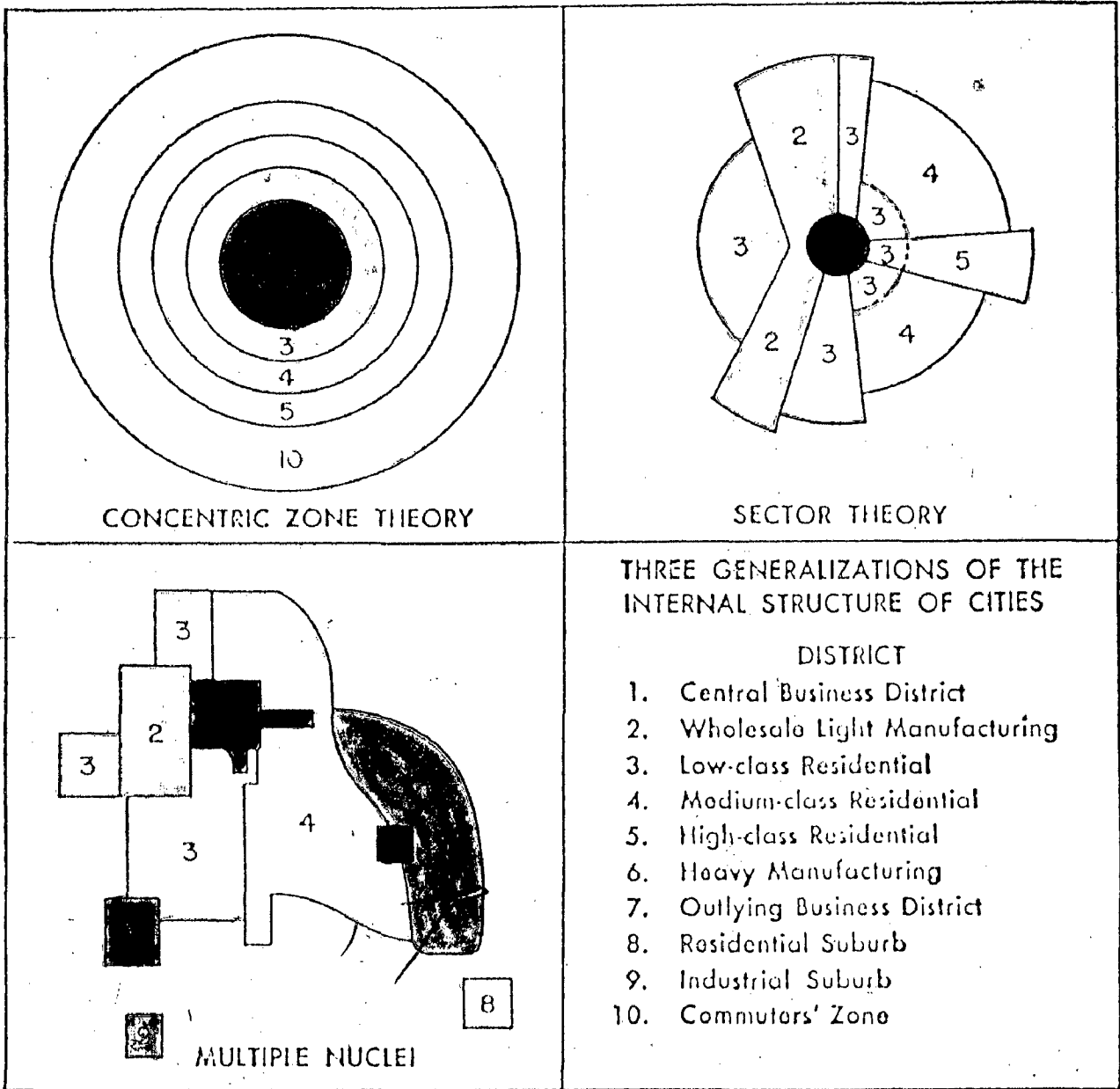
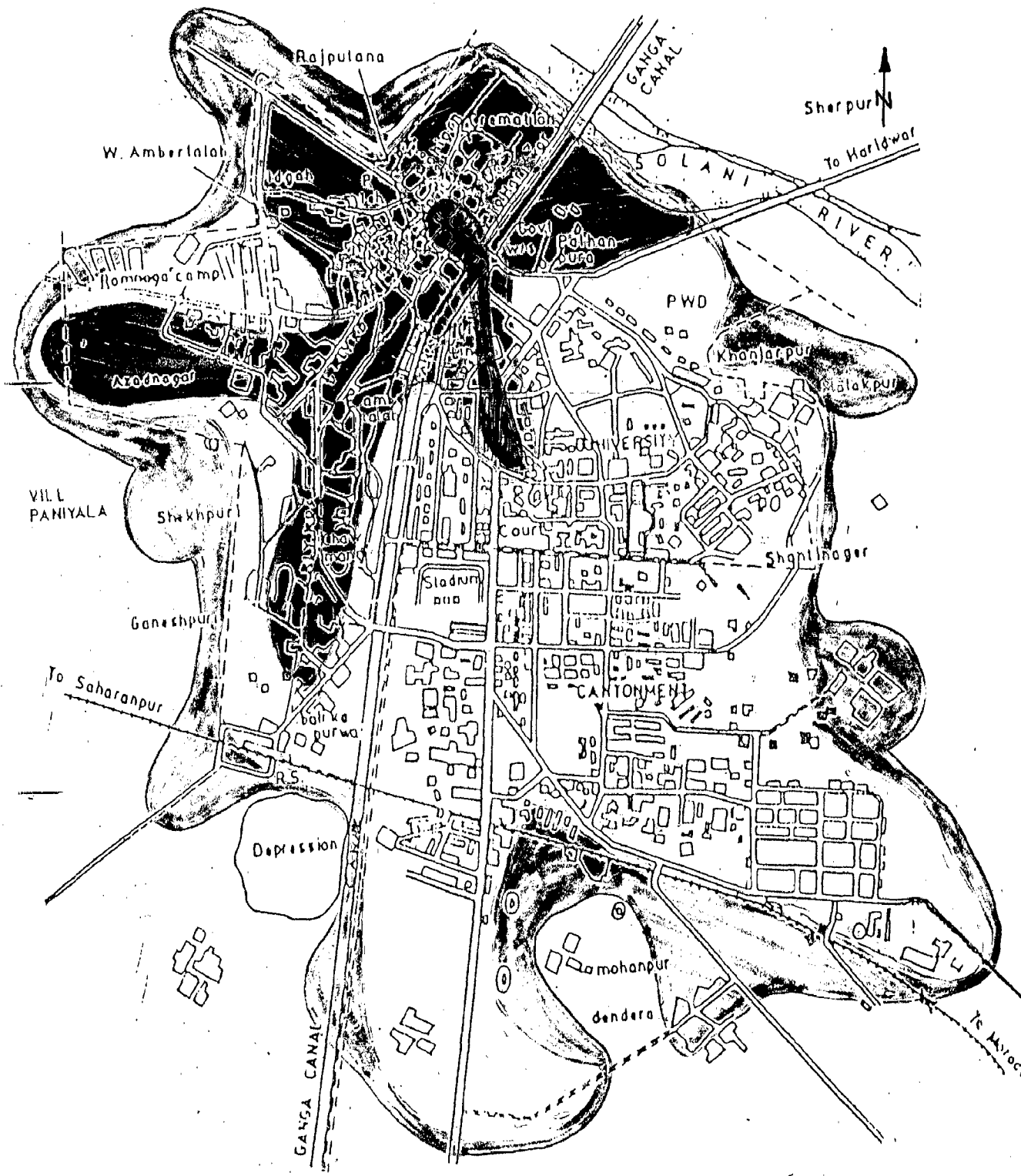


