

**SPATIAL PATTERN, GROWTH AND CHARACTERISTICS OF
URBAN SETTLEMENTS IN RAJASTHAN**

*Dissertation submitted to the Jawaharlal Nehru University in partial fulfilment of the
requirements for the award of the Degree of*

MASTER OF PHILOSOPHY

CHANDREYI BANERJEE



CENTRE FOR THE STUDY OF REGIONAL DEVELOPMENT

SCHOOL OF SOCIAL SCIENCES

JAWAHARLAL NEHRU UNIVERSITY

NEW DELHI

INDIA

2003



जवाहरलाल नेहरू विश्वविद्यालय
JAWAHARLAL NEHRU UNIVERSITY
Centre for the Study of Regional Development
School of Social Sciences
New Delhi-110067

CERTIFICATE

I, Chandreyi Banerjee, certify that the dissertation entitled "SPATIAL PATTERN, GROWTH AND CHARACTERISTICS OF URBAN SETTLEMENTS IN RAJASTHAN" for the degree of MASTER OF PHILOSOPHY is my bonafide work and may be placed before the examiners for evaluation.

Chandreyi Banerjee
(CHANDREYI BANERJEE)

Forwarded by

A Banerjee
(DR. ANURADHA BANERJEE)
SUPERVISOR

Aslam Mahmood
(PROF. ASLAM MAHMOOD)
CHAIRPERSON

ACKNOWLEDGEMENT

No amount of gratitude can be sufficient for the valuable suggestions, generosity and patient hearing that my supervisor Dr. Anuradha Banerjee has provided during the preparation of this dissertation. Her impeccable and persuasive guidance at every step has been a constant source of inspiration for me. .

I also express my sincere gratitude as well to Prof. Aslam Mahmood, the Chairperson of my centre and Prof. Saraswati Raju, who as part of my advisory committee also provided me with time-to-time guidance. I also express my sincere thanks to Prof.Sudesh Nangia and all other faculty members of CSRD.

I would like to thank Verghese Sir, who has helped me in doing cartographic and computer work.

I would like to thank the staff members of CSRD Documentation Unit and JNU Central Library, for their help to properly avail library facilities for data collection, journals, articles and other required literature.

I would also like to thank the staff members of the Census Office at R.K.Puram.

I would like to express my sincere gratitude to my parents, sister Atreyi, and especially my grandfather for their everlasting support and encouragement.

Finally, I would sincerely like to thank many others who were helpful in their own ways during this process though their names are not mentioned here.

I take responsibility for errors remaining.

Chandreyi

CONTENTS

List of Tables

List of Figures

CHAPTER 1: INTRODUCTION ...1-12

1.1. Selection of the Study Area

1.2. Objectives

1.3. Database

1.4. Methodology

1.5. Scheme of Chapterisation

1.6. Survey of Literature

References

CHAPTER 2: GEOGRAPHICAL BACKGROUND ...13-42

2.1. Introduction

2.2. Physiography

2.3. River System and Water Resources

2.4. Climate

2.5. Soils

2.6. Natural Vegetation

2.7. Agriculture

2.8. Irrigation

2.9. Mineral Wealth

2.10. Industrial Activities

2.11. Population Distribution

2.12. Conclusion

References

CHAPTER 3: SPATIAL PATTERN OF URBAN SETTLEMENTS ...43-57

3.1. Introduction

3.2. Demarcation of Geographical Regions

3.3. Evolution of Urban Settlements in Rajasthan

3.4. Spatial Pattern of Urban Settlements

3.4.1. *Theoretical Spatial Patterns*

3.4.2. *The Nearest Neighbour Technique*

3.5. Conclusion

References

CHAPTER 4: GROWTH OF URBAN SETTLEMENTS IN RAJASTHAN ...58-68

4.1. Introduction

4.2. Factors Promoting Growth of Urban Settlements

4.3. Growth of Urban Settlements in Rajasthan (1961-2001)

4.4. Conclusion

References

CHAPTER 5: CHARACTERISTICS AND CLASSIFICATION OF URBAN SETTLEMENTS IN RAJASTHAN ...69-108

5.1. Introduction

5.2. Characteristics and Classification of Urban Settlements

5.3. Conclusion

References

CHAPTER 6: RELATIONSHIP AND HIERARCHY OF URBAN SETTLEMENTS ...109-126

6.1. Introduction

6.2. Settlement Systems---Models and Theories

6.2.1. *The Rank-Size Rule*

6.2.2. *The Primate City Model: A Contrast to Rank-Size Rule*

6.2.3. *Binary Pattern*

6.2.4. *The Concept of Urban Hierarchy*

6.3. Application of Settlement System Models in the Different Geographical Regions of Rajasthan

6.4. Application of Settlement System Models in the State of Rajasthan as a Whole

6.5. Arrangement of Urban Centres into a Hierarchical Order

6.6. Conclusion

References

CHAPTER 7: SUMMARY AND CONCLUSION ...127-131

Appendix

Bibliography

LIST OF TABLES

Table No.	Title	Page No.
2.1	Surface Runoff in Different River Basins	22
2.2	Land Use Data in Rajasthan, 1991	31
2.3	Irrigation by Sources(1991)	34
2.4	Facts Related to Population in Rajasthan(1991+2001)	40
4.1	Trends in Growth of Urban Settlements in Rajasthan (1961-2001)	60
4.2	Number of Industrial Areas in Rajasthan (1961-2001)	60
4.3	Percentage of Urban Population in Rajasthan (1961-2001)	61
4.4	Literacy Rates in Rajasthan (1961-2001)	61
4.5	Growth of Urban Settlements in the Different Geographical Regions of Rajasthan (1961-2001)	62
4.6	Number of Industrial Areas in the Different Geographical Regions of Rajasthan (1961-2001)	63
4.7	Percentage of Urban Population in the Different Geographical Regions of Rajasthan (1961-2001)	63
4.8	Literacy Rates in the Different Geographical Regions of Rajasthan (1961-2001)	64
4.9	Number of Urban Settlements in Each Size Class in Rajasthan (1961-2001)	65
4.10	Number of Urban Settlements in Each Size Class in Different Geographical Regions of Rajasthan	66
5.1	Classification of Urban Settlements on the Basis of their Location Type	71
5.2	Classification of Towns on the Basis of Population Density	74
5.3	Classification of Urban Settlements on the basis of Literacy Rates	82
5.4	Six Sub-Triangles and their Predominant and Sub Functions	92
5.5	Functional Types and the Percentage of Total Workforce	92
5.6	Classification of Urban Settlements on the Basis of their Economic Characteristics and Functions	93
6.1	Hierarchical Order of Urban Settlements in Rajasthan, 1991	120

LIST OF FIGURES

No.	Title
2.1	: Rajasthan: Administrative Units
2.2	: Rajasthan: Physiographic Divisions
2.3	: Rajasthan: Drainage Systems
2.4	: Rajasthan: Climatic Regions
2.5	: Soil Map of Rajasthan
2.6	: Land Use in Rajasthan (1990-91)
2.7	: Rajasthan: Distributional Pattern of Major Crops
2.8	: Irrigation by Sources in Rajasthan (1990-91)
2.9	: Rajasthan: Mineral Distribution
2.10	: Levels of Industrial Development, 1991
2.11	: Rajasthan: Population Density, 1991
3.1	: Rajasthan: Demarcation of Geographical Regions
3.2	: Rajasthan: Distribution of Urban Centres in different Geographical Regions, 1991
4.1	: Trends in the Growth of Urban Settlements in Rajasthan(1961-2001)
4.2	: Number of Urban Settlements in Each Size Class in Rajasthan, 1981
5.1	: Ternary Diagram

CHAPTER 1: INTRODUCTION

A '*human settlement*' is defined by geographers as, " a place inhabited more or less permanently by man". It may also be defined as a collection of man-made structures put up with the intention of habitation or social or economic use which forms a spatial unit for human interaction.

The study of any settlement may be approached as:

- i. settlement as a unit, in which the settlement is treated as an individual entity with its own internal organization;
- ii. settlement as a part of a system, which is the study of the total settlement system, the interrelatedness of various units which involves ranking, hierarchy, classification etc.

Much of this study would deal with the latter approach.

The earliest contribution to establish the science of human settlement in a systematic way, was made by a Greek scholar *C.A.Doxiadis* (1968)¹ who coined the term 'Ekistics' for the study of human settlements and the term gained a global recognition in an *U.N Conference at Vancouver* (1976)².

Settlements being expression of the interaction between human beings and the environment, each of them are highly varied in space as each individual human being exhibiting great variations in terms of their population, economy, social life etc; and, it is here, that we try to distinguish between an urban and a rural settlement.

The dictionary meaning of the term 'urban' is given as polished, cultured or refined as opposed to the term 'rustic' (associated with rural, meaning coarse and unrefined), and 'urbanization' (in a demographic sense), " an increase in the proportion of the urban population to the total population over a period of time"³.

The concepts of urban and urbanization are as old as the civilization itself- the first traces of civilization found by archaeologists reveal the presence of cities though with time, the connotation of the term might have undergone changes with urban centers gradually transforming from seats of administrative power to centres of trade and commerce.

So far as the definition of the term '*urban*' is concerned, different scholars have also defined it in many ways.

*Aurousseau*⁴, suggests that the rural are those sections of the people who are spread over the countryside, and are engaged in the production of primary necessities from the soil, whereas the urban section are those dense clusters of persons who have an immediate interest in the production of the material for their food or clothing or general comfort, but are engaged in transport, manufacturing, buying and selling goods or in educating the people or in managing the affairs of the state or in merely 'living in towns'.

*Murphy*⁵, defines the urban area as busy streets lined with houses, stores, factories and the like.

*Smailes*⁶, point out that a town may be regarded first and foremost as a community of people pursuing a distinctive way of life as compared to the rural population of the countryside.

*Jones*⁷, has defined an urban settlement as “ a physical conglomeration of houses and streets or it is a center of exchange and commerce or it is a kind of society or even a frame of mind”.

Sociologist, *Wirth*⁸, has defined a city as, “ a relatively large, dense, and permanent settlement of socially heterogeneous individuals”.

Population size of a place has often been used as a criterion for defining an urban settlement. In order to define urban settlement, the lower limit of urban population should range from 300 to above 20,000 by which a place is considered to be urban⁹. For example, France in 1962 defined as urban commune containing agglomerations of 2,000 or more inhabitants living in contiguous houses or with not more than 200m between the houses; Mexico in 1960 specified localities of 2,500 or more inhabitants, while Japan specified 30,000 or more inhabitants¹⁰.

Whatever, may the criterion of definition be, a single criterion has met with no success for, urban settlements as a spatial phenomenon, exhibits many interregional differences. Hence, *Sorokin*, *Zimmerman* and *Sombart*¹¹ evolved the need for 'multiple' or compound definitions by assembling eight characteristics---

- i. occupation;
- ii. environment;
- iii. density of population;
- iv. size of community;
- v. homogeneity or heterogeneity of the population;
- vi. social differentiation and stratification;
- vii. mobility; and
- viii. system of interaction.

In India, the *Census* has its own definition of urban and it also uses a multiple or compound criteria defining an urban place as :

all statutory towns i.e. all places with municipality, corporation, cantonment board or notified area committee etc;

all other places which satisfy the following criteria:

- i. a minimum population of 5,000;
- ii. at least 75% of the male working population engaged in non-agricultural pursuits;
- iii. a population density of at least 400/sq. km(or 1000/sq. mile)¹².

A town with a population of 1,00,000 and above is referred to as a 'city'. The 'outgrowth' of towns and cities may also be treated as urban, and a town or city with its outgrowth may be treated as an 'urban agglomeration', a term introduced in 1971 Census.

With efforts to formulate several other definitions of urban, aiming to clearly demarcate between urban and rural, and establish '*rural-urban dichotomy*', yet, there is still no consensus on what exactly defines an urban and a rural, and urbanization, actually being considered as a process of transformation from ruralism to urbanism, *Trewartha*¹³, rightly points out that, it is extremely difficult to delineate an urban and a rural, as these are only mental constructs, and, that it is a continuum from large agglomeration to small clusters, where it may not be possible to point out the disappearance of urbanity and beginning of rurality¹⁴.

But, nonetheless, urban and rural settlements may be distinguished from each other, and each of them form two separate discourses.

With the domain of any study being so extensive, it might not be possible to look into each and every facets of it, but when approaching as a population geographer, the demographic and spatial aspects no matter becomes important, and regarding the relevance of the topic, we may say that, urban settlements and the process involved, that is the process of urbanization, being a fair index of the level of socio-economic development, population geographers have there concern in the study of urban settlements.

1.1: SELECTION OF THE STUDY AREA

As understood from the title of this work, the study area chosen is Rajasthan. The reason behind the selection of such area is rooted in diversity of its physical landscape. It is a land of both the Aravallis and the shifting sand dunes of the great Thar Desert, of scorching heat and

freezing cold, presenting a great variation in the distribution of its population. The same is applicable in the distribution of its urban settlements as well, portraying a diverse scenario and urban settlements being limited to certain favourable pockets like :

- i. the piedmont and the intermontane regions of the Aravallis;
- ii. along major rivers and their tributaries;
- iii. rocky tops and higher slopes for security purposes
- iv. fresh water and salt lakes; and
- v. caravan route crossings.

Though the state occupies a bottom position among the states of India in terms of percentage share of the country's urban population (10th as per 1991 Census), temporally, the urban population of Rajasthan has registered quite a rapid growth and with potentialities of mineral occurrence, availability of power resources, irrigation development and development of transport and communication, providing scope for further expansion of secondary and tertiary sectors, and consequent growth of urban settlements. Thus, its position has improved to 8th as per 2001 Census in country's share of urban population among the states.

1.2: OBJECTIVES

The following shall be the objectives of this study:

1. To briefly study the geographical background of Rajasthan for the purpose of our own understanding regarding the various aspects of urban settlements in the state, and thereby divide the state into several geographical regions.
2. To bring out the variations (if any) in the spatial distribution pattern of urban settlements in the state or, more specifically in the geographical regions so carved out.
3. To trace the growth of urban settlements in the state from 1961(the first census after the state came into being in 1956) to 2001.
4. To look into the characteristics of the urban settlements of the same and attempt a classification thereof, on the basis of several demographic, social and economic parameters.

5. To evaluate the nature of relationship between the urban settlements and the hierarchy of the urban settlements.

1.3: DATABASE

The study is based on secondary data, mostly obtained from the *Census of India* publications namely:

1. General Population Tables of Rajasthan, Series 21, Part IXA.
2. District Census Handbook (Village and Town wise Primary Census Abstract and Village and Town Directories), Series 21.
3. Town Directories, Rajasthan, Series 21.
4. Census Volumes on Urban Population, 1991.
5. Provisional Population Tables, Series-9, 2001.

Apart from these, other sources of data are:

6. Statistical Abstract of Rajasthan, 1962, 1972, 1982, 1992.

Wherever possible, this study has been extended till recent times i.e. till the period of 2001 Census, but in certain cases due to paucity of data, the study will have to be limited till 1991 Census only.

A number of *maps* have been used to illustrate the variety of facts and findings. The main sources of these maps are the maps obtained from the Census Atlases of Rajasthan, those from the National Atlas and Thematic Mapping Organisation as well as from the website www.mapsofindia.com.

Other websites have also been used for the search of relevant informations.

1.4: METHODOLOGY

So far as the methodology of the study is concerned, various qualitative, quantitative, cartographic and statistical methods have been employed.

Qualitative methods or descriptive analysis.

Quantitative methods include different relevant methods like growth rates, nearest neighbour analysis, rank-size rule, primacy indices, composite index etc.

Cartographic techniques mostly involves the preparation of maps using choropleth techniques while *statistical techniques* like bars, pie etc may be used in preparing certain thematic maps.

1.5: SCHEME OF CHAPTERISATION

The study is likely to include seven different chapters, dealing with various aspects of urban settlements in the state of Rajasthan.

Chapter 1 is an *introductory part* of the study comprising also of a brief note on the selection of the study area, the objectives of the study, database, methods used, scheme of chapterisation as well as a short survey of relevant literature.

Chapter 2 shall provide us an insight into the *geographical background* of Rajasthan, both in terms of its physical and cultural landscape, namely, its physiography, drainage, climate, soils, natural vegetation, mineral wealth, agriculture, industry, as well as an idea of the geographical regions of the state for the purpose of developing a better understanding of the area.

Chapter 3 will be a study of the *spatial pattern of urban settlements* in the different geographical regions so carved out.

Chapter 4 will try to trace the temporal *growth of urban settlements* in the state and what factors may be attributed to for that growth—both an overall growth over a particular period of time as well as growth of urban centres in different size classes may be examined.

Chapter 5 shall probe into the *characteristics* of different urban settlements and *classify* them in terms of several demographic, social and economic parameters.

Chapter 6 will try to deal with the *kind of relationship* existing between the urban centres when treated as a unified system and how these settlements can be arranged into some form of *hierarchy*.

Finally, **Chapter 7** will provide an overview of the entire study, trying to *summarize* it and *conclude* from the net results that have been obtained from the study.

1.6: SURVEY OF LITERATURE

In view of enriching our knowledge, which in turn would enhance the easiness of this study, it seems pertinent here to undertake a survey of the works of some great scholars of the past as well as contemporary times, proving relevant for this study. The various contributions of these scholars may be described following a chronological order.

Hoffer(1920)¹⁵, tried to analyse the spatial relationship between the town and the country with the help of structural models based on empirical studies.

Dickinson (1932)¹⁶, provided a descriptive analysis of the distribution—functional association of the smaller urban centers of East Anglia.

The pioneering work of *Christaller*(1933)¹⁷, on central places was based on his study of Southern Germany. On the basis of several functions like administration, education, transportation, trade and commerce, he identified various ranks and orders of settlements on the basis of which, there emerges an urban hierarchy which, in turn may be organized according to three principles, namely, market, transportation and administrative.

Another pioneering work was put forward by *Jefferson* (1939)¹⁸, on the concept of a primate city. He stressed that the largest city, shall be super eminent not merely in size, but in national influence and would dominate the social, cultural, economic and political scenario of the entire region.

Contrasting to this idea of Jefferson was another new concept offered by *Zipf*(1941)¹⁹, who may be credited for the formalization of rank-size rule. His study was based on 100 largest metropolitan districts in the U.S.

The rule postulated by him stresses that the population of the 2nd largest city would have half the population of the largest city, that of the 3rd largest city $1/3^{\text{rd}}$ and so on.

Smailes(1944)²⁰, studied urban hierarchy in U.K. According to him, hierarchy of urban centres may be determined from an assessment of the number and kind of central services and institutions and the degree to which they tend to be associated in one place. He identified 5 institutions for the purpose of arranging the urban centres of England and Wales—banks, secondary schools, cinema, weekly newspaper and hospital.

Jaffe (1945)²¹, tried to establish a cause-effect relationship between the changes in the population trends due to industrialization and the sprawling of urban centres in the western countries with special reference to U.S.A.

Dickinson (1947)²², has also studied the spatial pattern of the City Region in terms of its spatial ecological aspects.

Raza(1951)²³, had traced the growth of urban settlements and development of urbanization in pre-historic India specially in terms of smaller marketing centres of the Indus Valley.

Gananathan(1952)²⁴, has offered a study on the spatial pattern of urban settlements in India, referring to the morphological arrangements of major towns.

Brush (1953)²⁵, attributed the hierarchical pattern of urban centres in Europe to industrialization.

Losch(1954)²⁶, developed his own model of central places. He superimposed the hexagonal market area devised by Christaller, of different goods to obtain a number of sectors with many, and a number of sectors with few production sites. His scheme identified six sectors with many higher order settlements called city-rich sectors and six sectors with few higher order settlements called city-poor sectors and this entire scheme was described as an economic landscape.

Clark and Evans (1954)²⁷, offered with a new method of measuring the spatial distribution of settlements by measuring the distance separating any phenomena and its nearest neighbour in space. Three types of spatial distribution were identified –random, uniform and clustered.

Aziz(1955)²⁸, provided a study of the distribution and growth of urban towns in India as well as tried to relate the areal growth of major cities and their surrounding region.

Viewing from a sociological perspective, **Crane** (1955)²⁹ tried to provide a study of the trends and growth of urban settlements in India.

Berry(1956)³⁰ offered an analytical study of the geographical and non- geographical variables for a distinct order of hierarchy of urban centres in U.S.A.

Emphasizing on the central function of trade in different urban areas, **Madden** (1956)³¹ tried to trace the spatial pattern of urban growth in U.S.A.

Misra(1956)³² studied trends of urbanisation in India in light of several socio-economic factors.

Philbrick(1957)³³ has also presented a model on the hierarchy of central places in U.S.A. According to him the hierarchy of nested centres presented six orders of central places increasing in degree of specialization and the nested centres of hierarchy has been diagrammatically represented in the form of a pyramid with the primate at the apex.