FIG 5.2

PLAN OF ROORKEE TOWN: CONCENTRICT ZONE MODEL



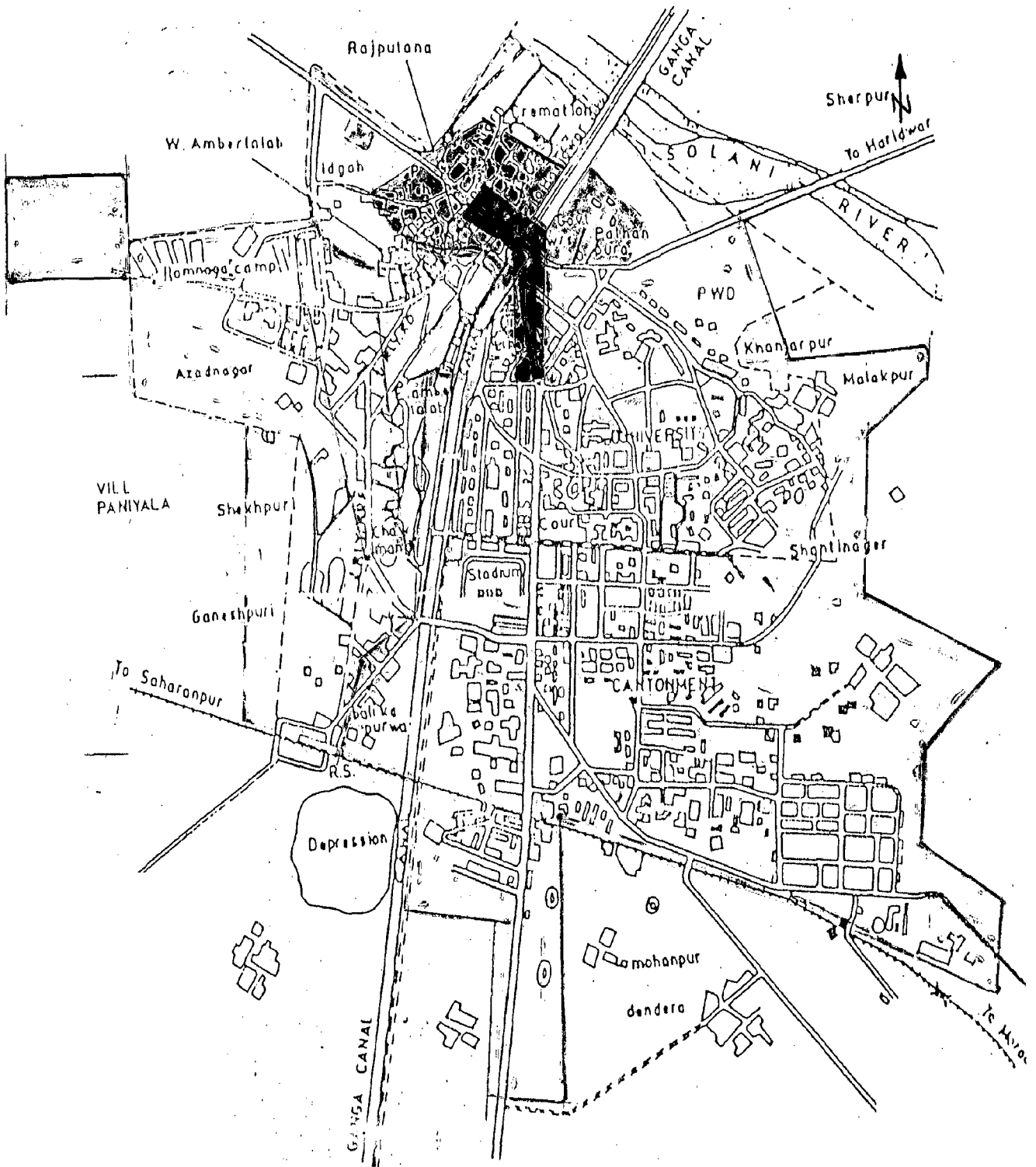
LEGEND

- CENTRAL BUSINESS DISTRICT
- ZONE OF TRANSITION
- ZONE OF WORKMEN'S HOMES
- ZONE OF BETTER RESIDENCES
- COMMUTERS' ZONE

SCALE 1:27500

FIG-5.3

ROORKEE TOWN: SECTORAL DEVELOPMENT MODEL



LEGEND




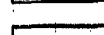
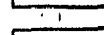
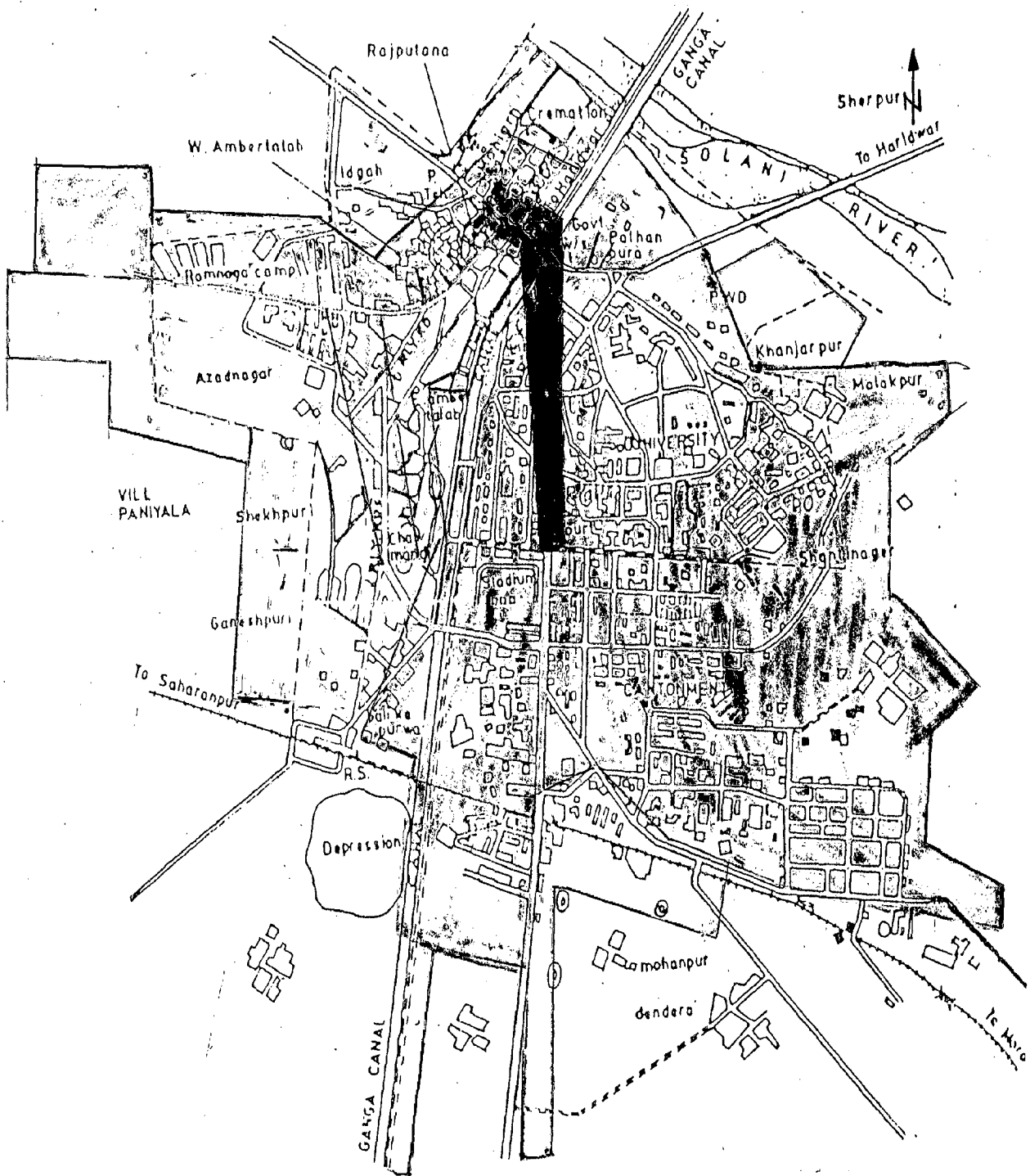

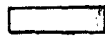
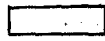
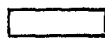
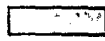
-  CENTRAL BUSINESS DISTRICT
-  WHOLESALE LIGHT MFG
-  LOW CLASS RESIDENTIAL
-  MEDIUM CLASS RESIDENTIAL
-  HIGH CLASS RESIDENTIAL

FIG 5.4

PLAN OF ROORKEE TOWN: MULTIPLE NUCLEI MODEL



LEGEND

-  CENTRAL BUSINESS DISTRICT
-  WHOLESALE LIGHT MFG.
-  LOW CLASS RESIDENTIAL
-  MEDIUM CLASS RESIDENTIAL
-  HIGH CLASS RESIDENTIAL

SCALE-1:37500

FIG 5.5

radiating out of central nucleus, though some sectors do emerge from CBD as depicted in Fig. 5.4.

5.3.4 Development as per Multiple Nuclei Concept :

The broad pattern of growth of Roorkee town seems to follow Multiple Nuclei theory as soon in the model drawn in Fig. 5.5. There are distinctly different types of development around separate nuclei such as University and Cantonment, Old Bazar, Ram Nagger Camp and new residential development.

5.3.5 Findings and Analysis :

Though the three theories of urban growth are not applicable in all respects while studying the internal structure of the town to understand its growth pattern, some significant features have emerged which are given below :

1. Growth pattern does not follow any of the classical theories in all respects, though there are some similarities in respect of few zones/ sectors.
2. Developments have mostly taken place along main transport routes and have taken shape of ribbon development in many places.
3. Because of absence of major industrial base, the town has conspicuous absence of slum like low class residential zone/ sector/ nucleus.
4. Villages on fringes form a kind of commuter zone or residential suburbs.

5. Civil Lines area, though smaller in size, has assumed character of high class residential development due to influence of Roorkee University and Cantonment which taken together occupy more than half the total area of Roorkee U.A.
6. Various institutions on eastern side and Solani river apparently have acted as barrier to physical growth of the town in that direction.
7. Large proportion of areas showing high class residential development helps in establishing educated elitist character of the town.
8. Latest trend of isolated high class residential development along Delhi road and to lesser extent on Hardwar road appears to be due to natural barrier of Solani River.
9. The growth pattern does not follow the set patterns as per the theories of urban growth due to absence of heavy manufacturing and this is the reason behind lessor or no industrial pollution and existence of better living environment.
10. Generally growth on the periphery of the town is uncontrolled.
11. Conversion of agricultural land along main roads into residential and commercial use.

12. Despite restrictions to growth of town as given earlier, developments are taking place on almost all sides particularly along major axes of access to the town.

CHAPTER 6
RURAL URBAN FRINGE
OF ROORKEE

RURAL URBAN FRINGE OF ROORKEE

6.1 FRINGE DEVELOPMENT AROUND ROORKEE

6.1.1 Developments during last two decades: (1971-91)

Till 1971, Roorkee town had pockets of vacant land within developed area and also vacant land towards south west, west and north west periphery within the Municipal limits and pressure for development on fringes outside the municipal limits had not built up. However, with growth of population most of the vacant land within the municipal boundary was gradually brought into use primarily for residential purposes. Whatever vacant plots remained were available only at exorbitantly high prices, whereas the agricultural land just outside the municipal boundary, which had not been exploited till then could be purchased at much lower prices. The average distance of peripheral areas from centre of the town is just about 4 km. and was another favourable factor leading to commencement of development on fringes. It has been revealed during the study that the fringe development started during decade 1971-81 and major developments took place during next decade 1981-91, which is still continuing.

Apart from developments in Pathapura in North, Adarsh Nagar is north east, Solanipuram on eastern side and some developments in Azad Nagar and other areas on western side falling within the

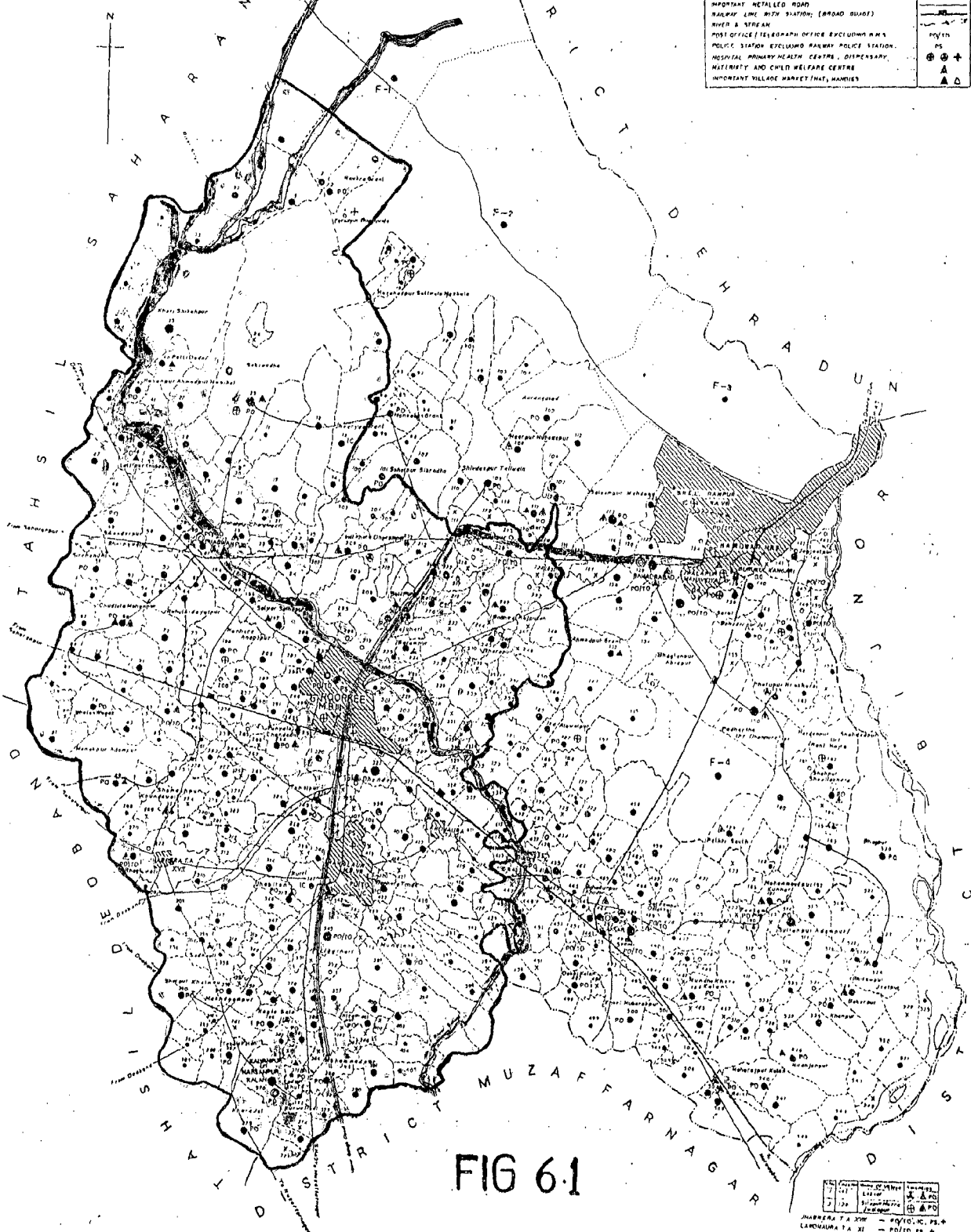
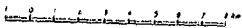
minucipal boundary, the revenue and abadi villages outside the periphery of municipal boundary, got involved deeply in the process of fringe development. These have been identified as Khanjarpur, Bhangeri, Dhandera, Mohanpur Mohammadpur, Asafnagar, Shafipur, Raheeampur, Padli Gujar, Paniyala, Salempur Rajputan, Salhepur Shahpur, Sunehra and some others. Population of these villages is given in Table 6.1. Revenue Map of Roorkee Tehsil showing these villages is given in Fig. 6.1. Total population of these villages during decade 1981-91 has increased by 40.22% as compared to 26.97% in respect of rural areas of Roorkee Tehsil.