Stewart (1958)³⁴ has broadly analysed the urban rank-size relationship and has tried to explain the spacing of cities as a product of significant hierarchical order.

In a study by **Berry and Horton** (1970)³⁵, of 37 countries all over the world, only 13 countries showed rank-size relationship, 9 were classified as intermediate and the rest 15 showed primacy pattern.

Lall and Thirth(1971)³⁶ offered a study of the background of contemporary spatial patterns of urban centres, their growth as well as a description of the processes of urbanization in India.

Sen(1971)³⁷ in his study of Miryalguda Taluka in Andhra Pradesh, tested three methods of determining the hierarchy of central places, namely, the scalogram analysis, population threshold, and functional characteristics based on occupational characteristics.

Singh (1985)³⁸ have studied rank-size relationship of central places in the Mithila Plain of North Bihar and the discrepancy between the average and the expected size of individual urban centres irrespective of their size portrays a deviation from the rule.

Ramachandran's(1989)³⁹ study on urbanization and urban systems in India is regarded as a major contribution in the study of urban settlements in India. His is an elaborate work covering all possible aspects of urban settlements and urbanization whether it be the historical part of it, the conceptual aspect, empirical work even covering the policy issues.

Based on 1991 Census data, **Majumdar**(1998)⁴⁰ tries to portray the spatial pattern of urbanization in Haryana and urban growth in its various districts taking both growth of towns by size class and growth of population in different size class of towns into consideration.

Diego (1999)⁴¹ tries to draw a comparison between the pattern of urbanization in the European and the Less Developed Countries.

REFERENCES

1. Doxiadis, C.A. (1976), "*Action for Human Settlements*", Athens Publishing Centre, Athens.
2. Penalosa, Enrique, (1976), "*Habitat*", The U.N. Conference on Human Settlements
Published by Regional Congress on Local Authorities for
Development of Human Settlements in Asia and Pacific, 9-16
June, 1982, Yokohama, Japan.
3. Ghosh, Sumita, (1998), "*Introduction to Settlement Geography*", Orient Longman Ltd.,
Calcutta.
4. Arousseau, M. (1921), "*The Distribution of Population—A Constructive Problem*",
Geographical Review, Vol. XI.
5. Murphy, R.E. (1966), "*The American City: An Urban Geography*", Mc.Graw Hill Book Co.,
New York.
6. Smailes A.E (1953), "*Geography of Towns*", London.
7. Jones, Emrys, (1966), "*Towns and Cities*", OUP, London.
8. Wirth, L. (1938), "*Urbanisation as a Way of Life*", American Journal of Sociology, Vol.44.
9. Gibbs, J.P. (1961), "*Urban Research Methods*", D. Van Nostrand Co. (Canada)Ltd., Toronto.
10. Hudson, F.S. (1976), "*Geography of Settlements*", Mac Donald and Evans Ltd., Plymouth,
U.K.
11. Maunier, (1910), "*The Definition of City*", American Journal of Sociology, Vol.15.
12. Census of India, (1991), *Series I, Vol. I, Paper II*, Registrar General and Census
Commissioner, Ministry of Home Affairs, India.
13. Trewartha, G.T. (1969), "*A Geography of Population: World Pattern*", John Wiley and
Sons Inc., New York.
14. United Nations, (1955), "*Demographic Yearbook for 1952*", New York.
15. Hoffer, Charles, R. (1929), "*A Study of Town—Country Relationship*", East Lansing,
Michigan State College, Agricultural Experiment Station,
Special Bulletin No.181, October.
16. Dickinson, R.E. (1932), "*The Distribution and Functions of Smaller Urban Settlements in
East Anglia*", Geography, Vol.17, No.95, Part I.
17. Christaller, W. (1933), "*Central Places in Southern Germany*", (translated in English by
C.W Baskin), Englewood Cliffs, Prentice Hall.
18. Jefferson, Mark. (1939), "*The Law of Primate Cities*", Geographical Review, Vol.29.

19. Zipf, G.K (1941), *"National Unity and Disunity"*, Principia Press, Bicomington, Illinois.
20. Smailes, A.E. (1944), *"The Urban Hierarchy in England and Wales"*, Geography, Vol.XXIX.
21. Jaffe, A.J. (1945), *"Population Trends and City Growth"*, The Annals of the American Academy of Political and Social Sciences, Vol.242, November.
22. Dickinson, R.E. (1947), *"City, Region and Regionalism"*, OUP, New York.
23. Raza, Moonis, (1951), *"Urbanisation in Pre-Historic India"*, Geographer, Vol.5.
24. Gananathan, V.S. (1952), *"Distribution of Urban Settlements in India"*, Proceedings of the 17th International Geographical Congress, Washington.
25. Brush, J.E. (1953), *"The Urban Hierarchy in Europe"*, Geographical Review, Vol.43.
26. Losch, A. (1954), *"The Economics of Location"*, Yale University Press, New Haven, (translated in English by Woglom, W.H. and W.F. Stopler).
27. Clark, P.J. and F.C. Evans (1954), *"Distance to Nearest Neighbour as a Measure of Spatial Relations"*, Ecology, Vol.35.
28. Aziz, A. (1955), *"A Study of Indian Towns"*, Geographer, Vol.7(1), Summer.
29. Crane, R.I. (1955), *"Urbanism in India"*, The American Journal of Sociology, Vol.60, No.5.
30. Berry, B.J.L. (1956), *"Geographical Aspects of the Size and Arrangements of the Urban Centres"*, (M.A Thesis, University of Washington).
31. Madden, C.H. (1956), *"Some Spatial Aspects of Urban Growth in the United States"*, Economic Development and Cultural Change, Vol.4.
32. Misra, A.B. (1956), *"Some Trends in Urbanisation in India"*, Paper Submitted to the 39th Conference of the Indian Economic Association, Cuttack, Indian Economic Journal Conference.
33. Philbrick, A.K. (1957), *"Areal Functiona;l Organisation"*, Regional Geography, Vol.33.
34. Stewart, C.T.Jr., (1958), *"The Size and Spacing of Cities"*, Geographical Review, Vol.48.
35. Berry, B.J.L., and F.E.Horton (1970), *"Geographic Perspectives on Urban Systems"*, Prentice Hall Inc., New Jersey.
36. Lall, A and R.Thirth (1971), *"Spatial Analysis of Urbanisation in India"*, Tjodschrift vor Economiche en Sociale Geographie, Vol.62(4).
37. Sen, L.K (1971), *"Planning for Rural Growth Centres for Integrated Development: A Study of Miryalguda Taluka"*, NICD, Hyderabad.
38. Singh, B.L. (1985), *"Rank-Size Relationship in Central Place System of Mithila Plain, North Bihar"*, National Geographical Journal on India, Vol.31.

39. **Ramachandran, R.** (1989), *“Urbanisation and Urban Systems in India”*, OUP, New Delhi.
40. **Mazumdar, P.** (1998), *“Trends in Urbanisation and Urban Growth in Haryana: 1901-1991”*, Geographical Review of India, Vol.60(1).
41. **Diego, Puga,** (1998), *“Urban Patterns:European vs. LDC’s”*, Journal of Regional Science, Vol.32(2).

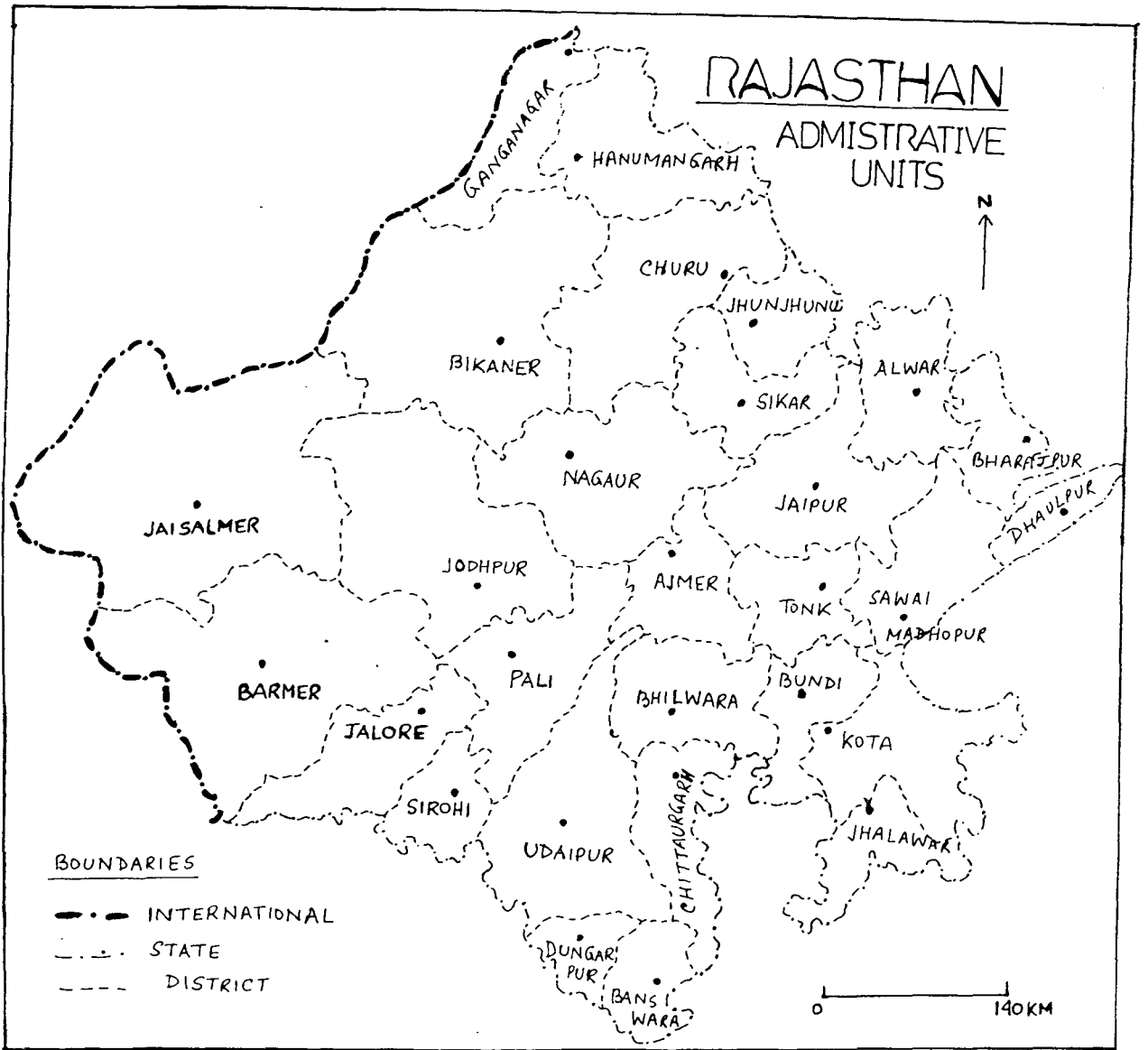


Fig.2.1

CHAPTER 2: GEOGRAPHICAL BACKGROUND

2.1: INTRODUCTION

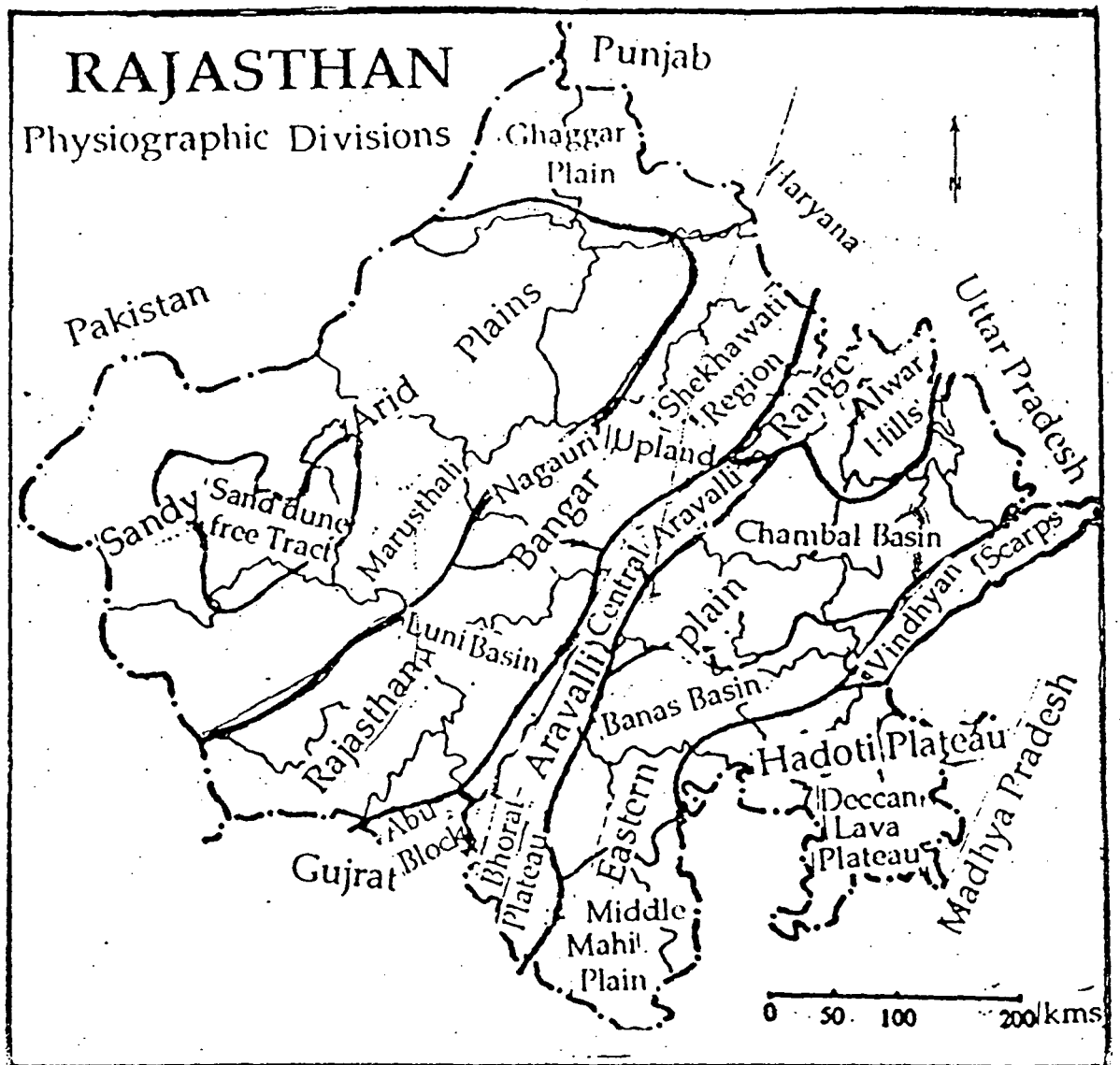
Rajasthan, 'the land of kings', has derived its present name from the famous '*Annals and Antiquities of Rajasthan*' (1829) of **Colonel Todd**, the renowned historian. Formerly, the entire territory was known as 'Rajputana' owing to the predominance of Rajputs, a term first used by **George Thomas**.

Formed in 1956, the state was divided into 27 districts in 1991, which at present has increased to 32. At present it has also gained the status of being the largest state in India.

Extending between latitudes 23°3'N – 30°12'N and longitudes 69°30'E – 78°14'E and covering an area of 3.42 lakh sq. km., Rajasthan is the only desert State in India, having within its territory, a true hot desert, the Thar. The Tropic of Cancer passes through its southern tip. From north to south, it stretches for 826 kms and from west to east for 869 kms. The State has land boundary of 5,920kms kms out of which 1,070 kms long is the Indo-Pak border, Known as *Radcliffe Line*.

Physiographically varied and culturally diversified, Rajasthan has much lower population density (165/km²) compared to that of India (324/ km²) (2000). A higher percentage of rural population (76.61%)(2001) indicated that the state is predominantly rural. Yet, there are several urban centres, their numbers amounting to 222 in 2001 will Jaipur being the only million-plus city.

Now, before we study any aspect of an area, it is essential to have an understanding of the geographical background of that area. Therefore, this chapter would mainly highlight on this to facilitate in this study of urban settlements in Rajasthan.



Source: L.R. Bhatta, "Geography of Rajasthan," 1996.

Fig.2.2

2.2 PHYSIOGRAPHY

Physiographically, it is difficult to find a region more varied and diverse than Rajasthan with *“the present relief being ultimately the product of past fluvial cycle of erosion and recent aeolian cycle of erosion”*¹.

With the desert forming a dominant part of the physiography, it is the Aravallis which divides the land into natural divisions and taking India as a whole, Rajasthan stretches in two of India’s physiographic divisions; viz,

- i the Great Plains, and
- ii the Central Highlands.

On the basis of present landforms, the land can be divided and sub-divided into several orders of physiographic divisions as follows:

I WESTERN SANDY PLAIN

- a. Sandy Arid Plain : i. Marusthali
ii. Dune free tract.
- b. Rajasthan Bangar (Semi-Arid Plain) : i Luni Basin
ii. Shekhawati Region
iii Nagauri Upland
iv Ghaggar Plain

II ARAVALLI RANGE AND HILLY REGION

- a. Alwar Hills (or North-Eastern Hilly Region)
- b. Central Aravalli Range : i Shekhawati Lower Hills
ii. Marwar Hills.
- c. Borat Plateau (or Mewar Rocky Region)
- d. Abu Block Region

III EASTERN PLAIN

- a. Chambal Basin
- b. Banas Basin
- c. Chappan Plains or Middle Mahi Plains

IV HADAUTI PLATEAU (SOUTH-EASTERN RAJASTHAN PLATEAU)

- a. Vindhyan Scarpland
- b. Deccan Lava Plateau.

WESTERN SANDY PLAIN

Comprising of the districts of Bikaner, Barmer, Churu, Jodhpur, Jaisalmer, Nagaur, Hanumangarh, Sriganganagar, Pali, Sikar, Sirohi and Jhunjhunu, and covering about 61% of the total area of the state (1,96,747sq.km), the Western sandy Plain is a vast expansion of wind - blown sand, a 'sanded over peneplain' with rocky outcrops appearing in between. The general elevation of the region is 300m in the north and 150m in the south excepting the Jalore –Siwana Upland, being above 300m. The region is sub –divided into two regions of second order:

Sandy Arid Plain characterised by its typical desert conditions, covering the whole of Bikaner and Jaisalmer, north-western part of Barmer and Jodhpur, western part of Nagaur and Churu and southern part of Ganganagar district. The landscape is marked with sand covered plains (or '*Thals*'), sand dunes, internal drainage and saline depressions. This region may again be sub- divided into two third order regions:

Marusthali (or '*land of dead*'), stretched across Bikaner, Jaisalmer, Churu, some parts of western Nagaur and western two- thirds of Barmer and Jodhpur districts. Towards further west, the region is known as Thar Desert, an essentially flat plain characterised by shifting dunes locally termed '*dharians*' which has acquired the name of '*dharati. dhoran ri*' (*land of sand dunes*) for Rajasthan. "*There is multiplicity of types of dunes and of dune agglomeration in different parts of the Marusthali. On the basis of their shape, size wind direction and vegetation cover, different types of dunes have been recognised in this region namely (i) longitudinal dunes, (ii) crescent-shaped dunes and (iii) transverse dunes*"². The Sam sand dune in Jaisalmer is the largest active sand dune.

Dune Free Tract: The rocky, comparatively dune free tract of Jaisalmer-Barmer-Bikaner, mainly covers the area around the Jaisalmer town, half of Pokaran tehsil and southern parts of Phalodi tehsil in Jodhpur district. "*To the north of Jaisalmer and South of Pokaran, a number of playa takes occur in basins bordered by low scarps.*

These takes though fed by centripetal drainage, remains dry for the greater part of the year”³.

Rajasthan Bangar or Semi-Arid Plain: Covering the eastern part of the Western Sandy Plain. It is a slightly undulating plain with thin veneer of sand, stretching from the foothills of the Aravallis and finally merging into the Marusthali. With old rocks protruding above the surface, the region is drained by innumerable short water courses. This region can again be sub-divided into four regions of third order:

Luni Basin: Being drained by the Luni river, this region comprises of Barmer, Jalore, Jodhpur, Nagaur and Pali districts. It is an extensive alluvial plain marked with hills with steep slopes.

Shekhawati Region: Situated north of Luni basin up to the northern limits of Rajasthan, this is a plain area covering Sikar, Jhunjhunu and Churu districts characterised by inland drainage, undulating sandy terrain traversed by longitudinal sand dunes.

Nagauri Upland including the Ladun, Deedwana, Nagaur and Jayal tehsils of Nagaur district. This region is full of sand hills, and several low depressions of saline water forming salt lakes, important ones being Sambhar, Deedwana and Degana.

Ghaggar Plain occupying the vast alluvial Ghaggar floodplains mostly in the Ganganagar district. It is a sandy plain marked with sand dunes, most of which are stationary.

ARAVALLI RANGE AND HILLY REGION

Extending for about 692kms from Palampur in Gujarat to Delhi, and within Rajasthan for about 550kms from Khetri in the north-east to Khed Brahma in the south-west, the Aravallis form a dominant landform of the state. The average height

of the region is 600m above sea level, and highest in *Guru Shikhar* (or '*the Saint's Pinnacle*' as described by Todd) near Mt. Abu (1727m). Heron⁴ believes them to be probably the oldest folded mountain on the globe, folded in a synclorium occupying the site of a geosyncline, still existing as a range and are reduced to their present dimensions by sub-aerial denudation

This physiographic unit covering 12.5% of the total area of the state (42,826 sq.kms), may be divided into four second order regions:

Alwar Hills or North-Eastern Hilly Region: This stretches from the low ridges of Delhi to the isolated hills of Alwar and Jaipur with their offshoots being found in Sikar, Shri Madhopur, Neem- Ka Thana and Khetri tehsils in the west. According to Heron, "*the Aravallis around Alwar form a wide and intricately dissected hill mass*"⁵ with the average elevation varying between 300-670m. The ridges have a N-S alignment with longitudinal valleys in between stretching for several kilometers. Flat hilltops form small plateaus.

The Central Aravalli Range comprising of the districts of Ajmer, Jaipur and southwestern parts of Tonk, extending from Sambhar Lake to Borhat Plateau and having a general elevation of 700 m. Its northern part forms a saddle between the Jaipur-Alwar hills and Ajmer and Mewar. This region may be further sub- divided into two regions of third order:

Shekhawati Lower Hills consisting of several broken hills as well as marked by sand hills and having a general elevation of 400m.

Marwar Hills comprising the tehsils of Beawar, Ajmer and Kishangarh, with an average elevation of 550m. Constituting the several parallel successions of hills, these form the highest part of the Northern Plains.

Bhorat Plateau or Mewar Rocky Region: Covering almost the whole of Udaipur district, the Borhat Plateau forms one of the highest portion of the Aravallis having an

altitude of nearly 1,225m, from where a number of spurs and ridges branch off in almost all direction. Moreover, they also represent the Great Indian Watershed.

The Abu Block: This covers almost the whole of Sirohi district. While its western part is entirely hilly, its eastern part consists of Mt. Abu, a 19kms long and 6kms wide, narrow and irregular plateau, surrounded by several projected peaks, Guru Shikhar being the main peak as well as other peaks near Ser, Achalgarh or in the area west of Dilwara.

EASTERN PLAIN

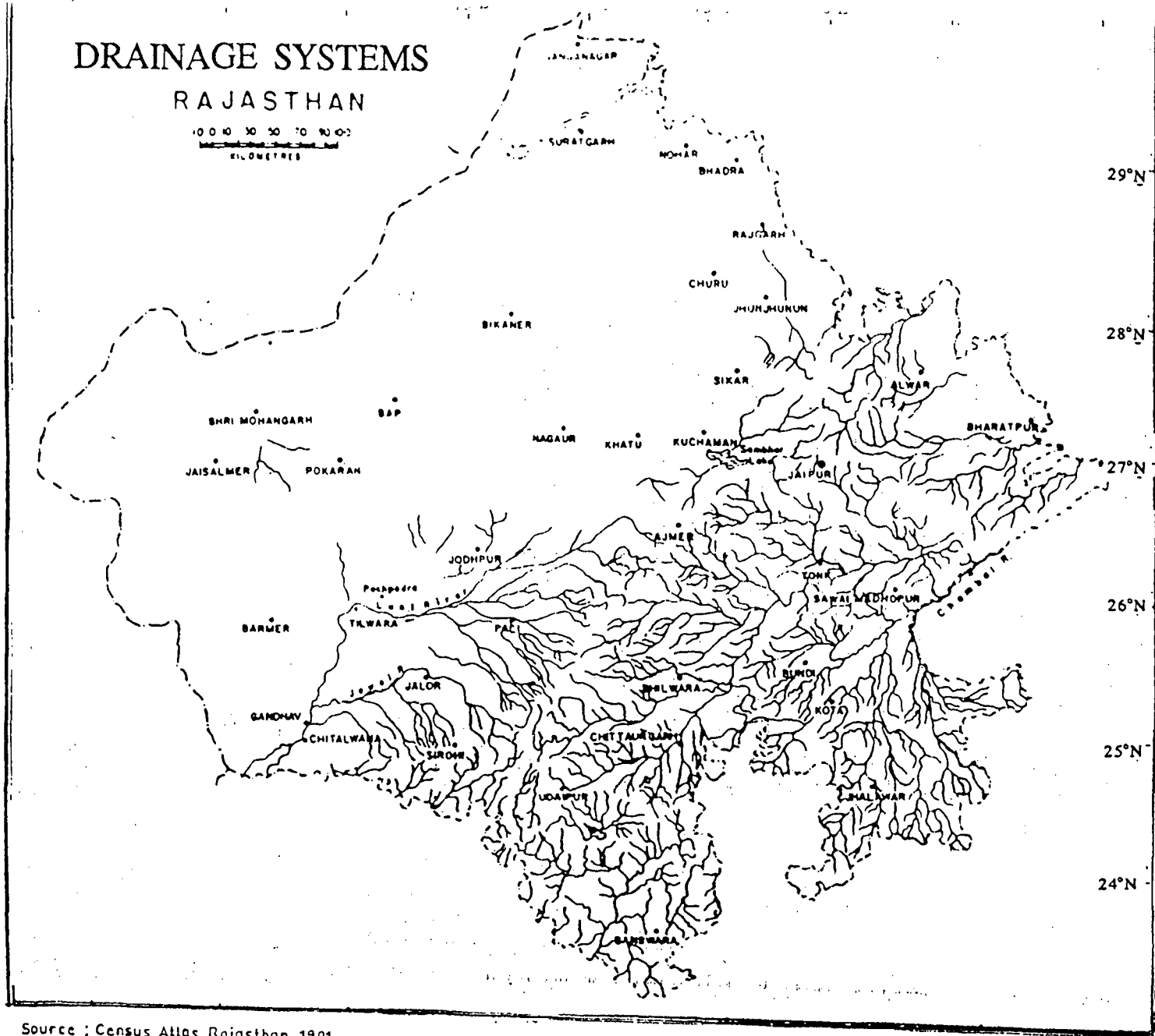
This region covering about 16.2%(55,426 sq.kms) of the total area of the state presents an amalgam of lowland and upland topography which are products of both geological history and exogenetic forces like peneplanation, warping, intrusion and deformation. The average elevation of the region is 300m and it may be divided into three regions of second order:

Chambal Basin: Covering the district of Kota, Bundi, Tonk, Sawai Madhopur and Bharatpur, “ *these Chambal lowlands are of a character peculiar to themselves, some times forming the floors of vast hollows in the ravines, far, perhaps from the river, but only just above the usual level of its stream; sometimes, skirting the beds of the ravines themselves they elsewhere rise in the wavy and irregular hillocks from the water’s or beside it from a tip of a low but fertile field*”.⁶

Banas Plain: Essentially a peneplain, this extends from the east of the Aravallis to Malpura Upland in the north- east and is known as Mewar Plain in the south and Malpura-Karauli plain in the north. While Bhilwara, Chittaurgarh and some parts of Udaipur forms part of it, this plain in Tonk and Sawai Madhopur bears testimonies of erosional surfaces of many periods.

DRAINAGE SYSTEMS RAJASTHAN

0 0 10 20 30 40 50 60 70 80 90
KILOMETRES



Source : Census Atlas, Rajasthan, 1991

Fig 2.3

Middle Mahi Plain: This covers Dungarpur and Banswara districts. While its central and eastern parts comprise of fertile plains, locally termed ' *Chappan*,' its western part is hilly and the entire plain is locally named ' *Bagar* '.

HADAUTI PLATEAU (SOUTH-EASTERN RAJASTHAN PLATEAU)

This region is locally called ' *Pathar* ' (stony) and ' *Uparmal* ' (high tableland). Occupying greater part of Bhilwara, Bundi, Kota, Baran and Jhalawar districts, this covers 11.3% of the total area of the state. Consisting of more or less upland and broad depressions, this physiographic unit may be divided into two second order regions:

Vindhyan Scarplands: Extending through Sawai Madhopur to Bundi and Kota, and having a general elevation between 350-550m, "*here the usually horizontal Vindhyas are folded and faulted, presumable by the rigid Aravallis which are overthrust onto them along the Boundary fault.*"⁷

Deccan Lava Plateau: Also known as ' *uparmal* ', this is a large and stony upland lying in the form of three concentric escarpments.

2.3 RIVER SYSTEM AND WATER RESOURCES

The drainage system of Rajasthan is greatly influenced by the Aravallis, in that it forms part of the Great Indian Watershed, dividing the drainage of the Bay of Bengal to its east from that of the Arabian Sea to its west. The most characteristic feature of drainage system of Rajasthan is that, nearly 60.2% of the area of the state has inland drainage system and most of it is to the west of the Aravalli divide.

Thus, the drainage system of Rajasthan may be broadly categorized as:

- I. RIVERS OF BAY OF BENGAL DRAINAGE SYSTEM
- II. RIVERS OF ARABIAN SEA DRAINAGE SYSTEM
- III. RIVERS OF INLAND DRAINAGE SYSTEM.

RIVERS OF BAY OF BENGAL DRAINAGE SYSTEM

Chambal: Having the old mythological name of '*chamawati*', this river originating from Manpur near Mhow in Indore district of M.P and entering Rajasthan near Chaurasigarh, it is the only perennial river of the state flowing the boundaries of Kota and Bundi and also Sawai Madhopur and Dhaulpur districts for 376kms.

Banas(*'hope of the forests'*): Originating from the Khamnor Hills near Rajsamand, and flowing across Rajsamand, parts of Bhilwara, Tonk and Sawai Madhopur districts, ultimately meeting the Chambal near Rameshwar in Sawai Madhopur, this 480kms long river is the only river in the state which has its entire course in Rajasthan.

Banganga: Having its origin in the hills of Bairath in Jaipur district, this river takes a south- easterly course with a total length of 240kms in Rajasthan, and flows into Bharatpur district.

Gambhiri: A small river of 110kms, it originates from the hills of Sawai Madhopur and flows past Sawai Madhopur and Bharatpur districts.

The above rivers meet the Bay of Bengal through the river Yamuna of the Ganga System.

RIVERS OF ARABIAN SEA DRAINAGE SYSTEM

Luni: Having its origin in the Nag Pahar Hill near Ajmer, this 482kms long river initially flows through Nagaur district and thereafter taking a south- westerly course flows through Jodhpur, Barmer and Jalore districts.

Sabarmati: Being mainly a river of Gujarat, it flows for a very short distance of 29kms in Rajasthan through Udaipur district, having its origin near Padara near Kumbhalgarh.

Mahi: Originating from Ammoru near Mhow in M.P, Mahi is one of the major rivers of the state, especially in Dungarpur and Banswara, demarcating the boundary between the two.

All the above rivers are ephemeral in nature, having their water supply during the monsoons.

RIVER OF INLAND DRAINAGE

Ghaggar: Considered to be the ancient '*Saraswati*', this river starting from the Kalka Hills in H.P, flows through the district of Ganganagar and Hanumangarh in Rajasthan. At places it is 7kms wide evident of its huge drainage in the past.

Sota-Sabi: While the Sota originates in the hills of Bairath, the Sabi originates from Sewan Hills and these flows through Kotputli,, Bansur, Behror, Kishangarh and Mandawar tehsils.

Kakni: Also known as '*Masurdi*', this is the main river of Jaisalmer flowing for only 27kms.

Kantli: Originating from the hills of Udaipurwati in Jhunjhunu district, it ultimately terminates in the sands of Churu after flowing for 48kms.

All the above rivers owe their origin to the water accumulation during the monsoon and flow through the dry sand as far as their limited supply of water permits.

The following table gives the annual surface runoff for different river basis in Rajasthan.

DISS
307.7609544
B2235 Sp

TH11031

01
TH11031



TABLE 2.1 SURFACE RUNOFF IN DIFFERNT RIVER BASINS⁸

River Basins	Area (sq.kms)	Annual Flow (MCM)	Utilisable Flow (MCM)
Chambal	72,032.05	6,130	2,980
Banas	45,833	4,360	3,100
Banganga	6,742.57	440	350
Gambhiri	4.812	450	400
Luni	34,866.40	1,630	530
Sabarmati	2,797	890	840
Mahi	16,891	3,570	3,350
Others		2,115	745
Total		19,585	12,295

MCM: Million Cubic Centimeters.

The above table shows that about more than 70% of the annual flow in concentrated in the basis of three potential rivers- Chambal, Banas and Mahi, all flowing in the southern and eastern parts of the state. Owing to limitation imposed by physiography and soil, only about 12,295 MCM (62.7%) of the surface water can be utilized.

LAKES

Rajasthan is also known as a state of '*varieties of lakes*', these lakes may be broadly divided into saline and fresh water lakes.

Saline Water Lakes

Sambhar: Situated on the border of Jaipur and Nagaur districts, this is the largest lake of Rajasthan and a great source of salt production in India.

Deedwana is located near Deedwana town in Nagaur district.

Pachpadra: Situated near Pachpadra in Barmer, it contains salt of high quality (sodium chloride upto a level of 98%) corresponding to sea salt.

Lunkaransar: Located near Lunkaransar town in Bikaner district, it mainly produces sodium chloride.

Fresh Water Lakes

Jaisamand near Udaipur is the largest freshwater lake in the state and the biggest artificial freshwater lake in the World.

Rajsamand near Kankroli in Udaipur district.

Pichola, Fateh Sagar and Udaisagar lakes in Udaipur.

Anasagar in Ajmer.

Pushkar near Ajmer.

Nakki Lake near Mt. Abu.

Silised near Alwar.

Kolayat near Bikaner, and,

Balsamand near Jodhpur.

2.4 CLIMATE

From the point of view of climate, the year in Rajasthan may be broadly divided into four major conventional seasons:

- I. THE HOT WEATHER SEASON (March –mid-June).
- II. THE SEASON OF GENERAL RAINS (mid-June – September).
- III. THE SEASON OF THE RETREATING MONSOON (October –November).
- IV. THE COLD WEATHER SEASON (December- February).

THE HOT WEATHER SEASON

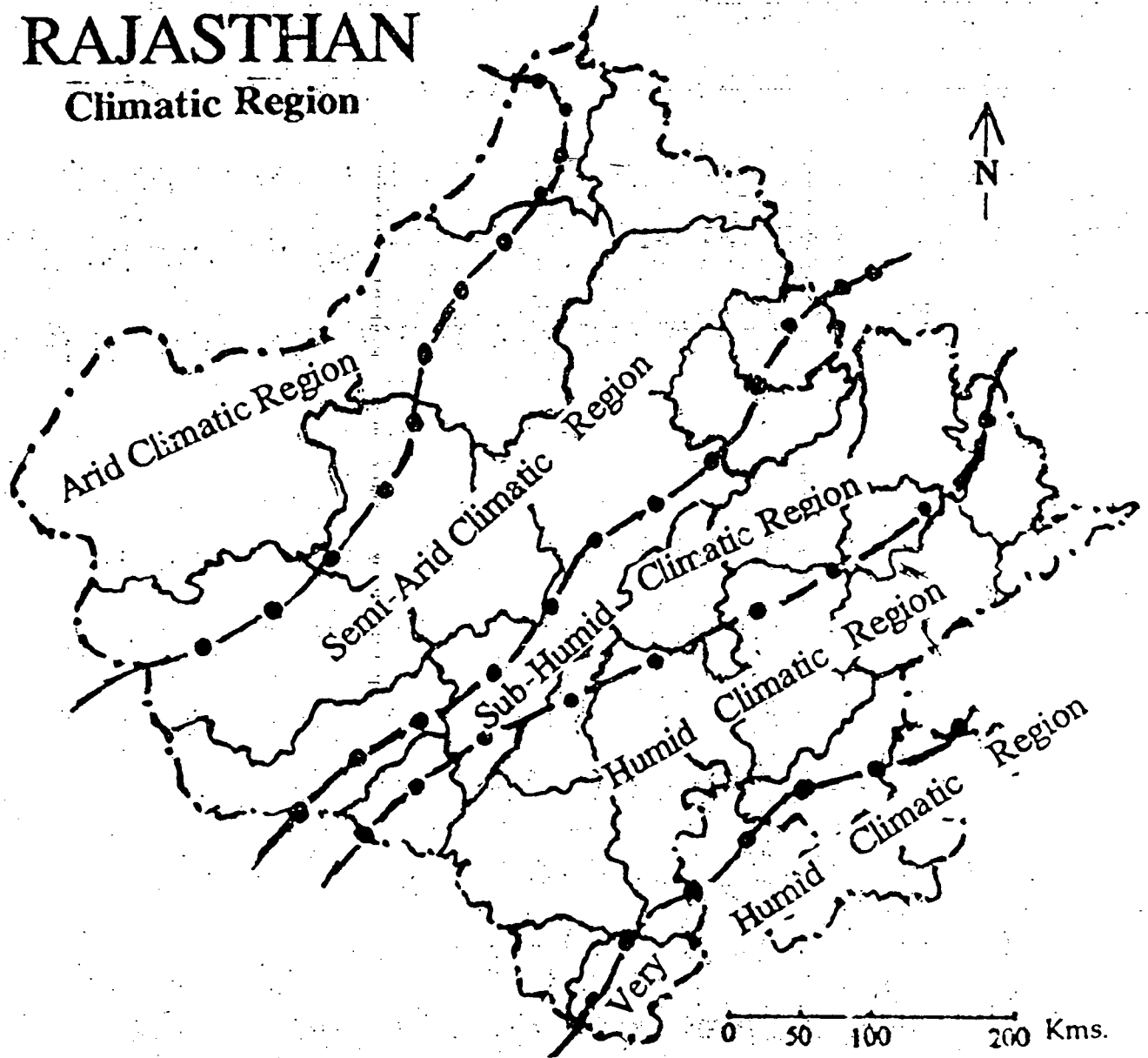
In this, due to inverse in temperature, the atmospheric pressure falls subsequently over the heated land. Winds blow from west to east and thus, are dry and warm. The maximum daily temperature goes upto 40°-45°C with the temperature constantly increasing in the north and west of the Aravallis. Local heating results in strong convection currents consequently resulting in the formation of dust devils (swirls) and dust storms locally termed '*andhis*' which may occasionally bring down the temperature specially if followed by rain though the humidity drops down to 1%. Nights even in summers are cool.

THE SEASON OF GENERAL RAINS

The monsoon currents over the Indian Subcontinent gets splitted up into two branches-Bay of Bengal and Arabian Sea branch, both aiming to reach the low pressure area of Sind and Rajasthan. But Rajasthan due to its location experiences indrift of the monsoon currents with a marked decrease of rainfall from east to west, making the area west of the Aravallis, the most arid part of the country. The 50cm isohyetal line divides the state into two--- east and south of this line; there is increase in rainfall with Mt. Abu in the south recording the highest rainfall in Rajasthan.

RAJASTHAN

Climatic Region



Source: L.R.Bhalla, "Geography of Rajasthan", 1996.

Fig.2.4

THE SEASON OF THE RETREATING MONSOON

This is a season of fairly uniform temperature, the maximum ranging between 33°-36°C and minimum from 17°-21°C at various places. Winds are light and highly variable owing to withdrawal of monsoons.