Semi urban and urban constructions on periphery of Roorkee during last two decades (1971-91) showing number of dwelling units constructed and consequent increase in population have been estimated and worked out as given in Table 6,.2. The figures given have been apaproximately worked out and only include urban and semi urban consrtructionbs; traditional villages not having been accounted for in these figures.

6.1.2 Trend of Perifpheral Growth :

A study of developments taking placing on periphery of Roorkee, has revealed that all new constructions are taking place in open agricultural land. Most of the developments are taking place along existing main roads. Lower class dwellings are located closer to existing built up areas as compared to isolated spatial bungalows coming up in comparatively for off places and /or along main roads. and soime even on canal bank towards

TAHSIL ROORKEE REVENUE MAP



DISTRICT BOUNDARY	(Dashed line)
TALUK BOUNDARY	(Dotted line)
POSTAL BOUNDARY	(Dash-dot line)
FOREST BOUNDARY WITH CODE NUMBER	(Line with 'F' and code)
VILLAGE BOUNDARY WITH CODE NUMBER	(Line with 'V' and code)
TALUK HEADQUARTERS	(Circle with 'T')
POSTAL HEADQUARTERS	(Circle with 'P')
URBAN AREA WITH LOCATION CODE	(Hatched area)
VILLAGE BY POPULATION SIZE: UNINHABITED	(Small circle)
LESS THAN 500	(Small circle with '1')
500-999	(Small circle with '2')
1000-4999	(Small circle with '3')
5000 & ABOVE	(Small circle with '4')
SIZE UNKNOWN	(Small circle with '5')
IMPORTANT METALLED ROAD	(Thick solid line)
RAILWAY LINE WITH STATION (BROAD GAUGE)	(Line with cross-ticks)
RIVER & STREAM	(Wavy line)
POST OFFICE / TELEGRAPH OFFICE EXCLUDING R.M.S.	(Circle with 'PO' or 'TG')
POLICE STATION EXCLUDING RAILWAY POLICE STATION	(Circle with 'PS')
HOSPITAL / BHOVA / HEALTH CENTRE / DISPENSARY	(Circle with 'H' or 'B' or 'D')
WATERMILL AND CHILD WELFARE CENTRE	(Circle with 'M' or 'C')
IMPORTANT VILLAGE MARKET (M.T., HANDEE)	(Circle with 'A' or 'M')

FIG 61

7	11	12	13	14	15
16	17	18	19	20	21

JHABERA T.A. XIV - PG/10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21
 LAKHNAU T.A. XI - PG/10, 11, 12

south. Apart from constructions by individuals, some piece meal developments are being carried out by private small colonisers, who after purchasing vast tracts agricultural land are developing it into smaller residential plots for sale by providing access roads. A common features of all such development is that they are carried out in piece meal manuer at individual level with number of plots varying from 5 to 50 plots in each of them, with no coordination between them and no other infrastructure and other facilities.

6.1.3 Future Trend of Growth in Fringe Areas :

Apart from the growth on immediate periphery of Roorkee some other developments have started taking place or will take place in near future which will have direct impact on Roorkee town in the long run and may lead to integration of other smaller neighbouring towns particularly Mangalaur and Landhaura and some rural areas. Some of these developments as came to notice during the study are given below :

1. Commencement of settintg up of an Indusrtrial Estate in Shikarpur revenue village near Landhaura area on Roorkee -Landhaura - Laksar road - rail route by U.P. State Industrial Development Corporation.
2. Development of residential complex of 169 residential plots for defence personnels by Army Welfare Housing Organisation in Shikarpur village area between Roorkee and Landhaura.

3. Likely notification of Dhandhera village (1991 population 10018) , adjoining Roorkee Cantonment as Notified Town Area in very near future.
4. Development of south civil lines on Delhi road towards south as big residential complex by private developers.
5. Proposed expansion of Roorkee University and future plans of opening up of new campus for which only possible areas available are in south west direction west of canal or on the north eastern side across Solani River.
6. Development of an Army Trust in Tansipur revenue village area on western side of canal in further south west direction with a proposed school, and residential complex for approximately 40 residential plots.
7. Barrage cum bridge on Roorkee Canal south of railway line under construction, by U.P. Irrigation Department under World Bank project and construction of twin equaduct on solani river.
8. Development of residential plot complex in Saidpur revenue vilklage area across Solani river on Roorkee Hardwar road in north east direction by officers and staff of National Institute of Hydrology, Roorkee.
9. Proposed modern residential public school near Dhanauri village beyond Piran Kaliytan in north east.