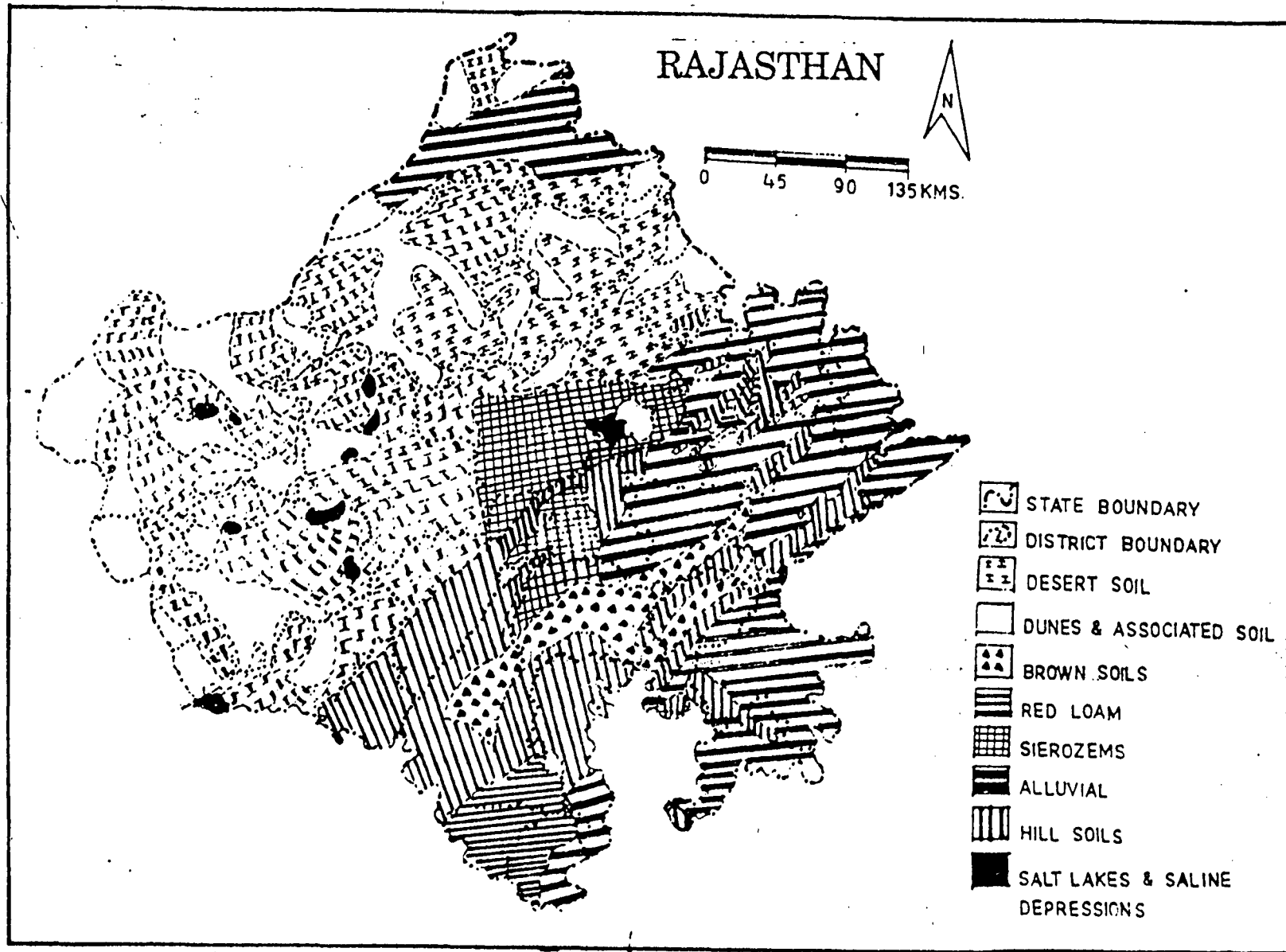
THE COLD WEATHER SEASON

With the sun migrating to the Southern Hemisphere and the whole of the country coming under the influence of the sub-tropical anticyclonic cell, cold weather cyclones travel across Rajasthan from west to east. Temperature gradually decreases to the winter minimum, with the average mean temperature in January ranging from 12°C in the north to 16°C in the south; sky is almost cloudless and offshore winds yield little or no rainfall.

CLIMATIC REGIONS

Based on rainfall distribution and temperature variation, a general classification of climate of Rajasthan may be attempted as:

1. **Arid Region** covering Jaisalmer, northern Barmer, parts of Jodhpur, western part of Bikaner and southern part of Ganganagar districts. Average summer temperature is more than 34°C while winter temperature ranges between 12°-16°C. Rainfall is extremely low recording from 10cm-20cm.
2. **Semi Arid Regions** comprising western Ganganagar, Jodhpur and Barmer districts. Summer temperature range, between 32°-36°C while in winter it ranges between 10°-17°C. Rainfall ranges from 20 cm-40cm and is highly erratic but torrential.
3. **Sub Humid Region** including Alwar, Jaipur, Ajmer, eastern part of Jhunjhunu, Sikar, Pali and Jalore and north-western parts of Tonk, Sirohi and Bhilwara districts. Rainfall mostly coming in the rainy season ranges between 40-60cm. While the average summer temperature is recorded to be between 28°-34°C, it is 12° C-16°C in winter.



Source: N.A.T.M.O

Soil Map of Rajasthan

Fig.2.5

4. **Humid Region** covering Bharatpur, Dhaulpur, Sawai Madhopur, Bundi, Kota and north-eastern Udaipur, Rainfall is between 60-80cms.
5. **Very Humid Region** including south-east Kota, Jhalawar, Banswara, south-west Udaipur and adjoining areas of Mt.Abu. Rainfall ranging from 80-150cm is received in these areas.

2.5:SOILS

Great variation in climate, topography and mineral composition of the source rocks finds their expression in the varying characteristics of soils in Rajasthan. While the soils in south and south-eastern parts of the state may have been formed due to prolonged effect of climate and vegetation, pedogenesis in northern and western parts may be attributed largely to aeolian and fluvial processes. The distribution of different soil types and their salient characteristics are as follows.

DUNE AND INTERDUNE SOILS

These occur in two continuous chains-one is Barmer, Bikaner and Jaisalmer and another in eastern Bikaner and Churu districts, and in a discontinuous belt from Sanchoreshore through Deedwana to Lachmangarh. These soils are fine sandy, light yellowish brown to pale brown, containing very low organic matter content, medium to low phosphorous, medium to high potassium, having 2-5% clay and 0.4-1.37% silt with a very low water retention capacity of 50-80mm/metre depth. Interdunal soils are very much similar only with a higher amount of silt (2-3%), clay (5-7%) and CaCO₃ (2-5%) While the dunal soils only supports grasses, in the interdunes, pearl millet, moong and moth may be cultivated.

BROWN SANDY SOILS

These occur widely in Jodhpur, Nagaur, Bikaner, Jaisalmer, Jalore, Sirohi and Pali districts. Being fine sand to loamy sand, these are brown, yellowish brown and pale brown, having 4-6% clay and 3-5% silt with a very low organic matter content,

medium to high potassium, are granular and non-calcareous with a moisture retention capacity of 60-90 mm/meter depth. These are generally cultivated for rain-fed crops like bajra, guar, moth and moong.

FLOOD PLAIN SOILS

Mainly formed by the flood sediments deposited by the river Ghaggar, these soils are mainly found in the Ganganagar and Bikaner districts, are fine sand to loamy sand, brown to gray brown with granular and sub- angular block structure. These soils contain 12-22% silt and 11-18% clay, medium amount of organic carbon (0.21-0.45%), fair amount of phosphorous, potassium and other micronutrients with a high moisture retention capacity from 180-231 mm/meter depth. These soils are fertile and may yield good quality bumper crops of paddy, wheat cotton, sugarcane, oilseeds and pulses.

SOILS OF YOUNGER ALLUVIAL PLAIN

These soils are largely found in the districts of Alwar, Bharatpur and parts of Jaipur. Very deep, pale brown and sandy loam, these soils contain 8-15% clay, and 6-10% silt, 0.3-0.4% organic carbon, fair amounts of other macro- and micro- nutrients. The CaCO₃ content varies from 1-2.5% in different horizons and in the lower horizons soft nodules of CaCO₃ may also occur. The moisture retention capacity ranges from 200-215 mm/meter depths, but these soils suffer from problem of water-logging. Winter crops like wheat, sorghum, pulses and groundnut are grown.

BROWN SOILS

Occurring largely in Bhilwara, Tonk and Ajmer districts and in scattered parts in Udaipur, Chittaurgarh and Jaipur districts, these brown soils are medium to fine-textured, sandy loam to clay loam with sub-angular blocky structure and are non-calcareous. The organic carbon content varies from 0.5-0.8% and the moisture retention capacity is 110-250mm/meter depth. Though natural salinity is a major problem, these soils are productive both in irrigated and rain-fed areas.

RED LOAM SOILS

These soils are generally found in narrow valley fills as in the flat intermontane area. These are widespread in the southern districts of Dungarpur, Udaipur, Chittaurgarh districts. These soils are strong brown, sandy loam to loam, devoid of CaCO_3 , contain medium organic carbon content of 0.4-0.6% and the moisture retention capacity varies from 75-80mm/meter depth. These soils are very productive and apt for growing cash crops like cotton and sugarcane.

BLACK SOILS

Developed from the Vindhyan Rocks and Deccan Trap sediments deposited by River Chambal and its tributaries, the black soils are found in Kota, Bundi, Sawai Madhopur, Jhalawar and Banswara districts and in scattered parts of Udaipur and Chittaurgarh. Vary dark grayish brown in colour, these are clay loam, having angular blocky structure with 20-25% silt and 35-40% clay content, organic carbon ranging from 0.4-0.6% and lime concretionary existing in the substrata. These soils have a characteristic property of swelling when wet and shrinking when dry, developing cracks of 50-100cms depths after drying. The moisture retention capacity is very high, 145-200 mm/meter depth. Higher yields of crops like cotton, sugarcane, sorghum, wheat, mustard, pulses and oilseeds can be obtained.

HILL SOILS

Mainly found in the foothill region of the Aravallis in Sirohi, Udaipur, Rajsamand, Chittaurgarh and Ajmer districts, these soils vary from reddish to yellowish red, are sandy loam to clay loam and are well -drained. But cultivation in these soils is very much restricted due to shallow nature of these soils and presence of stones on the surface.

2.6: NATURAL VEGETATION

Rajasthan presents a great variety of natural vegetation, ranging from scanty vegetation in the western arid region to mixed deciduous and sub-tropical evergreen forests in the east and south -east of the Aravalli Range.

Forests

The forests of different types cover about 9.44%(1997) of the total area of the state most of it being found in the districts of Alwar, Banswara, Bharatpur, Bundi, Dhaulputr, Sawai Madhopur, Sirohi and Udaipur. While some of the forests occur in pure stands others are mixed with other species.

Type of Forest	Area Where Found
1. Dhol (principal forest type covering 60% of the total forest area)	South -eastern part of the Aravalli Hills.
2. Kattha (occupy 3% of the total forest cover)	South -eastern part of the state.
3. Salar (cover 5% of the total forest area)	Alwar, Ajmer, Chittaurgarh, Jaipur, Jodhpur, Sirohi and Udaipur.
4. Dhak	Generally occupy foothills and depressions.
5. Bamboo (occupy 2.5% of the total forest cover)	Chittaurgarh, Udaipur, Kota and Abu Hills
6. Teak	South and south -eastern parts of the state mostly in Chittaurgarh and Udaipur.
7. Mixed Micellaneous Forest (covering 20% of the total forest area)	Bundi, Chittaurgarh, Kota, Sirhoi and Udaipur.
8. Sub-tropical Evergreen	Found around Mt. Abu, where the average annual rainfall is 150cm/more.
9. Thorn	Formed mainly in the arid north -western part of the state-Nagaur, Pali, Sikar, Jhunjhunu, Ajmer, Jodhpur and Jaisalmer and also in the ravines and sandy tracts.

GRASSLANDS AND PASTURES

Locally known as '*beeds*' these occur extensively in Sikar, Jhunjhunu, larger parts of Ajmer, Bhilwara, and in limited parts of Udaipur and Sirohi as well as in the hilltops and their slopes in Mewar, Marwar and Alwar Hills.

SCRUBS AND BUSHLANDS

These represents the poorest floral type but covers substantial part of the state and are found in scattered patches or in long stretches, generally occupying steeper hill slopes, plateau tops, and rocky denuded plains with thin soil cover where forest do not flourish and where cultivation is not possible.

2.7: AGRICULTURE

Agriculture is the mainstay of the economy of Rajasthan with a majority of the population being engaged in it. It is also the source of raw materials for several agro-based industries. As is indicated by the land use data for 1991, it may be said that a large part of the total area of the state cannot be used for agricultural purposes due to limitation imposed by relief and aridity, while the total cropped area is only 52.8%, the net sown area is also only 45.2% and 47.2% is not utilized for agriculture. The following table shows the land use pattern in Rajasthan.

Land Use in Rajasthan (1990-91)

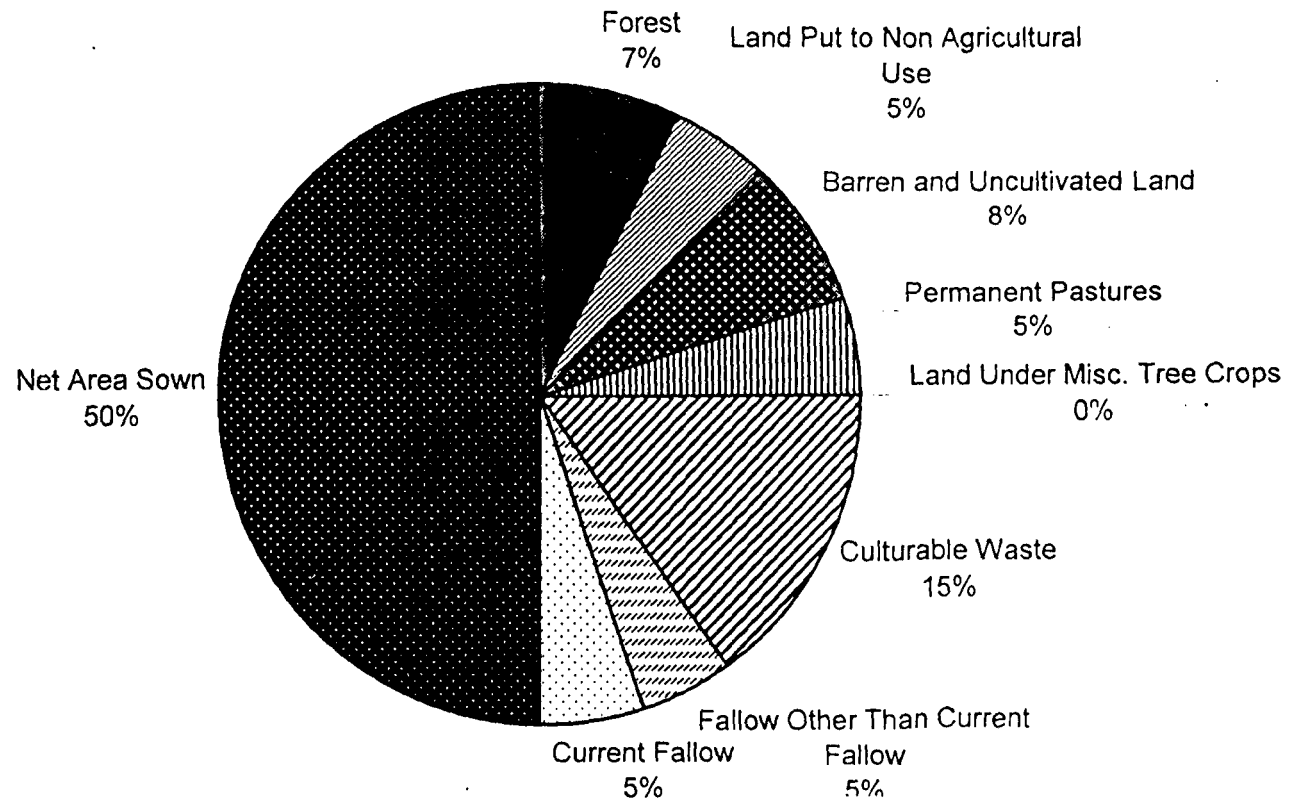


Fig 2.6

TABLE 2.2: LAND USE PATTERN IN RAJASTHAN (1991-92)⁹

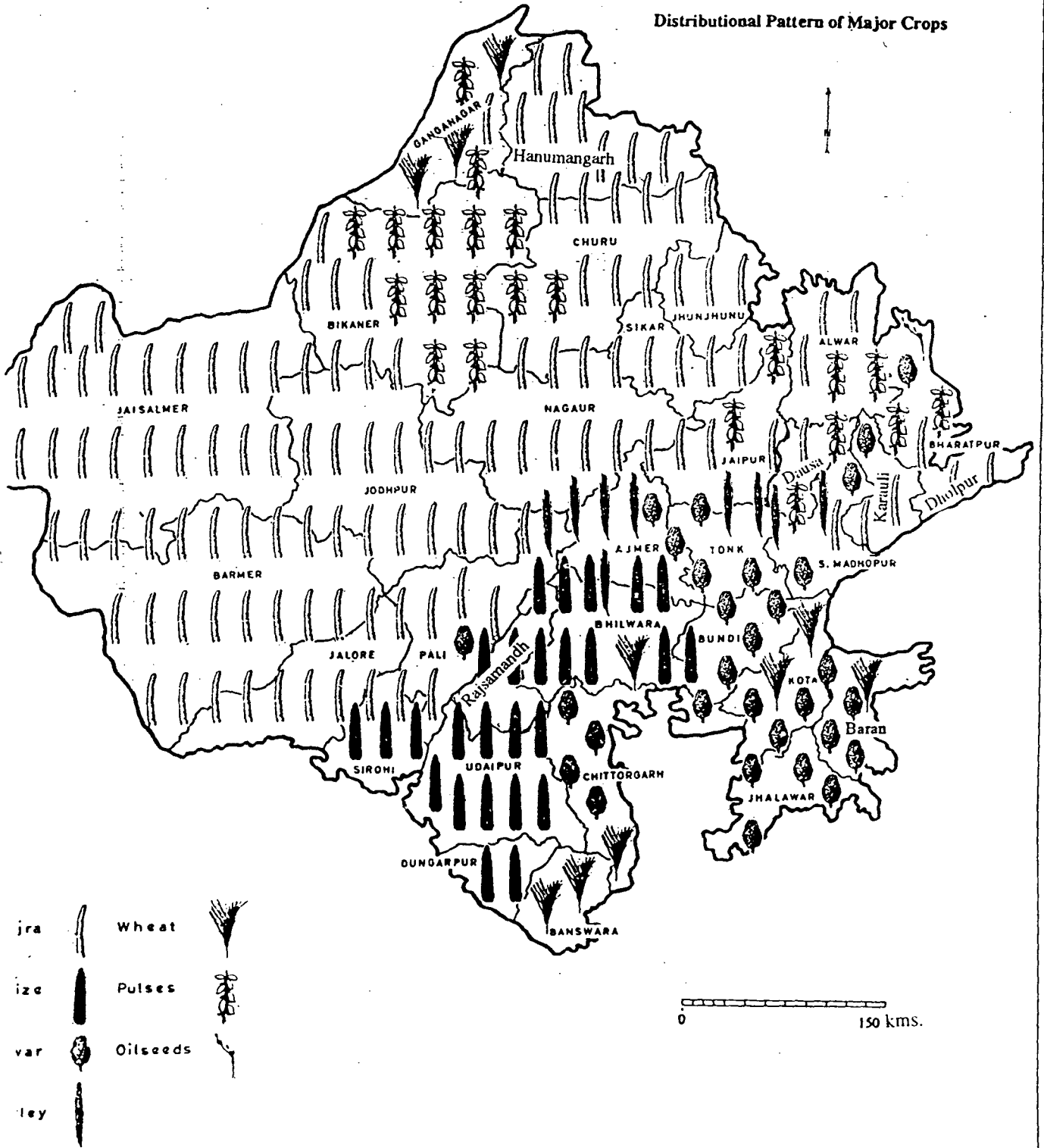
	Area (lakh hectares)	Percentage of Total Area
Reporting area for land utilization purpose	342.43	100.00
Forest	24.50	7.20
Land put to non – agricultural use	16.56	4.90
Barren and uncultivated land	26.85	7.80
Permanent pastures and other grazing land	17.63	5.10
Land under miscellaneous tree crops and groves	0.16	0.05
Cultivable waste	51.53	15.10
Fallow other than current fallow	16.95	4.91
Current fallow	18.05	5.27
Net sown area	170.20	49.67
Area sown more than once	33.60	9.80
Total cropped area	203.80	56.25

So far as the cropping pattern of the state is concerned, several interesting facts emerge, the cropping pattern being highly influenced by climatic and edaphic conditions.

- i. greater emphasis is laid on the cultivation of food crops in agricultural produce.
- ii. while jowar and bajra are the major crops in Rajasthan, rice and wheat may be grown in the humid eastern and parts southern of the state;
- iii no specific crop is grown as fodder;

RAJASTHAN

Distributional Pattern of Major Crops



Source: N.A.T.M.O

Fig 2.7

- iv the double cropped areas are very limited, and in majority of the holdings only one crop may be grown; and,
- v. very little cropped area is devoted to commercial crops.

The following are some of the major food as well as non- food crops of Rajasthan along with these areas of production;

Food Crops	Area of Production
Bajra	90% of lies in Barmer, Bikaner, Jodhpur, Nagaur, Churu, Sikar, Jalore, Jhunjhunu, Ganganagar, Jaipur and Jaisalmer districts.
Pulses	90% area lies in Churu, Nagaur, Bikaner, Jodhpur, Jhunjhunu, Sikar, Jaipur, Ganganagar and Barmer districts.
Wheat	90% area lies in Ganganagar, Kota, Bharatpur, Pali, Tonk, Alwar, Bundi, Sawai Madhupur, Jaipur, and Chittaurgarh districts.
Jowar	90% area lies in Kota, Tonk, Ajmer, Jhalawar, Nagaur, Pali, Sawai Madhopur and Bundi districts.
Maize	90% area lies in Udaipur, Bhilwara, Chittaurgarh, Banswara, Dungarpur and Ajmer districts.
Barley	90% area lies in Jaipur, Ganganagar, Alwar, Jhunjhunu, Tonk, Ajmer, Bhilwara, Udaipur, Bharatpur, Dhaulpur and Pali districts.
Gram	90% area lies in Jaipur, Ganganagar, Bharatpur, Alwar, Sawai Madhopur, Kota, Tonk, Jaipur, Churu and Bundi districts.
Rice	90% area lies in Banswara, Dungarpur, Udaipur, Ganganagar, SawaiMadhopur, Bharatpur, Dhaulpur, Kota and Bundi districts.