TABLE 6.1
POPULATION OF PERIPHERIAL VILLAGES

S.No.	Name of village	Population	
		1981	1991
1.	Khanjarpur	3405	4266
2.	Bijholi	3021	4083
3.	Bhangeri	3200	4354
4.	Dhandera	5670	10018
5.	Mohampur Mahammadpur	4787	5790
6.	Asafnagar	1238	583
7.	Tansipur	2480	3028
8.	Shafipur	141	1952
9.	Rahimpur	987	1300
10.	Padli Gujar	2585	4236
11.	Panyala Chandpur	3245	5526
12.	Safarpur	1873	2237
13.	Rasoolpur	831	1118
14.	Salehpur Shahpur	533	750
15.	Salempur Rajputan	2295	3592
16.	Sunehra	1475	2687
17.	Rampur	3931	3742
18.	Matlabpur	836	902
19.	Saidpura	2884	3670
20.	Sherpur	845	1037
		46262	64870
		Increase :	18608
		Percentage Increase:	40.22

Source : Census Data 1981 and 1991

10. Proposed shifting of St. Gabriel Academy, presently the best school of Roorkee town area to an area across Solani river in north east direction.

All these developments when fully completed are likely to stimulate further growth which as has been the experience in most of the cities in India will be sporadic haphazard and manifest into enormous problems in times to come.

6.2 DEMOGRAPHIC FEATURES

6.2.1 Population Trends:

In District census Hand Book 1981, Roorkee has been shown as an urban Agglomeration (U.A.) is defined as the continuous urban spread at a place which may cover one or more than one town with their outgrowth. The Roorkee U.A. comprises of Roorkee Municipal Board township enclosed within the Municipal boundary and Roorkee Cantt. The population of Roorkee within the Municipal limits in 1991 is 80262.

TABLE 6.2

URBAN/DEMI URBAN CONSTRUCTIONS AND POPULATION ON ROORKEE
 PHERIPHERY (1971-91)

S. No.	Area/Village	1971-81		1981-91		Total		
		Houses	Popu.	Houses	Popu.	Houses	Popu.	
1.	Khanjarpur*	52	260	95	475	145	735	*Settlements close
2.	Bengheri*	45	225	65	325	110	550	to inhabited
3.	Dhandhera*	90	450	140	700	230	1150	village devel.by
4.	Mohanpur * Mohammadpur	45	225	80	400	125	625	lower class Empl.
5.	Along & across ⊕- Delhi Road	-	20	100	20	100	100	⊕ Spacious high class residences
6.	Eastern Canal ⊕ bank south of Railway line	-	-	14	84	14	84	mixed with middle income group.
7.	Subhash Nagar ⊕	151	755	355	1775	506	2530	⊕ Large scale
8.	Paniyala Area ⊕	-	-	98	490	98	490	middle income
9.	Kashipuri ⊕	-	-	61	305	61	305	group type houses
10	Mahigiran & old Tehsil periphery	-	-	115	575	115	575	Low income group.
11	Other areas	25	125	75	375	100	500	Mixed type of development.
Total		400	2040	1118	5590	1526	7644	

NOTE All figures are approximate as estimated during the
 course of the study.

Population of Roorkee Cantonment in 1991 is estimated at 19919. The total 1991 population of Roorkee U.A. , thus works out to 10081, more than one lac, justifying enhancement of its status to Class I town, as against Class II town at present. These figures do not include the developments taking place on the periphery outside the municipal and the cantonment boundaries. If increase in population as a consequence of peripheral developments are taken into consideration, the figures would be much higher and the Roorkee Municipal town by itself would deserve Class I city status.

6.2.2 Projected Population :

The projected population of Roorkee U.A. and fringe areas for years 2001 and 2011 have been computed by Geometric Progression method as given below (Refer Table 4.2 and Figs. 4.5 and 4.6).

1. Roorkee Town within present Municipal Limit :

$$P_o = 61851 \quad (1981 \text{ population})$$

$$P_m = 80262 \quad (1991 \text{ population})$$

$$r = \text{Rate of growth of population}$$

$$n = \text{No. of years from } P_o \text{ to } P_m', \text{ i.e.}$$

$$1991 - 1981 = 10$$

$$P_m = P_o (1 + r)^n$$

$$1+r = (P_m/P_o)^{1/n}$$

$$= (80262/61851)^{1/10}$$

$$= 1.026$$

(a) 2001 population :

$$P_{2001} = 1991(1+r)^n$$

$$n = 2001 - 1991 = 10$$

$$= 80262 (1.026)^{10}$$

$$= 104086$$

(b) 2011 Population

$$P_{2011} = P_{1991} (1 + r)^{20}$$

$$= 2011 - 1991 = 20$$

$$= 80262 (1.026)^{20}$$

$$= 136025$$

2. Roorkee Cantonment :

$$\begin{aligned}
 P_{1971} &= 14895 \\
 P_{1981} &= 17225 \\
 (1+r) &= (17225/14895)^{10} \\
 &= 1.015
 \end{aligned}$$

(a) 1991 population :

$$\begin{aligned}
 P_{1991} &= P_{1981} (1 + r)^{10} \\
 &= 17225 (1.015)^{10} \\
 &= 19919
 \end{aligned}$$

(Also physically verified to be approx. same)

(b) 2001 population :

$$\begin{aligned}
 P_{2001} &= P_{1981} (1 + r)^{20} \\
 &= 17225(1.015)^{20} \\
 &= 23034
 \end{aligned}$$

(c) P2011 Population :

$$\begin{aligned}
 P_{2011} &= P_{1981} (1 + r)^{30} \\
 &= 17225 (1.015)^{30} \\
 &= 26640
 \end{aligned}$$

3. Roorkee U.A. (wirthin present limits of Municipal and Cantonment Boards)

$$\begin{aligned}
 (a) \quad P_{1991} &= 80262 + 19919 \\
 &= 100181
 \end{aligned}$$

$$\begin{aligned}
 (b) \quad P_{2001} &= 104086 + 23034 \\
 &= 127120
 \end{aligned}$$

$$\begin{aligned}
 (c) \quad P_{2011} &= 135025 + 26640 \\
 &= 161665
 \end{aligned}$$

4. Populatiuon on immediate 'Urban Frfinge' due to new developments,

1991 population = 7644 (estimated, Refer Table 6,2)

Taking present decennial growth rate of 26.12% for Hardwar district (1991 census figures).