**IRRIGATION BY SOURCES IN RAJASTHAN
(1990-91)**

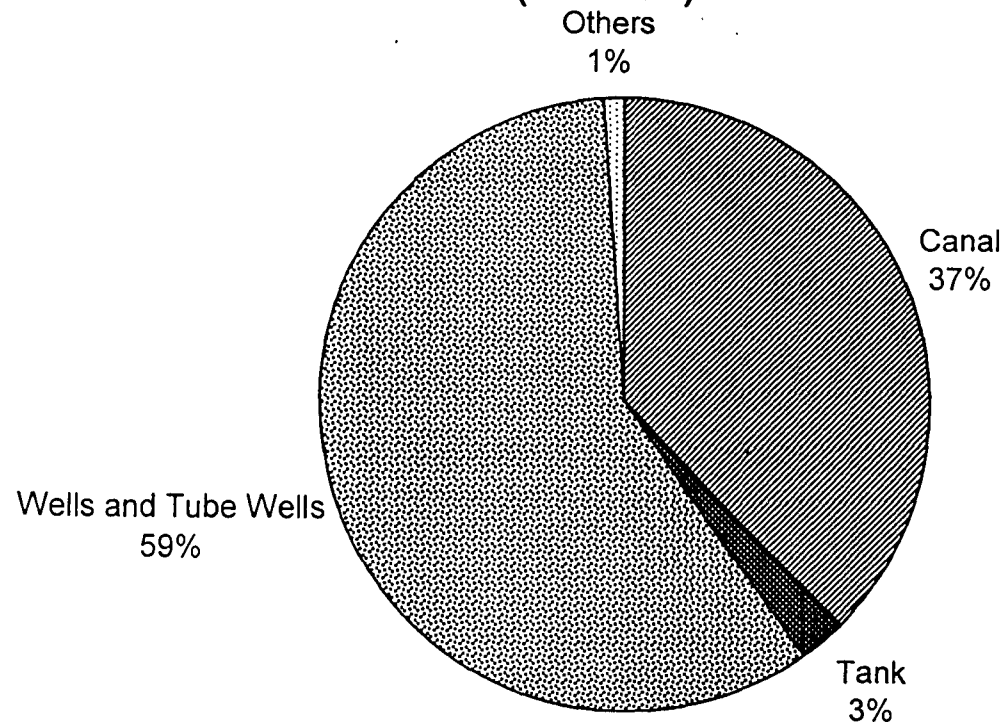


Fig 2.9

Non-food Crops	Area of Production
Groundnut	90% area lies in Chittaurgarh, Sawai Madhopur, Bhilwara, Jaipur, Bharatpur, Dhaulpur, Ajmer, Udaipur, and Jhalawar districts.
Mustard	90% area lies in Alwar, Bharatpur, Dhaulpur, Ganganagar, Jaipur, Sawai Madhopur, Sikar, Jhunjhunu and Sirohi districts.
Linseed	90% of the area lies in Kota, Bharatpur and Dhaulpur districts.
Cotton	90% area lies in Ganganagar, Ajmer, Banswara, Chittaurgarh, Pali, Udaipur and Tonk districts.
Sugarcane	90% area lies in Ganganagar, Udaipur, Bundi, Chittaurgarh, Bharatpur, Dhaulpur, Bhilwara and Sawai Madhopur districts.

2.8 IRRIGATION

Only about 37% of the total geographical area of the state is cultivable. The agricultural production of Rajasthan mainly depends on monsoon rains which are themselves abnormal, erratic, scanty and unevenly distributed with prolonged drought periods. This increases the dependability on irrigation sources.

BASIC SOURCES OF IRRIGATION

There are three main sources of irrigation in Rajasthan:

- i Wells and tube wells;
- ii Tanks; and
- iii Canals.

TABLE 2.3 IRRIGATION BY SOURCES¹⁰

Sources	Percentage (1990-91)
Canal	37.48
Tank	2.69
Tube wells and wells	58.61
Other	1.22
Total	100.00

From the above table we see that, wells and tube wells are the dominant sources of irrigation in Rajasthan followed by canal irrigation.

A number of irrigation projects have come up in the state, which is considered to deserve special mention.

Indira Gandhi Canal Project: Formerly known as the Rajasthan Canal Project, it was taken by the Central Power and Water Commission in 1951, considering the water requirements of Bikaner. It comprises of two stages—stage I providing irrigation facilities to its full target of 5.78 lakh hectares, and stage II with a target of 7.0 lakh hectares, also supposed to provide drinking water supply in Barmer and Jaisalmer.

Chambal Project: A joint project of M.P and Rajasthan mainly aimed at controlling the floods of the River Chambal, its water is used for irrigation, power generation and drinking purpose. It irrigates a total area of 10 lakh hectares of land in Kota and Bundi districts.

Bhakra Canal Project: Situated on the River Sutluj, the project has a command area of 3.66 lakh hectares with an annual designed intensity of irrigation as 62% out of which the share of Rajasthan is 15.2% Mainly Ganganagar and Hanumangarh districts are benefited from this.

Mahi Bajaj Sagar Project: A joint venture of Rajasthan and Gujarat, this project stands on river Mahi in Banswara, with an irrigation potential of 74,760 hectares out of which 56,218 hectares could be irrigated.

Jawai Project: Situated on Jawai River in Pali district it mostly caters to the irrigation needs of Pali and Jalore districts and some parts of Sirohi district as well.

Bisalpur Project: Built on River Banas in Bisalpur in Tonk district, it comprises of two phases, the first phase supposed to provide drinking water and second phase irrigation to an area of 69,300 hectares drinking water and second phase irrigation to an area of 69300 hector on the right bank of the river.

Narmada Project: This is supposed to provide water to several villages of Jalore and Barmer districts.

Gang Canal Project: Originating from the left bank of River Sutluj at Husaniwala, it cover a gross area of 4,92,428 hectares and has brought 6.6 lakh acres of land in the Ganganagar district under irrigation, transforming it into '*green ghettos*'.

Bharatpur Canal: Originating from western Yamuna canal, it irrigates a total area of 11,000 hectare out of which Bharatpur district alone accounts for 8,500 hectares.

Some other important Projects are:

Orain Irrigation Scheme: On River Orain to provide irrigation facilities to Bundi and Chittaurgarh districts.

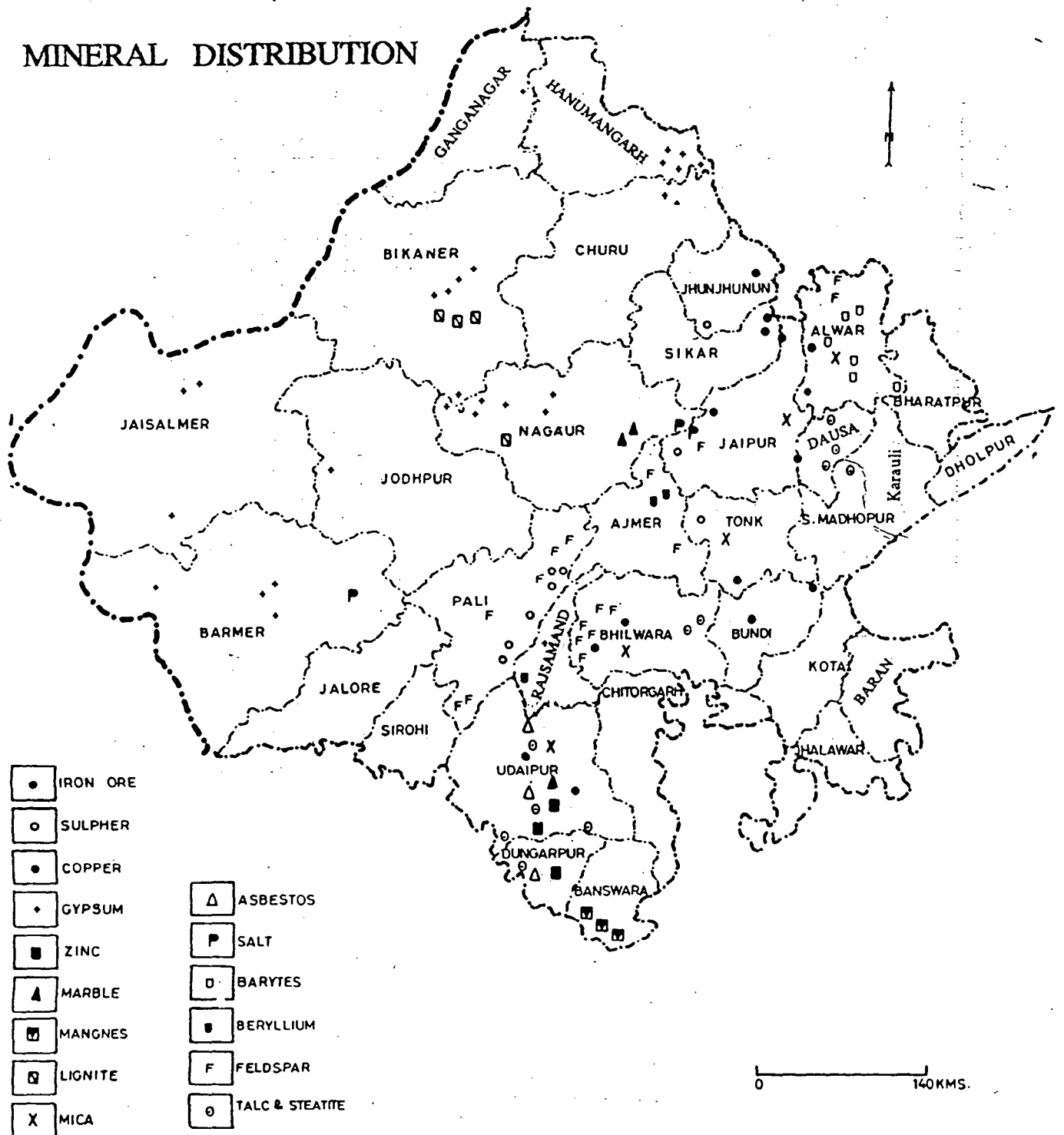
Gambhiri Project on river Gambhiri to provide irrigation facilities to Chittaurgarh.

Sidhmukh and Nohar Irrigation Projects, supposed to benefit Ganganagar, Hanumangarh and Churu districts.

These irrigation projects are supposed to provide all round development in agricultural as well as industry.

RAJASTHAN

MINERAL DISTRIBUTION



Source: N.A.T.M.O

Fig 2.9

2.9: MINERAL WEALTH

Rajasthan is one of the most important mineral producing states in the country, endowed with a rich wealth of metallic and non-metallic minerals/ores as well as a variety of building stones.

Metallic Minerals / Ores	Area of Production/ Occurrence
Copper ore	Production mines located at Khetri, Kolihan and Chandmari in Jhunjhunu district and Kho-Dariba in Alwar district.
Iron ore	Jaipur, Udaipur, Jhunjhunu and Sikar districts
Lead-Zinc ore	Most important mines located at Zawar and Rajpur-Dariba in Udaipur district.
Manganese Ore	Banswara district.
Tungsten	Degana in Nagaur district.

Non-Metallic Minerals/Ores	Area of Production/ Occurrence.
Asbestos	Rikhabdeo (Udaipur district), Ajmer and Pali
China-clay	Bhilwara, Bikaner, Jaipur, Sawai Madhopur, Sikar and Udaipur.
Dolomite	Ajmer, Alwar, Jhunjhunu, Jaipur, Jaisalmer and Sikar districts.
Feldspar	Ajmer district.
Flourite	Dungarpur and Jalore districts.
Garnet	Ajmer, Bhilwara, and Tonk districts.
Emerald	Ajmer and Udaipur districts.
Gypsum	Bikaner, Barmer, Jaisalmer, Nagaur, Pali and Ganganagar districts.

Non-Metallic Minerals/Ores	Areas of Production/Occurrence
Mica	Bhilwara, Ajmer, Jaipur, Tonk and Udaipur districts.
Quartz	Alwar, Jhunjhunu, Jodhpur, Pali, Tonk and Udaipur districts.
Rock Phosphate	Birmania and Fatehgarh in Jaisalmer district and Jhamar-Kotra in Udaipur.
Silica sand	Bharatpur, Bundi, Jaipur and Sawai Madhopur districts.
Soapstone (Talc)	Bhilwara, Dungarpur, Jaipur and Udaipur districts.
Wollastonite	Sirohi district.
Vermiculite	Ajmer district.
Lignite	Palana in Bikaner
Fuller's Earth	Bikaner and Barmer districts.
Building Stone	Area of Production/Occurrence
Sandstone	Bharatpur, Bhilwara, Bundi, Chittaurgarh, Jhalawar, Jodhpur, Kota and Sawai Madopur districts.
Limestone	Alwar, Chittaurgarh, Jaipur, Jodhpur, Kota, Nagaur, Pali, Sikar and Udaipur districts.
Marble	Makrana in Nagaur district
Granite	Jalore district.

2.10: INDUSTRIAL ACTIVITIES

Prior to Independence, due to limited to technical know-how, lack of transport facilities and the introvert policies of the rulers of this state the resources could not be utilised for the development of modern industries and industrialisation in the state is thus a recent phenomenon.

SPATIAL DISTRIBUTION OF INDUSTRIAL ACTIVITIES

The Marusthali and the Bangar region of Rajasthan is industrially one of the most undeveloped regions of the state. Although there are considerable number of industries in some of the districts like Jodhpur, Bikaner and Ganganagar, most of them are small-scale processing local raw materials and manufacturing light consumer goods. This poor state of industrial development may be attributed to several factors like lack of raw materials and infrastructural development, precarious condition of agriculture, dearth of mineral and power resources, limited means of transportation etc.

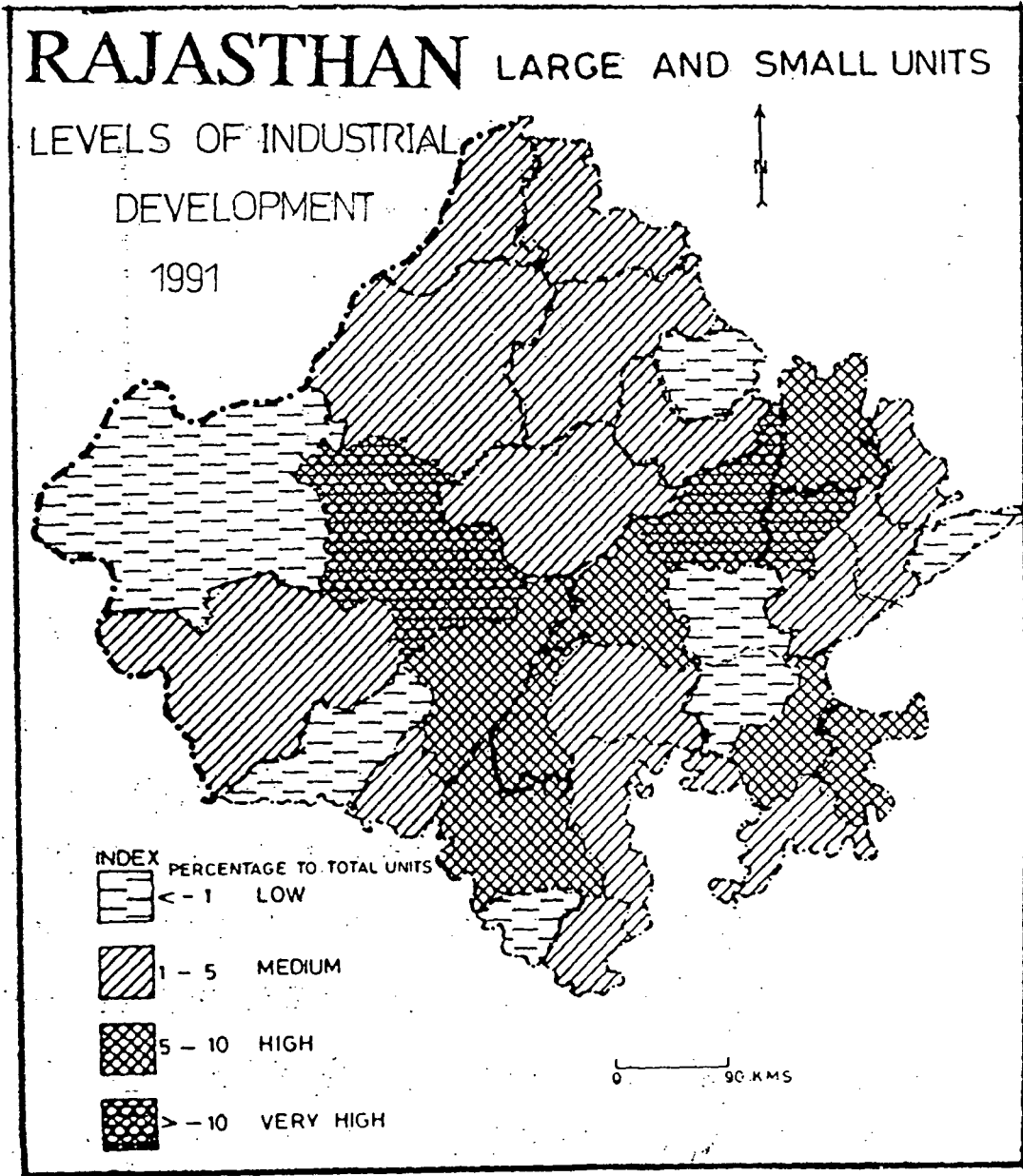
The districts of Ajmer, Jaipur are industrially more developed, with Jaipur being the industrial hub of the state having a variety of industrial units. The central location of Ajmer on the main Delhi-Ahmedabad railway line has led to setting up of Railway Loco and Carriage Workshops as well as few other industries in the city. Beawar, another industrial town in Ajmer district has three textile mills and a number of wool processing units, getting its supply of cotton and wool from nearby areas. A great industrial center of Rajasthan, Kota, drawing cheap hydro- electricity from the Chambal Project has attracted a large number of industries. It has cotton textile industry, a woollen factory, a glass factory, engineering industries and a large precision instrument factory, set up by the Government of India. Engineering industries are also located at Bharatpur, which also has a public sector railway wagon factory known as SIMMCO. Besides, there are woollen factories, one each at Bharatpur, Sawai Madhopur and Tonk.

Other districts have insignificant industrial development.

Thus, there exists a large inter regional imbalance in industrial development of Rajasthan.

LEVELS OF INDUSTRIAL DEVELOPMENT

Industrialization being a recent phenomenon, it is very difficult to categorize Rajasthan into different industrial region. A simple classification may be attempted



Source :L.R. Bhalla, "Geography of Rajasthan", 1996.

Fig. 2.10

based on the percentage of units of each district to total number of large or medium units of the state in production. Thus, there may be:

- I. **Highly Industrialised** districts of Jaipur and Jodhpur having more than 10% large or medium industrial units of total large/medium of Rajasthan.
- II. **Medium Industrialised** districts of Alwar, Ajmer, Kota, Pali and Udaipur with 5-10% of large/medium industrial units of total large/medium units of Rajasthan.
- III. **Low Industrialised** districts of Bharatpur, Baran, Bikaner, Nagaur, Churu, Bhilwara, Chittaurgarh, Rajsamand, Ganganagar, Hanumangarh, Barmer, Jhalawar, Sirohi, Sikar, Sawai Madhopur and Banswara, having 1-5% of the total large or medium units of Rajasthan.
- IV. **Very Low Industrialised** districts like Dhaulpur, Jaisalmer, Bundi, Jalore, Tonk, Jhunjhunu and Dungarpur having below 1% of the total large/medium units of Rajasthan.