- (a) Peripheral population 2001 :

$$\begin{aligned} P2001 &= 7644 (1 + 0.2612) \\ &= 9641 \end{aligned}$$

- (b) Peripheral Population 2011 :

$$\begin{aligned} P2011 &= 9641 (1 + 0.2612) \\ &= 12159 \end{aligned}$$

5. Population of villages on urban fringe likely to merge in to Roorkee U.A. due to peripheral peripheral developments,

$$P1991 = 64870 \text{ (Refer Table 6.1)}$$

Applying the decennial growth rate of district, i.e. 26.12%,

$$\begin{aligned} \text{(a) } P2001 &= 64870 (1 + 0.2612) \\ &= 81814 \end{aligned}$$

$$\begin{aligned} \text{(b) } P2011 &= 81814 (1 + 0.2612) \\ &= 103184 \end{aligned}$$

- (f) Total population of Roorkee Urbabnizable area including the peripheral development and villages on the fringe,

$$\begin{aligned} \text{(a) } P1991 &= 80262 + 19919 + 7644 + 64870 \\ &= 172695 \end{aligned}$$

$$\begin{aligned} \text{(b) } P2001 &= 104086 + 23034 + 9641 + 81814 \\ &= 218575 \end{aligned}$$

$$\begin{aligned}
 \text{(c) P2011} &= 135025 + 26640 + 12159 + 103184 \\
 &= 277008
 \end{aligned}$$

From this analysis, it is revealed that even if the peripheral developments are not include within the Municipal limits of Roorkee by extending the Municipal boundary, the total population of Roorkee including the fringe would be 2.19 lacs in the year 2001 and 2.77 lacs by the year 2011. Even in 1991, this total has been estimated to be 1.73 lacs. Centrepetal forces would be predominant because oif finward flow of population/activities towards the centre of the town because of concentration of cofmmercial and other community facilities in the centre apart from administrative HQ of Tehsil and Roorkee Block situated in Roorkee town.

6.3 CAUSES OF FRINGE GROWTH

As brought out in the earlier chapters, charm of Roorkee town lies in its pioneer institutions and the military cantonment which is further enhanced because of its accessibility to facifltities in the region. In this connection, its close peroximity and well connected net work of roads to Hardwar, Rishikesh, B.H.E.,L., complex near Hardwar, Mfuzaffarnagar, Meerut, Saharanpur. Dehradun and Mussoorie, makes it attractive as a place of permanent settlement to service class population.

There are of course, many other reasons which make this medium town an ideal place for living and all these combined

together can be attributed to be the cause of peripheral development. The causes for fringe growth on periphery of Roorkee particularly during last two decades (1971-91) as analysed during this study can be briefly summarised as :

1. Elitist and intellectual environment provided by a large proportion of highly educated, white collared, disciplined population because of the University, other institutions/establishments & military cantonment
2. Accessibility to facilities within the town and in the region due to well connected net work of roads and railways links.
3. Close proximity to important places, pilgrim and tourist centres such as Dehradun, Mussoorie, Hardwar, Rishikesh, B.H.E.L., Complex (Ranipur), Piran Kaliyar, Meerut, Muzaffarnagar, Mangalaur, Saharanpur, Paonta Sahib and National Capital Delhi.
4. Healthy and peaceful environment surrounded by open countryside.
5. Non existence of pollution producing industries.
6. Non existence of any slum area in Roorkee towns.
7. Free from congestion as compared to other towns.
8. Very convenient road and rail connections to neighbouring states and far off places.
9. Easy availability of potable water at shallow depth which helps in meeting the water requirements of

population settling on periphery by digging shallow tube-wells,

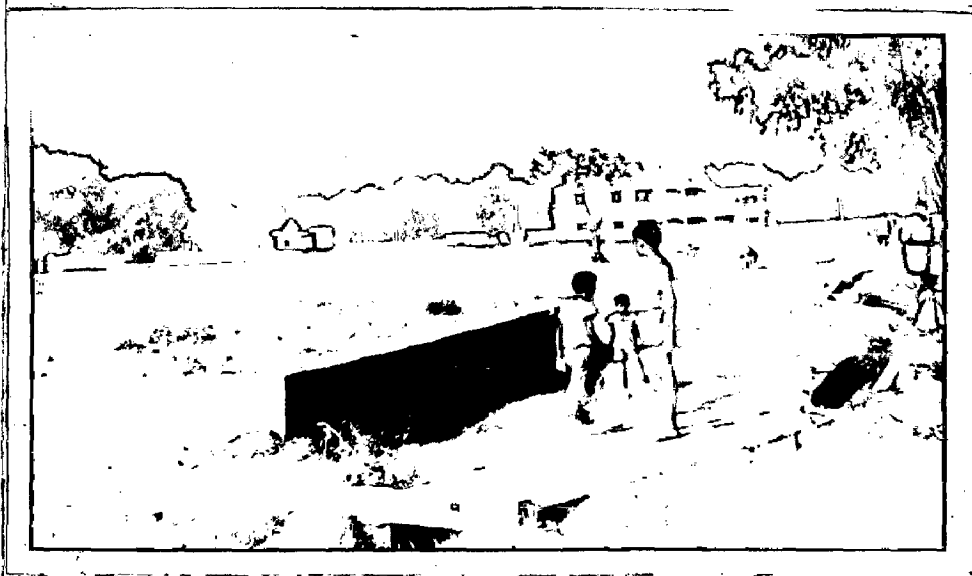
10. Availability of food grains, green vegetables and fruits at reasonably cheaper prices as compared to other bigger town.
11. Availability of other household commodity at reasonable/ cheap prices due to closer proximity to Delhi and other big towns.
12. Stray cases of theft, burglary or other law and order problems.
13. Total communal harmony between different communities with no cases of communal riots.
14. Absence of political activities and political exploitation.
15. Comparatively much cheaper price of agricultural land on the periphery of Roorkee town. Even the present rates of Rs.15,000/- per local bigha (amounting to approx. Rs.2/- per sq.ft.) in areas little away from main road to Rs.1,50,000/- per bigha (i.e. Rs.21/- per sq.ft.approx) on main roads and within a radius of about 5 Kms from centre of the town, can be called very cheap by any standards.
16. Non extension of municipal limits for more than five decades, as a result of which the urbanisable area of