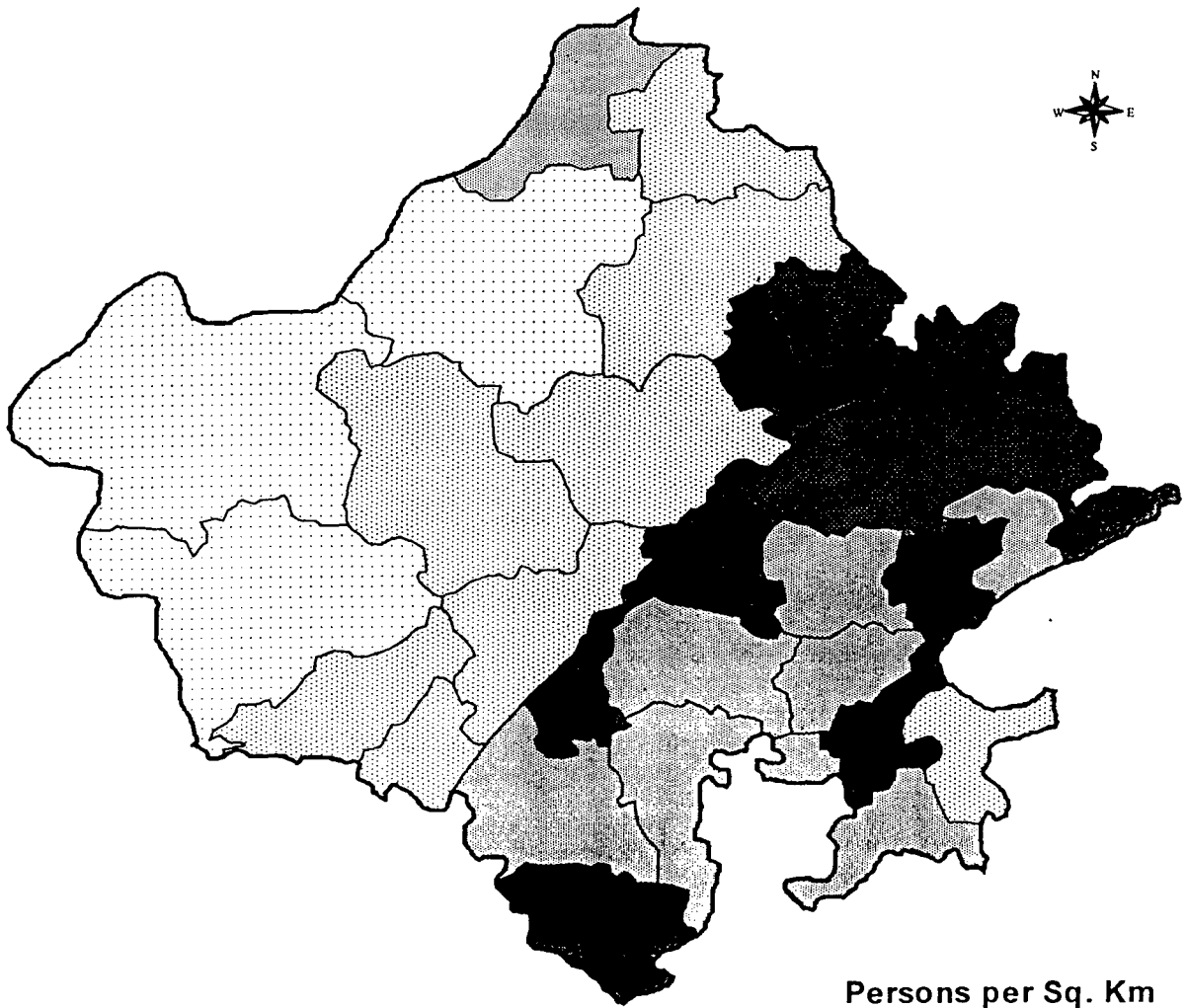
Hence, much planning and proper resource utilisation are the key words for the industrial development of Rajasthan.

2.11 POPULATION DISTRIBUTION

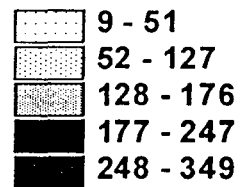
In 1991, Rajasthan had a population of 440.05 lakh persons (5.19% of India's total population) ranking 9th in total population among the states of Indian Union. In 2001, her population has increased to 564.73 lakh persons (5.50% of India's total population), its rank being improved to the 8th position among the states.

Closely following the pattern of rainfall distribution, the population distribution of Rajasthan exhibits great intra-regional variations, with the density of population decreasing from east to west. While in the western arid part of the state, the population is highly scattered and largely clustered around water points, the eastern part accounts for good concentration of population, owing to flat alluvial topography, over 50cms of rainfall and water supplies of several rivers.

RAJASTHAN
POPULATION DENSITY
1991



Persons per Sq. Km



Map Not to Scale

Fig 2.11

The Aravallis present a good concentration of population in few favoured pockets, also exhibiting differences between its northern and southern parts-- the northern part with a more or less level topography, fertile soil and irrigational facilities has comparatively more population than the southern part with hilly and rugged terrain and forest cover. However, there are few patches of concentration in the districts of Dungarpur and Banswara, being the haven of the tribals.

**TABLE 2.4: FACTS RELATED TO POPULATION OF RAJASTHAN
(1991+2001)¹¹**

State/District	Area (sq.km)	Population		Density (Persons/sq.km).	
		1991	2001	1991	2001
Rajasthan	342239	44005990	56473122	129	165
Ganganagar	21899	2622777	3305077	120	151
Bikaner	27244	1211140	1673562	44	61
Churu	16830	1543211	1922908	92	114
Jhunjhunu	5928	1582421	1913099	265	323
Alwar	8380	2296580	2990862	274	357
Bharatpur	5066	1657584	2098323	326	414
Sawai Madhopur	10527	18003471	2321662	171	221
Jaipur	14267	4882326	6569178	342	460
Sikar	7732	1842914	2287229	239	296
Ajmer	8481	1729207	2180526	204	257
Tonk	7194	975006	1211343	137	168
Jaisalmer	38401	344517	507999	9	13
Jodhpur	22850	2153483	2880777	94	126
Nagaur	17718	2144810	2772894	121	157
Pali	12387	1486432	1819201	120	147
Barmer	28387	1435222	1963758	51	69
Jalore	10640	1142563	1448486	107	136

Sirohi	5136	654029	850756	128	166
Bhilwara	10455	1593128	2009516	152	192
Udaipur	16385	2829101	3618479	176	221
Chittaurgarh	10856	1484190	1802656	137	166
Dungarpur	3770	874549	1107037	232	294
Banswara	5037	1155600	1500420	229	298
Bundi	5550	770248	96129	138	173
Kota	12306	2030831	2591148	165	211
Jhalawar	6219	956971	1180342	154	190
Dhaulpur	3034	749479	982815	247	324

Ganganagar includes Hanumangarh.

Udaipur includes Rajsamand.

Jaipur includes Dausa.

Kota includes Baran.

Sawai Madhopur includes Karauli.

2.12: CONCLUSION

Thus, we see that, the natural elements contributes to great inter –regional diversity in the state of Rajasthan and this also finds expression in the regional contrasts and variations in human components as well. This diversity in both natural and human elements together gets reflected in the spatial pattern, growth and characteristics of human settlements, as a whole across the state and thus urban settlements might be no exception to it.

REFERENCES

1. **Bhalla, L.R.** (1996), "*Geography of Rajasthan*", Kuldeep Publications, Ajmer.
2. **Misra, V.C.** (1968), "*The Marusthali*" in R.L.Singh (ed.), *India Regional Studies*, New Delhi, 21st I.G.U Publication.
3. **Chatterjee, S.P.** (1965), "*Physiography*", in the *Gazetteer of India*, Ministry of Information and Broadcasting.
4. **Heron, A.M.** (1938), "*The Physiography of Rajputana*", Proceedings of the 25th Science Congress, Calcutta.
5. *ibid.*
6. (1876), "*Statistical, Descriptive and Historical Account of U.P*", Vol.9.
7. **Spate, O.H.K. and T.A.Learmouth** (1967), "*India and Pakistan*".
8. **Raheja, P.C. and A.K. Sen** (1964), "*Resources in Perspective: Developments in Rajasthan*", Souvenir, Govt. of India, Jodhpur.
9. (1991), "*Statistical Abstract of Rajasthan*", Directorate of Economics and Statistics, Jaipur.
10. *ibid.*
11. **Census of India** (2001), "*Provisional Population Tables*", Paper 2, Series-9, Ministry of Home Affairs, India.
12. (1986), "*Land and People*" in *State Gazetteer of Rajasthan*, Vol.1., Jaipur.

CHAPTER 3: SPATIAL PATTERN OF URBAN SETTLEMENTS

3.1: INTRODUCTION

The concept of 'space' is a central theme in any geographical study, as it is this concept, which adds a geographical tinge to any discourse. Therefore, for a geographer, the spatial pattern of any phenomenon, urban settlement in this case, becomes a vital issue especially so in an area like Rajasthan which presents so much of diversity, as we have come to know from our earlier discussions in the previous chapter. Hence, an attempt will be made in this chapter to highlight on the spatial pattern of urban settlements in Rajasthan.

3.2: DEMARCATION OF GEOGRAPHICAL REGIONS

If we view space from a broader perspective and consider it to be an amalgam of several individual units, then each individual unit may be considered to be unique in itself and varying from each other. At the same time however, there might exist some degree of likeness among some of them, which if we aggregate leads to the formation of spatial units at a macro –level, that may be termed as a region. Thus, a region may be considered as an aggregation of several micro –level spatial units having some degree of homogeneity either in their natural landscape, say, topography, climate, soil etc, or in their cultural landscape like population, economic structure, social structure etc. Again, variation being integrally associated with the concept of space, one region differs from the other.

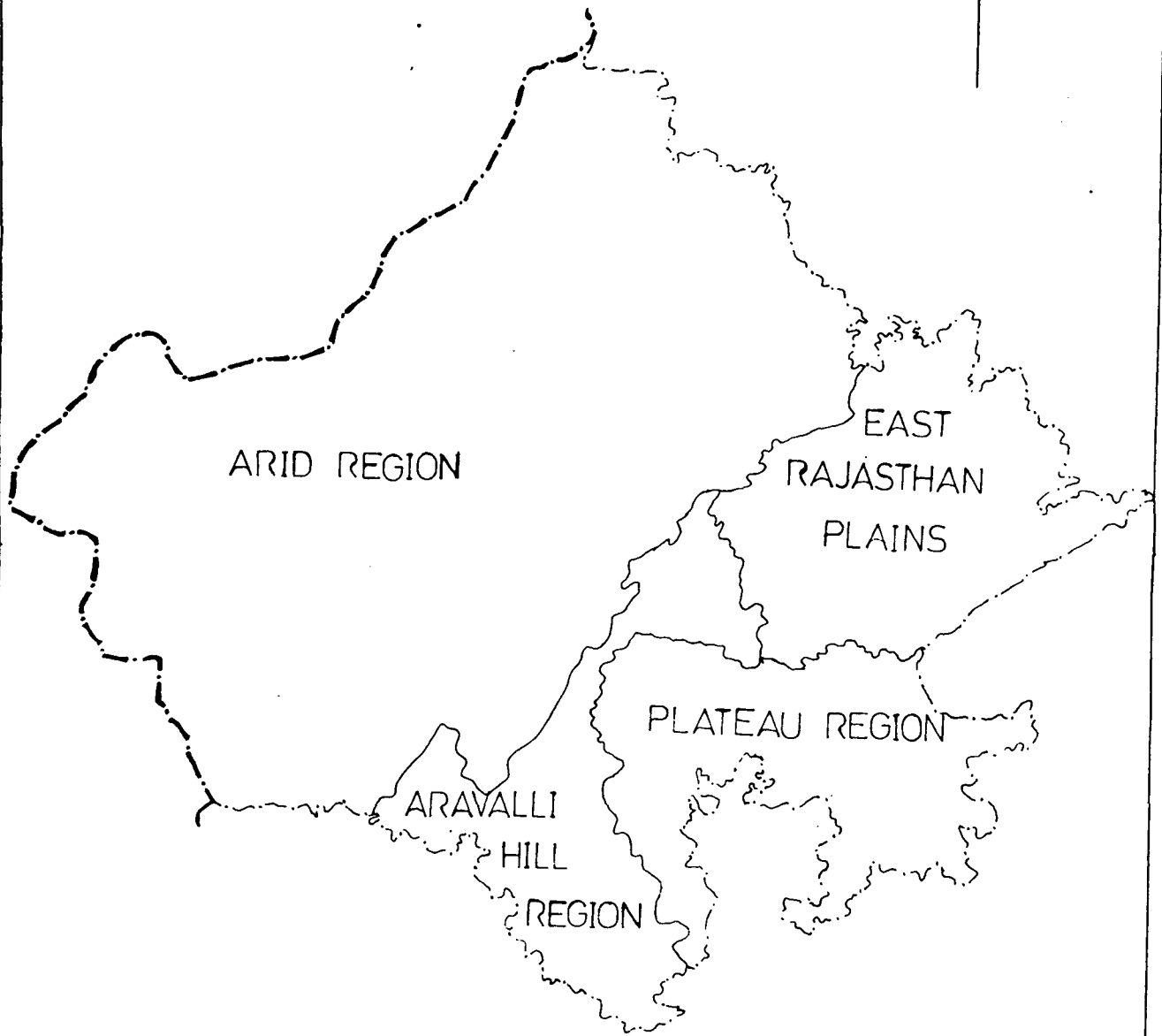
In the demarcation of geographical regions we shall consider both the natural and the cultural elements. Hence, the demarcation of geographical regions may be based on certain similarities in physical landscape, economic parameters or any other cultural

RAJASTHAN

DEMARCATON OF GEOGRAPHICAL REGIONS

0 160KM

N



— · — · — · — INTERNATIONAL BOUNDARY

- · - · - · - · STATE BOUNDARY

— REGIONAL BOUNDARY

Fig 3.1

element. The demarcation of geographical regions in Rajasthan, which has been attempted here, thus, has been done taking into consideration all the factors that we have discussed under the heading of 'Geographical Background'. At the same time, for the purpose of easiness of our study and computation work, an effort has also been made to conform to the administrative boundaries.

Four geographical regions have been carved out in the state of Rajasthan, namely,

I. THE ARID REGION.

II. THE EAST RAJASTHAN PLAINS.

III. THE PLATEAU REGION.

IV. THE ARAVALLI HILL REGION.

THE ARID REGION includes the districts of Barmer, Bikaner, Churu, Ganganagar (including Hanumangarh), Jodhpur, Jalore, Jaisalmer, Jhunjhunu, Pali, Nagaur and Sikar.

THE EAST RAJASTHAN PLAINS including Alwar, Bharatpur, Dhaulpur, Jaipur (including Dausa), Sawai Madhopur and Tonk districts.

THE PLATEAU REGION comprising of the districts of Bundi, Bhilwara, Jhalawar and Kota.

THE ARAVALLI HILL REGION comprising of the districts of Ajmer, Banswara, Chittaurgarh, Dungarpur, Sirohi and Udaipur (including Rajsamand).

Our study of spatial pattern of urban settlements would be based on these geographical regions trying to probe into as to whether there exists any variation across these spatial units. Further, not only in case of spatial pattern, but much of our study would be based on these geographical regions, to portray the spatial variations in a better way in a state so full of diversity.

3.3: EVOLUTION OF URBAN SETTLEMENTS IN RAJASTHAN

With urbanization being considered as a process of transformation from ruralism to urbanism, the evolution of urban settlements in any region becomes an important aspect of study as it might have a significant bearing on spatial pattern as well.

Temporally, if we analyse the evolution of urban settlements, urbanization was practically negligible in the initial decades of feudal rule. The erstwhile Rajputana was comprised of 18 princely states, two chiefships and the British districts of Ajmer and Merwara. Diverse geographical features, historical antecedents and complexities of ethnic descendants of Jats, Gujjars, Meenas, Rajputs, Bhils etc and the frequent conflict arising between the clan rulers, and diverse socio –economic, cultural and traditional background had lasting impacts upon the character of the original settlements. Scarcity of water, uncertainty of rainfall, frequent droughts etc with their consequent adverse effect on the economy greatly hindered the process of urbanisation. However, archaeological studies do find evidences of many flourishing urban centers like Ahar (Udaipur), Kali Banga and Pili Banga (Sri Ganganagar), Naliasar (Sambhar) etc in the historical past.

During the Mughal period, the condition remained almost stagnant as before. But nonetheless, there have been some urban centers, which dates long time back.

The state of Bikaner had several urban centers in 1814. Rajgarh (now in Churu district) was a great market center of this state and also a junction of the caravans. Abhore, Nagaur, Kaliasar, Kalibung were other important towns.

In the Marwar region, Jodhpur, Pali, Godwar, Jalore, Sanchore, Phalodi and Pokharan were the important towns of this area. Most of these were centers of trade and commerce.

Every erstwhile Rajputana state had some political, commercial and trade route centers in the past, like Bhilwara in Mewar, Churu in Bikaner, Malpura in Amber, Jhalrapatan in Kota and Pali in Marwar.

Looking into the north –western part of the state, the old bed of Ghaggar influenced the location of old fort towns of Anupgarh, Suratgarh and Hanumangarh, while in many other places salt marshes and lakes influenced the growth of towns like

Sambhar, Deedwana etc. The security, segregation as well as cultural and spiritual attachments of the Rajputs rulers also gave birth to cities like Jaipur, Jodhpur, Udaipur etc.

Thus, we see that urban settlements were limited to certain favourable pockets.

After the arrival of the railways in the last quarter of the 19th century, though a new wave of urbanization was set in due to associated increased volume of trade and commerce, with towns appearing along the railways like Phulera, Bandikui, Ratangarh etc, it was only in the post –independent period that the process got a real start receiving impetus from the expansion of administrative needs, industrial and commercial activities and development of communication. Moreover, initially with little scope for agricultural development due to vast expanse of infertile desert soil, scarcity of water, for irrigation, people even found it difficult to provide themselves with food and water, the basic sustenance of life. So, obviously this could not provide a background for trade and commerce to develop. But, after Independence, there was development of several irrigation projects followed by a rapid spurt in agricultural production, the state witnessing great prosperity. So people could now divert themselves to the development of other sectors as well, and thus, there was a consequent growth of urban settlements.

3.4: SPATIAL PATTERN OF URBAN SETTLEMENTS

Geography is often defined as the study of ‘spatial organization expressed as patterns and processes’, concerning essentially ‘man –environment relationship and emerging cultural landscape’. ‘The conceptual framework of areal association is intimately linked with pattern analysis’, the concept of pattern being borrowed from Plant Ecology. Thus, the aspect of spatial pattern becomes very important when approaching any study as a geographer.

A “*descriptive or qualitative approach*” may be undertaken on the basis of our understanding of the geographical background of the area. Each of the regions may be considered separately and the spatial pattern of urban settlements in each region be

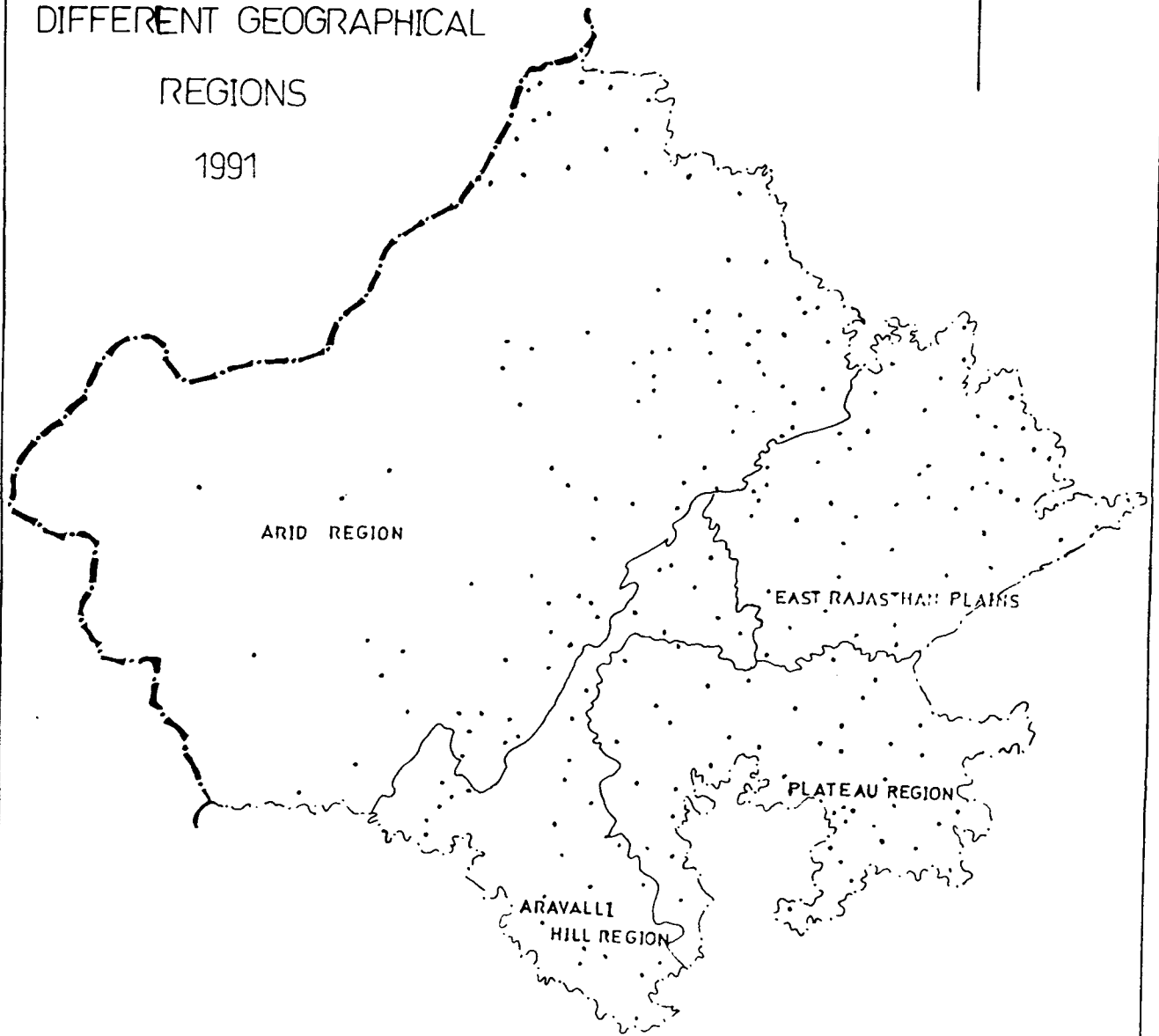
RAJASTHAN

DISTRIBUTION OF URBAN CENTRES IN
DIFFERENT GEOGRAPHICAL
REGIONS

1991

0 160KM

N



--- INTERNATIONAL BOUNDARY

- - - STATE BOUNDARY

— REGIONAL BOUNDARY

Fig 3.2

discussed. But before that, it is essential to have a knowledge of the theoretical spatial patterns, there existing three basic spatial patterns of settlements in theory---

- i. uniform spatial pattern;
- ii. random spatial pattern; and,
- iii. clustered spatial pattern.

3.4.1: THEORETICAL SPATIAL PATTERNS

As mentioned earlier, there are three basic spatial patterns of settlements.

In a **uniform spatial pattern**, the settlements are spaced regularly at equal intervals apart, with the distance between the settlement and its nearest neighbour being exactly the same for all the settlements. However, such pattern rarely exists in reality. Moreover, the settlements are all located along straight lines forming geometrical shapes like square, rectangle, parallelogram etc.

A **random spatial pattern** is just the reverse pattern of the uniform spatial pattern depicting a situation of entropy, a state of total disorganization. However, it is this spatial pattern, which is frequently met with in the real world. In this pattern, the settlements follow no order but are randomly distributed over space.

A third theoretical spatial pattern of settlement is the **clustered spatial pattern** representing an intermediate stage between the earlier two settlement patterns and a state of equilibrium in the settlement system. In this, some settlements are located close to each other while others may be located far apart.

A **pseudo –clustered pattern** of settlements may be found when a large part of the area is negative, such as, swamps, hilly areas with steep slopes, or areas covered with water bodies etc.

Let us now describe the spatial pattern of the urban settlements in the different geographical regions in the context of the above theoretical patterns with the aid of Map 3.2 showing the urban centers in Rajasthan, and analyse the factors underlying such pattern.

The Arid Region

This region perhaps presents the most hostile of the situations and hence, the urban settlements here may be said to follow a random pattern, developing wherever favourable pockets are available. Though the region contains the maximum number of urban settlements (90 out of 222 in 1991 and 88 out of 222 in 2001) and maximum percentage of urban population therefore, (41.14% in 1991 and 42.92% in 2001), at the same time, it also covers the largest portion of the total area of the state (61% conforming to the administrative divisions).

With the desert forming a dominant part of the landscape in this region, the urban settlements hardly follow any specific pattern. Whatever urban settlements are found, most of them are situated on the eastern side of the region, more in vicinity of the plains where the situations are comparatively less hostile. The typical true desert districts like Jaisalmer, Barmer, Bikaner, and Jalore hardly have any urban settlements and whatever urban settlements are found, they seem to be highly dispersed in this part of the region. The towns which have developed here are mostly either the district headquarters themselves or owe their origin to historical past for being centers of trade and commerce since then. Or else, the highly arid condition with great scarcity of water, with no river of significance excepting the Luni disappearing in the sands of the deserts and average annual rainfall being extremely low ranging between 10cm-20cm, great extremes of temperature, the highly infertile dunal and interdunal soils or the brown sandy soils supporting only grasses or only rain-fed crops like bajra, guar, moth and moong, sparse vegetation with mostly thorn cover presents the most adverse situations for human settlement as a whole. Moreover, the dearth of any significant mineral wealth in this region can never support industrial development. Both agricultural and industrial development being almost impossible, the development of urban settlements thus becomes out of question.

Bikaner however, being a big princely state in the erstwhile Rajputana, has been a seat of trade and commerce since then. Moreover with the coming up of the Indira

Gandhi Canal Project, much of the water requirement of the district has been met now promoting agriculture in the area and the Project still to be completed also provides employment to several people in the region. Thus Bikaner has developed into a big urban unit inspite of its deserted location. Pokharan in Jaisalmer has also been a center of trade and commerce from the past and thus has developed as an urban center.

Prominent urban settlements may be found in the districts of Jodhpur and Ganganagar. The factors attributable to may be discussed as—Jodhpur had also been an important urban center since the past with the city of Jodhpur being an important economic and political center in the entire Marwar region. Moreover at present times also, though mainly small –scale, the district of Jodhpur accounts fore considerable number of industries. Industries being a major pull factor for urban growth and urbanization, thus, Jodhpur has led to the development of several urban centers around as well as even in the adjoining district of Pali. So far as Ganganagar is concerned, drained by the mighty Ghaggar, the Bhakra Canal Project provides ample water to the region turning it into ‘green ghettos’. Sufficient irrigation water and the fertile floodplain soils have led to a flourishing agriculture in the region. This provides the base for the development of several agro –based industries based on mustard, sugarcane etc being grown here thereby promoting the growth of urban settlements in the area.

In other districts, fair number of urban centers have developed either as mining towns like Khetri in Jhunjhunu, Makrana and Degana in Nagaur etc or around salt lakes like Deedwana, promoting mining or salt production industries to attract urban settlements around. Several small urban centers have just developed around the big urban centers.

But as a whole, the urban settlements in this arid but plain region do not follow any pattern and may be said to be randomly located at any kind of favourable site available, with a tendency towards dispersion in the extreme west and a tendency towards uniformity in the eastern part.

The East Rajasthan Plains

In contrast to the Arid Region, the East Rajasthan Plains offers the most favourable of the situations for human settlement in the state. This plain land in the north-eastern part of the state, occupying 14.10% of the total land area of Rajasthan, also contains considerable number of urban settlements within its small area (54 as per 1991 Census and 51 as per 2001 Census).

Having a plain level surface, drained by several rivers like the mighty Chambal, Banas, Banganga and Gambhiri, and a favourable climate with fair amount of rainfall (average annual rainfall ranging between 40cm-80cm) as well as the productive alluvial soil provides the most suitable conditions for agricultural development. Agriculture is the most flourishing in this part of the state with a variety of food crops like rice, gram, barley, jowar and wheat as well non-food crops like groundnut, linseed, cotton and sugarcane being produced. This has also provided the basis for the development of different agro-based industries, after the food requirements of the people being met in a sufficient way. Besides, the presence of a huge mineral wealth of both metallic minerals like copper, iron etc, and non-metallic ones like silica sand, quartz, mica etc have also led to the development of several industries in the region. At the same time, this region being more in vicinity of the main heartland of the Northern Plains has been an area of regular interaction of the people. Plus industrial development being a key factor of urbanization, many urban units has developed within this small area.

A great seat of polity, trade and commerce since historical past, and the capital city of present times, also gaining the status of the only million plus city in the entire state of Rajasthan, is Jaipur. The influence of this city may be considered to generate a kind of growth impulse leading to a somewhat sprawling of so many urban units at short intervals around it. Jaipur is the industrial hub of the state with a variety of industrial units. There are also engineering industries, woolen textile industries found in Bharatpur, Sawai Madhopur and Tonk. This region contains many places of tourist interest as well, and hence tourism industry is equally flourishing.

The entire region being favourable for the development of urban settlements, the urban units that have developed here seems to have developed in a uniform fashion.

The Plateau Region

This region covering 13.3% of the total area of the state contained 44 urban units in 1991, which slightly increased to 48 in 2001. In this region too, we may say that urban settlements have developed almost uniformly over the entire area. A flat, tableland region receiving high amounts of rainfall (average annual rainfall exceeding 50cm even reaching 150cm in some parts), provides more or less suitable natural conditions for human settlements to grow all over. Moreover, the region is covered with the productive black soils and drained by the Chambal and Banas in certain parts. Thus the scope for agricultural development is very much there.

What has favoured the growth of urban settlements in the region is the presence of the Chambal Project using the power of which, Kota has emerged as the major industrial center of the area. Kota may also said to be generating growth impulses and thus many urban units have developed around Kota. Bhilwara and Chittaurgarh are other important urban centers of the region, which have been important since long time back as seats of trade and commerce.

Therefore, the pattern of urban settlements in this region too has an inclination towards uniformity with urban units sprouting up at regular intervals based on big urban centers.

The Aravalli Hill Region

The Aravalli Hill Region covers the smallest portion of 10.13% of the total area of Rajasthan, containing only 34 urban units as was in 1991 and 35 in 2001. Much of this region being hilly presents negative areas for human settlements and thus, settlements and population can be found in certain favoured pockets only. So urban settlements, which may be considered as an indicator of development, are very few in number and

seems to follow a clustered pattern in the favoured pockets. There exist differences between the northern and southern parts of the region, with the Aravallis being loftier in the south than in the north. The hilly, rugged terrain, large forested tracts mostly inhabited by the tribal population in the southern part of the Aravallis thus, hardly provide space for the development of urban settlements inspite of the presence of ample mineral wealth. On the contrary, the comparatively level land in the northern part has led to the growth of few urban units due to their locational advantages.

Ajmer due to its location along the main Delhi –Ahmedabad railway line, several industries have developed there along with Beawar considered to be its twin counterpart from industrial point of view. Kishangarh is another industrial center. Thus most of the urban settlements are concentrated in this part of the region. In the southern part only Udaipur in an urban settlement of prominence, this being an urban center since historical times as a political and commercial center.

Therefore, in this region of Rajasthan, there seems to exist more or less a clustered pattern of urban settlements, clustering in the favourable pockets found.

After having undertaken a descriptive or qualitative approach for the spatial patterns of urban settlements in the different geographical regions of Rajasthan, a “*quantitative approach*” may also be undertaken for the study of the same.

The **Nearest Neighbour Analysis** may considered to be the most appropriate quantitative technique for identifying the spatial patterns of settlements.

3.4.2: THE NEAREST NEIGHBOUR TECHNIQUE

In this a Nearest Neighbour Index is used, which was originally devised by plant ecologists Clark and Evans, while much of the pioneering work in using this concept in the study of settlement geography was made by King and Dacey

In this method, a number of settlements of a given hierarchical level are taken into consideration and for each settlement; their nearest neighbour is found out, using a map

as a base. Generally, topographical sheets showing settlement units are used, but this study dealing only with urban settlements, hence, a map showing only the urban centers of Rajasthan has been used to find the expected mean nearest neighbour distance (D_r) of all the urban settlements in the different geographical regions as well depending on the scale used (1:50,00,000 in this case), the actual mean nearest neighbour distance of all the urban settlements (D_o).

D_r may be worked out using the formula:

$D_r = 0.5 / D$, where, $D = N/A$ or density of settlements in a given area, N being the total number of settlements in the area and A the area of the place.

The Nearest Neighbour Index or R is the ratio of D_o to D_r , i.e.

$$R = D_o / D_r$$

The value of R ranges from 0 indicating maximum aggregation of all settlements at one particular location, through 1 representing random distribution to 2.15 suggesting a uniform or an even pattern.

The standard error of D_r or expected mean distance may be found out as:

$$S.E (D_r) = 0.26126 / (N / A)$$

If the value of R ranges between 0 and 1, then the pattern may be said to be approaching clustered pattern while if it ranges between 1 and 2.15, then the pattern may be said to be approaching uniform pattern, provided that D_r and D_o are significantly different, or else, the pattern may be considered to be random.

The standard normal variate (the limit of which at 1% and 5% levels of significance are 2.58 and 1.96 respectively) Z is used to test the significance of the difference between D_r and D_o where,

$$Z = (D_o - D_r) / S.E (D_r)$$

It should be noted that though no point outside the boundary of the given area is taken into account but, if it forms the nearest neighbour of any settlement, the distance should be included in the computation. Moreover, if the two settlements are the nearest neighbour of each other, the same distance should be measured twice.

Let us now try to find out the Nearest Neighbour Index for each of the four geographical regions to support the description with some quantitative basis.

The Arid Region

The nearest neighbour statistics of the 88 towns (2 other towns each being considered as parts of other towns forming an urban agglomeration) of this region represents a **R value of 0.93** suggesting approaching clustering.

Actual Mean Nearest Neighbour Distance (D_o)= 22.64kms.

Expected Mean Nearest Neighbour Distance (D_r)= 24.34kms.

Standard Error of D_r value= 1.356, and the

Value of Z is not significant even at 5% level of significance, rather it being negative, -1.254.

Hence the pattern in this region may be considered to be **random**.

The East Rajasthan Plains

The nearest neighbour statistics of 51 towns (3 other towns each being considered as parts of other towns forming an urban agglomeration) of this region represents a **R value of 1.279**, suggesting approaching uniform pattern.

Actual Mean Nearest Neighbour Distance (D_o)= 19.68kms.

Expected Mean Nearest Neighbour Distance (D_r)= 15.38kms.

Standard Error of D_r value= 1.125, and the value of Z (3.82) is significant at 1% level of significance.

Thus, the pattern in this region may be considered to be truly **approaching uniform pattern.**

The Plateau Region

The nearest neighbour statistics of 43 towns of this region represents a **R value of 1.271**, indicating approaching uniform pattern.

Actual Mean Nearest Neighbour Distance (D_o)= 20.67kms.

Expected Mean Nearest Neighbour Distance (D_r)= 16.26kms.

Standard Error of D_r value= 1.271, and the value of Z (3.402) is significant at 1% level of significance.

Therefore, in this region also the pattern of urban settlements may be said to be **approaching uniform pattern.**

The Aravalli Hill Region

A large part of this area being negative or hilly, the nearest neighbour technique does not hold good in this region and so, relying only on the descriptive approach, we can assume this region have urban settlements **clustered** only in the favourable sites.

3.5: CONCLUSION

Rajasthan being a land of diversity, this diversity is highly reflected in its spatial patterns in the different geographical regions carved out in the state thus, presenting a variety of spatial pattern of urban settlements, containing an amalgam of all the three

patterns found in theory, i.e. uniform, random and clustered in its different regions with a random pattern in the Arid Region, approaching uniform in the most habitable and suitable for the development of urban settlements, East Rajasthan Plains and the Plateau Region and a clustered pattern in the Aravalli Hill Region; any particular pattern being a product of the combination of both local natural and cultural factors.

Interestingly, the theoretical spatial patterns which when tried to be proved quantitatively, also matched well that which emerged after a descriptive study of the same was undertaken.

REFERENCES

1. **Bhalla, L.R.** (1996), "*Geography of Rajasthan*", Kuldeep Publications, Ajmer.
2. **Clark, P.J and F.C. Evans** (1954), "*Distance to Nearest Neighbour as a Measure of Spatial Relations*", Ecology, Vol.35.
3. **Dacey, M.F.** (1960), "*A Note on the Derivation of the Nearest Neighbour Distances*", Journal of Regional Science Association, Vol.2.
4. **Dacey, M.F** (1962), "*Analysis of Central Place and Point Patterns by a Nearest Neighbour Methods*", Land Studies in Geography, Series B, Vol.24.
5. **Dacey, M.F** (1963), "*Other Nearest Neighbour Statistics for a Class of Random Patterns in Multi-Dimensional Space*", Annals of Association of American Geographers, Vol.53.
6. **Gananathan, V.S** (1952), "*Distribution of Urban Settlements in India*", Proceedings of the 17th International Geographical Congress, Washington.
7. **King, L.J** (1962), "*A Quantitative Expression of the Pattern of Urban Settlements in Selected Areas of U.S.*", Tijdschrift voor Economische en Sociale Geographie, Vol.53.
8. **Lall, A and R.Tirtha** (1971), "*Spatial Analysis of Urbanisation in India*", Tijdschrift voor Economische en Sociale Geographie, Vol.62.
9. **Mazumdar, P** (1998), "*Trends in Urbanisation and Urban Growth in Haryana: 1901-1991*", Geographical Review of India, Vol.60(1).
10. **Rao, R.R.M** (1981), "*Growth of Cities—A Case Study of Warangal*", Inter India Publications.

CHAPTER 4: GROWTH OF URBAN SETTLEMENTS IN RAJASTHAN

4.1: INTRODUCTION

For geographers, the concept of space is of fundamental importance. But another concept, which is integrally related with space, is the concept of time. Hence, while we have talked of spatial patterns, --how they have evolved, then with it the time factor also becomes significant as a particular spatial pattern develops over time. Thus, we should always keep in mind of a '*space-time framework*'; time being expressed here in terms of 'growth', which may be either positive or negative. Therefore, in this chapter we shall discuss the growth of urban settlements over time in Rajasthan, i.e. in our chosen time period, from 1961 to 2001.

4.2: FACTORS PROMOTING GROWTH OF URBAN SETTLEMENTS

Since the word urbanization is rooted in the term 'urban', so the factors promoting urbanization may be treated as much the same to factors promoting the growth of urban settlements. The factors leading to growth of urban settlements have changed from time to time. In ancient times, urban centers grew due to surplus agricultural production and the concentration of political power and organized commerce. Manufacturing and technology are the new forces of industrial age. Today there are many factors. But overall, the growth of urban settlements may be said to be a function of socio-economic changes taking place through time. Growth being viewed as a process, therefore, the growth of urban settlements may also said to be a product of a number of factors which may be enumerated as below:

Political-Administrative Factors

This factor plays a role in the growth of urban settlements in the sense that, with an area being divided on administrative/political grounds, new administrative headquarters and the related paraphernalia inevitably emerges and in due course of time, these start performing atleast some of the urban functions and eventually grows into a town or a city. In fact, the politico-administrative factor often acts as an initial stimulus for urban growth, later on taken over by and further advanced by the growth of commercial and industrial activities. Even in the past, this factor has really played an important role behind the growth of urban settlements, these being seats of concentration of political power.

Economic Factors

In ancient times, an urban place was viewed as an economic parasite thriving on the agricultural surplus produced in the hinterland. This view, perhaps, had some value in those times when cities emerged predominantly from peasant societies, but no longer holds good in the post-industrial revolution period. At present, the urban place is a focal point of a variety of economic activities and it grows on the strength of the economic activities existing within it. Hence, so far as the economic factor of urban growth is concerned, the type of economy, the degree of commercialization of agriculture, the extent of diversification of the economy, the stage of economic advancement, the development of the means of transport and communication etc, are the ones that stimulate the growth of urban settlements. Then economic processes generate goods and services, which provides employment and sustains the urban area and promotes further growth of population. A process of cumulative causation sets in and the urban area grows with time.

Demographic Factors

An urban place grows in size with the growth of its population which is partly a function of natural increase in population i.e. differences between birth rates and death rates in the place, and, partly a result of migration which is a basic process behind urban growth. Urban areas not having the same population, size of population becomes an important factor for it determines the class of an urban center, and thus demographic factors contributing to a particular population size is of great significance. Again, migration in this is essentially a geographical process involving movement of people from one place to another wherein the concept of space comes in. Two major types of spatial movement may be considered relevant in this context---a) movement of people from rural areas to urban areas and b) movement of people from small towns to larger towns thereby further increasing the size of larger towns.