PLATE 6.1



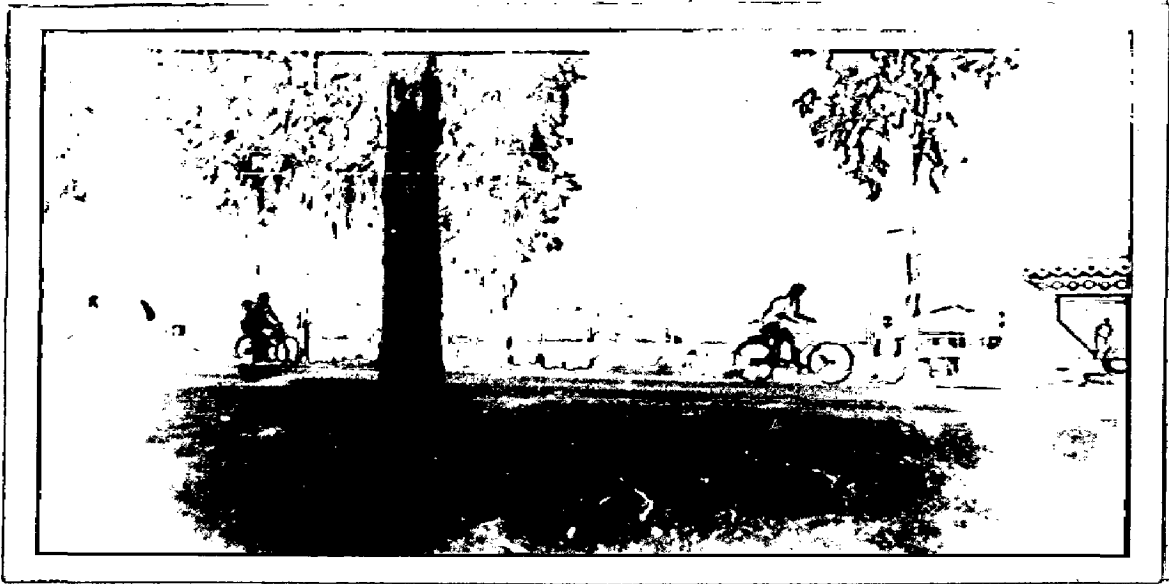
HIGH CLASS CONSTRUCTION IN SOUTH
NEAR DELHI ROAD

PLATE 6.2



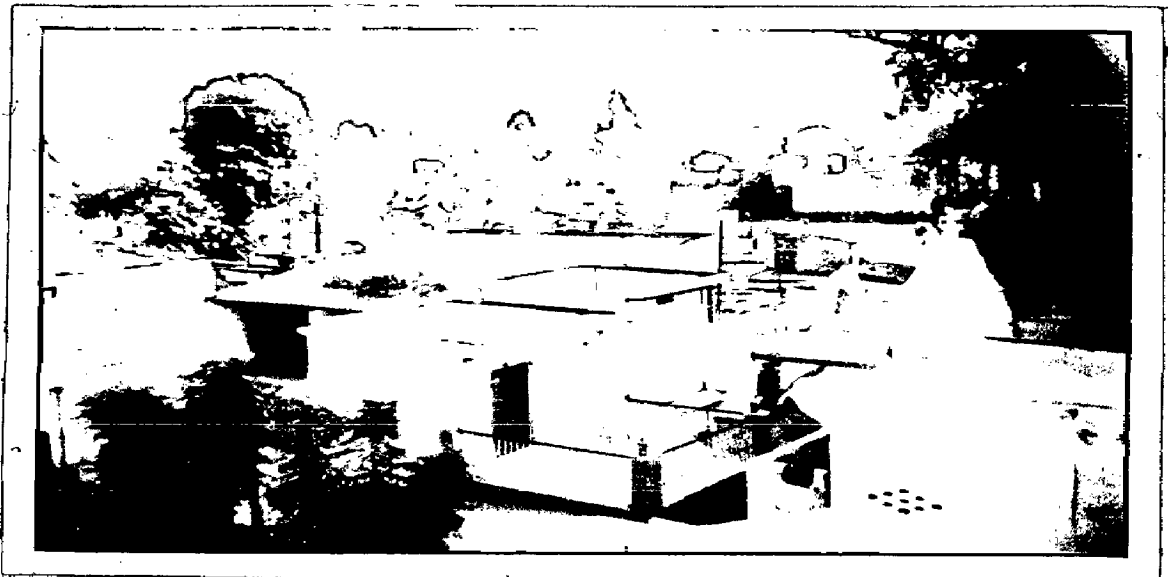
PRIVATE COLONY ON DHANDERA ROAD
BETWEEN OPEN AGRICULTURAL LAND

PLATE 6.3



PRIVATE COLONY DEVELOPMENT ON DELHI
ROAD

PLATE 6.4



UNORGANISED CONGESTED GROWTH ALONG
CANTONMENT BOUNDARY IN MOHANPUR
MOHAMMADPUR AREA