Social Factor

Towns and cities are social artifacts. With the mobility of people and the flow of information through mass media, the rural as well as the urban society gets transformed. Growth of urban settlements being treated as a function of social factors as well, the desire for improving the living standards, the appreciation for the benefits of urban living, and obviously the role of

Trends in Growth of Urban Settlements in Rajasthan(1961-2001)

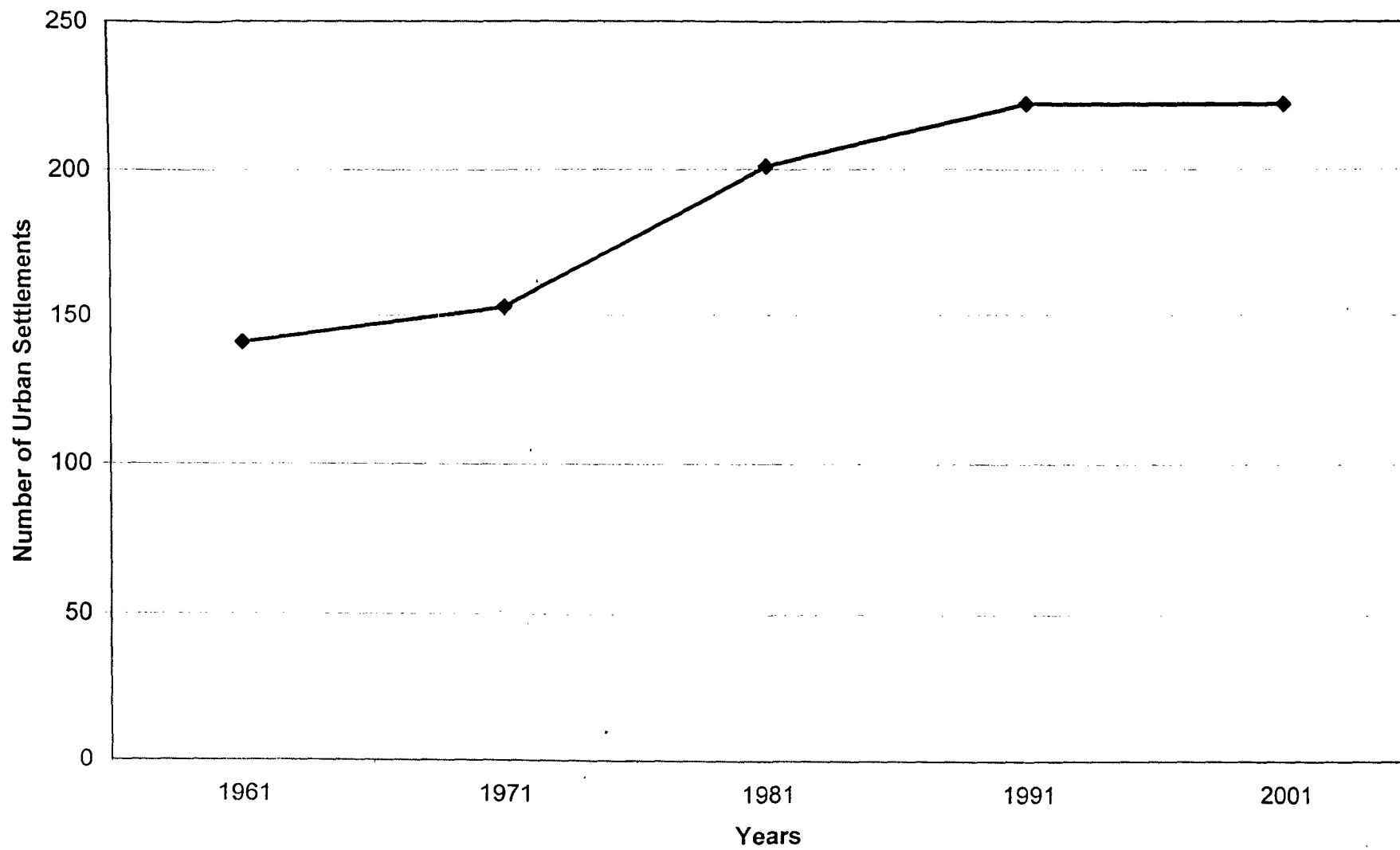


Fig 4.1

education in creating awareness among the people are definitely some of the social factors contributing to the growth of urban areas.

4.3: GROWTH OF URBAN SETTLEMENTS IN RAJASTHAN (1961-2001)

Having discussed the factors promoting the growth of urban settlements, let us now try to look into the growth of urban settlements in Rajasthan from the time period of 1961 (the first census year after the state came into existence in 1956) till 2001. The following table provides information regarding trends in the growth of urban settlements in the state

TABLE 4.1: TRENDS IN GROWTH OF URBAN SETTLEMENTS IN RAJASTHAN (1961-2001)¹

Census Year	Number of Urban Settlements	Percentage Decennial Growth rate
1961	141	
1971	153	+8.51
1981	201	+31.37
1991	222	+10.45
2001	222	+0.00

From the above table, it is evident that since 1961, the number of urban settlements had been growing in Rajasthan. Though it registered a slow growth in the initial decade, it received a great spurt in between 1971-81 attaining a maximum growth rate of 31.37%; then it again subsided in the next decade and surprisingly in between 1991-2001, the state registered no growth in the number of urban settlements with the growth rate being 0%.

Keeping in mind that growth of urban settlements is a product of socio-economic factors, let us now try to analyse the growth of urban settlements in Rajasthan in light of some of the contributing factors being selected from the different factors discussed above.

Industrial development being considered as one of the greatest factors behind urban growth with industrialization and urbanization treated as analogous, therefore, the number of industrial areas in Rajasthan may be chosen amongst economic factors, the growth of urban population amongst demographic factors and the rate of overall literacy in the state considering it as a medium of mass awakening towards urban way of living and correlation between each of these and the number of urban settlements may be worked out taking the same time frame.

Starting with economic factors considered to be the most important impetus behind the growth of urban settlements, table 4.2 gives the number of industrial areas in the state from 1961 till 2001.

TABLE 4.2: NUMBER OF INDUSTRIAL AREAS IN RAJASTHAN (1961-2001)²

Year	Number of Industrial Areas
1961	30
1971	54
1981	103
1991	225
2001	272

From the above table, we may say that there has been an increase in the number of industrial areas in the state over time especially in between 1971-81 and 1981-91, an increase of 49 and 122 units respectively. In the initial decade there was an increase of only 24 units and again after 1991 the increment came down to 47 units. Now taking the number of industrial areas as the independent or X-variable and the number of urban settlements as the dependent or Y-variable, the correlation between the two was worked out and the correlation

coefficient was found out to be +0.92(see Appendix IV-I) significant at 5% level of significance. This suggests that there is a highly positive and significant relationship between the two variables in Rajasthan. Thus the role of economic factor behind the growth of urban settlements proves to be true in case of Rajasthan too.

Next, we test the role of demographic factors finding its expression here through the percentage of urban population. Table 4.3 gives the percentage of urban population in Rajasthan in the specified time period.

TABLE 4.3: PERCENTAGE OF URBAN POPULATION IN RAJASTHAN (1961-2001)³

Census Year	Percentage of Urban Population
1961	16.28
1971	17.63
1981	21.05
1991	22.88
2001	23.38

The above table shows that over the specified time period the percentage of urban population has shown an upward trend to match with the similar trend in the number of urban settlements. The increase in the percentage of urban population has been maximum again in the time period of 1971-81, an increase of 3.42 units. In the beginning i.e. from 1961-71, the increase was low, of only 1.35 units; then it attained a peak in between 1971-81 and thence, again the increment in the percentage of urban population slowed down between 1981-91 and further between 1991-2001. In this case, the percentage of urban population was considered as the X-variable and the number of urban settlements as the Y-variable and correlation was run between the two. The correlation coefficient of the two variables came out to be +0.99(see Appendix IV-II) significant at 1% level of significance, which proves of a highly positive and significant relationship between the chosen variables. This is true because, as the urban population grows so does any urban settlement and gradually the growing population may shift to some other place coming within the sphere of influence or the surrounding hinterland of the settlement and eventually that place grows into some other urban unit with urban facilities being transferred there from the former and the process continues. Hence, the role of demographic factors has proved to be equally crucial in affecting the growth of the number of urban settlements in Rajasthan.

Since it is quantitatively not possible to illustrate the politico-administrative factors, lastly we have the social factors left to be represented through the percentage of literates in the state. Overall literacy may be taken into account because literacy and education considered to cause awakening among the masses and raise an appreciation for urban way of urban of living should be spread throughout any area. Table 4.4 gives the literacy rates in the state from 1961 to 2001.

TABLE 4.4: LITERACY RATES IN RAJASTHAN (1961-2001)⁴

Census Year	Literacy Rates
1961	15.21
1971	19.07
1981	24.38
1991	30.79
2001	49.73

The above table shows that literacy rates too, in Rajasthan, over the specified time period has increased. It registered a slow increase initially with literacy rates increasing to only 19.07% from 15.21%, an increase of only 3.86 units; then it further increased to 24.38% in 1981, that is by 5.31 units and thence by 6.41 units between 1981-91. The maximum increase by 18.94 units was registered in the last decade. Taking the literacy rates to be the X-variable and the number of urban settlements to be the Y-variable, a correlation was run between the two with the result that correlation coefficient came out to be +0.83 (see Appendix IV-III) but significant at only 10% indicating that though there apparently seems to be a high positive relationship between the two variables much of it may be called a chance factor here.

Having talked of 'space-time framework', thus, with time, the space actor also becomes important and so while we have discussed the growth in the number of urban settlements, one thing that strikes us now is that whether the growth is uniform across space or not. Keeping in mind, the four geographical regions carved out, let us now try to analyse as to whether the growth of urban settlements vary across these regions or not, again in the light of the same factors selected above while discussing the overall growth pattern in the state.

TABLE 4.5: GROWTH OF URBAN SETTLEMENTS IN THE DIFFERENT GEOGRAPHICAL REGIONS OF RAJASTHAN (1961-2001)⁵

Regions	Number of Urban settlements				
	1961	1971	1981	1991	2001
Arid	68	72 (+5.88)	91 (+26.39)	90 (-1.09)	88 (-2.22)
East Rajasthan Plains	32	36 (+12.5)	48 (+33.33)	54 (+12.5)	51 (-5.55)
Plateau	17	21 (+23.53)	36 (+71.42)	44 (+22.22)	40 (-9.09)
Aravalli Hill ²⁴	24	24 (0.00)	26 (+8.33)	34 (+30.77)	43 (+26.47)
Total	141	153	201	222	222

(Figures in the parenthesis shows the growth rate of the number of urban settlements).

The above table suggests that in all the regions there has been a slow growth in the number of urban settlements in the initial decade of 1961-71, then there has been a rapid spurt in between 1971-81 and again a downward trend has been noticed after 1981 till 2001, some regions even registering negative growth rates. The growth rate pattern of urban settlements in different regions, no matter how much they may be different from each other, follows a similar trend as that of the state as a whole.

Over the years, maximum number of urban settlements have been found in the Arid Region followed by the East Rajasthan Plains while the other two regions have been fluctuating amongst themselves with the Aravalli Hill region having greater number of towns in 1961 and 1971 but was superceded by the Plateau Region in 1981 and 1991 and again in 2001 the former accounted for greater number of urban settlements.

Having discussed the growth of urban settlements in light of several factors for Rajasthan as a whole, let us then analyse as to how the already selected factors promoting urban settlements holds good in each of the geographical regions.

Table 4.6 gives the number of industrial areas separately for the different regions.

**TABLE 4.6: NUMBER OF INDUSTRIAL AREAS IN DIFFERENT
GEOGRAPHICAL REGIONS OF RAJASTHAN (1961-2001)⁶**

Regions	Number of Industrial Areas				
	1961	1971	1981	1991	2001
Arid	10	18	42	83	97
East Rajasthan Plains	8	13	26	65	91
Plateau	5	10	20	44	37
Aravalli Hill	7	13	15	33	47
Total	30	54	103	225	272

As is evident from table 4.6, over the years most of the industrial areas have been largely concentrated in the Arid Region, but then it also covers the largest area of the state containing most of the districts. The East Rajasthan Plains are next to follow while again in the other two regions the number of industrial areas have been fluctuating likewise the number of urban settlements. However, a better picture of the relationship of the two i.e. number of urban settlements in each region and the number of industrial areas would emerge if correlation of the two is worked out between the two separately for the different regions again considering the number of industrial areas to be the X-variable and the number of urban settlements to be the Y-variable (see Appendix IV-IVa,b,c and d). The correlation coefficients of the two variables were found to be lowest and the most insignificant in case of the Arid Region and the relationship between the two may just be considered as matter of chance factor as industrial development is really poor in this area; even in East Rajasthan Plains containing Jaipur, the greatest industrial hub of the state the correlation coefficient between the two variables is not that high and that very significant while they were very high in the Plateau Region and especially the highest and the most significant for the Aravalli Hill Region reminding us the importance of the Kota industrial area in the former and Ajmer, Bewar and Kishangarh industrial areas in the latter.

Next we shall evaluate the role of demographic factor i.e. the percentage of urban population and see how it is related to the growth of urban settlements in each region. Table 4.7 shows the percentage of urban population in different regions of Rajasthan.

**TABLE 4.7: PERCENTAGE OF URBAN POPULATION IN DIFFERENT
GEOGRAPHICAL REGIONS OF RAJASTHAN (1961-2001)⁷**

Regions	Percentage of Urban Population				
	1961	1971	1981	1991	2001
Arid	17.76	18.42	21.39	22.29	19.79
East Rajasthan Plains	16.37	18.50	22.55	25.23	27.12
Plateau	24.24	30.63	39.66	22.93	24.13
Aravalli Hill	35.66	35.66	40.12	20.24	19.78

Table 4.7 indicates that the percentage of urban population increased in all regions over the years and then exhibits a decrement except the Eastern Rajasthan Plains and in the Plateau Region, which after showing a downward trend again display an upward trend in 2001. The Plateau and the Aravalli Hill Region accounts for the maximum percentage of urban population amongst all regions. Considering the percentage of urban population as the independent variable and the number of urban settlements as the dependent variable, when the correlation coefficients between the two variables were worked out, what was observed that the East Rajasthan Plains accounts for the highest and significant correlation between the two, the region as it is being comparatively favourable for growth and spread of human settlements, being followed by the Arid Region whereas the Plateau and the Aravalli Hill Region shows a negative relationship. (see Appendix IV- Va, b, c and d).

Having discussed the role of both economic and demographic factors, we are now left with the social factor of literacy, which is enumerated, in the following table.

TABLE 4.8: LITERACY RATES IN DIFFERENT GEOGRAPHICAL REGIONS OF RAJASTHAN (1961-2001)⁸

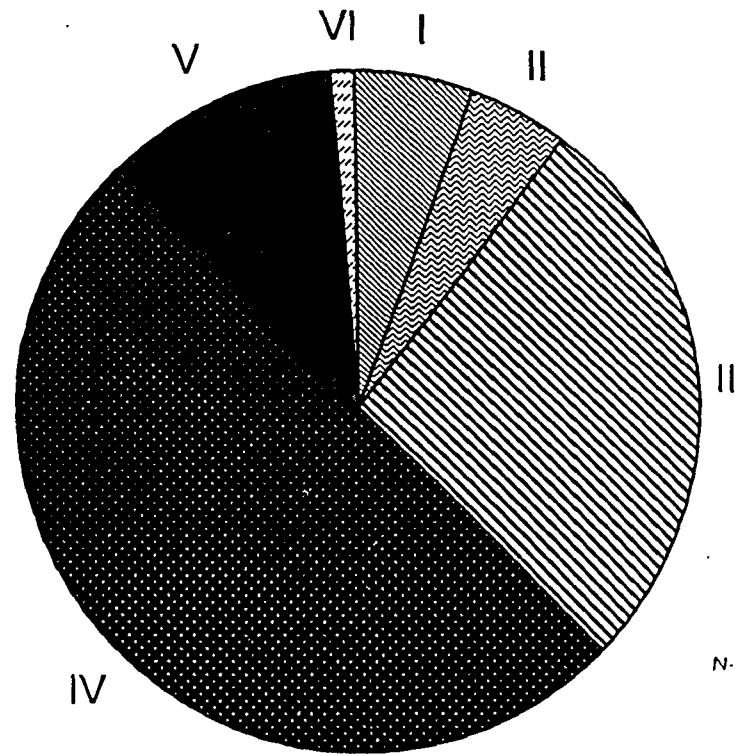
Regions	Literacy Rates				
	1961	1971	1981	1991	2001
Arid	15.21	20.78	22.69	29.37	49.73
East Rajasthan Plains	15.56	20.01	27.17	34.14	52.31
Plateau	13.97	18.87	24.27	30.14	48.61
Aravalli Hill	13.59	16.76	23.89	30.59	45.67

As is evident from table 4.8, the literacy rates have kept on increasing over the years in all the regions, especially so in the east Rajasthan Plains. But when the relationship between the two variables i.e. the number of urban settlements considering it to be the dependent variable and the literacy rates considering it be the independent variable were worked out, in most of the regions the relationship like the state as a whole turned out to be insignificant except the Aravalli Hill Region which shows a highly positive and significant relationship. (see Appendix IV-VI a, b, c and d).

So far we have seen the overall growth of urban settlements in the state of Rajasthan as a whole as well as in its different regional backgrounds. But one thing that needs to be highlighted here is that, urban settlements are not uniform in size, size being coterminus here with population and are greatly varied in this aspect. The Indian Census, provides for six size classes of urban settlements based on their population, namely,

Size Class	Population
I	1,00,000 and above
II	50,000-99,999
III	20,000-49,999
IV	10,000-19,999
V	5,000-9,999
VI	less than 5,000

Number of Urban Settlements in Each Size Class In Rajasthan, 1981



N.B. 1981 has been chosen as the growth of urban centres were maximum in 1971-81.

Fig 4.2

The class I urban centers are referred to as cities. Having now an idea regarding the growth of urban settlements in the state, our aim would now be to see as to what has been the growth of different size classes of urban centers over the years. Table 4.9 gives the number of urban settlements in each class from 1961-2001.

TABLE 4.9: NUMBER OF URBAN SETTLEMENTS IN EACH SIZE CLASS IN RAJASTHAN (1961-2001)⁹

Year	Class						Total
	I	II	III	IV	V	VI	
1961	6	4	23	51	49	8	141
1971	7	7	29	65	41	4	153
1981	11	10	55	101	23	1	201
1991	14	20	74	87	25	2	222
2001	20	26	876	63	22	5	222

From the above table is evident that, over the years, though there has been an increase in all the classes of towns excepting the class VI towns, decreasing in number in 1971 and 1981 and then further increasing, the maximum number of urban settlements mostly belongs to the size classes of III, IV and V specially in the class IV category having a population of 10,000-19,999 till 1991. The reason may be attributed first of all to the demographic scenario of the state largely having unfavourable conditions for human settlements, as it the state as a whole may be said to be sparsely populated. Secondly, the industrial development in the state has been very slow and late with poor development of infrastructural facilities as well and thus, urbanization considered to be going hand-in-hand with industrialization also has been very limited, restricted in few favoured pockets. The people mostly live in rural areas and therefore, big urban centers with great infrastructures and lot many industrial units to attract population towards them have remained few in number over the years. Whatever, urban settlements thus, have developed, cannot support much population and thus, are largely smaller in size belonging either to the III, IV or V category.

Again, if we go down to the regional level, let us try to see what picture emerges there

TABLE 4.10: NUMBER OF URBAN SETTLEMENTS IN EACH CLASS IN DIFFERENT GEOGRAPHICAL REGIONS OF RAJASTHAN (1961-2001)¹⁰

Year	Regions																											
	Arid							East Rajasthan Plains							Plateau							Aravalli Hill						
	I	II	III	IV	V	VI	Tot	I	II	III	IV	V	VI	Tot	I	II	III	IV	V	VI	Tot	I	II	III	IV	V	VI	Tot
1961	2	2	11	28	20	5	68	1	1	7	11	10	2	32	1	0	3	7	6	0	17	2	1	3	7	11	0	24
1971	2	3	15	34	16	2	72	2	2	8	18	5	1	36	1	1	4	8	7	0	21	2	1	4	8	9	0	24
1981	4	7	27	44	9	0	91	3	1	13	26	5	0	48	2	0	7	21	5	1	36	2	2	8	10	4	0	26
1991	4	11	30	39	6	0	90	4	4	19	22	5	0	54	2	3	8	24	6	1	44	3	2	9	11	8	1	34
2001	8	14	39	24	2	1	88	5	7	24	11	4	0	51	2	3	13	14	8	0	40	4	3	12	11	7	3	40

As observable from the above table that, just like the state as a whole, in its different regions as well, the maximum number of urban settlements over the years belong to the classes III, IV and V, again specifically, the class IV category having the maximum number of settlements till 1991. However, from 2001, there has been a shift to class III towns in almost all the regions. This speaks of that, no matter what kind of a region it may be in this land of diversity, favourable or unfavourable for human settlements, the urban settlements in Rajasthan cannot support a large population and this has been proved over the years.

4.4: CONCLUSION

We see that there has been a rise in the number of urban settlements in Rajasthan over our specified time period of 1961-2001 in absolute terms. However, from the percentage increase the trend of increment can be understood well with a slow start in the initial decade, a rapid spurt between 1971-81 and thence, a downward trend has been noticed. The same is true if we go down to the regional level. So far as the factors affecting the growth of urban

settlements are concerned, much of it may be said to be a function of economic and demographic factors reflected through number of industrial areas and percentage of urban population respectively. However, this statement does not necessarily holds good for the different regions where we see that the Arid Region inspite of accounting for the largest number of urban settlements over the years as well as the largest number of industrial areas, does not have any significant relationship between the two; here the space factor comes in, it having the largest area ought to have many settlements while for the Plateau Region and the Aravalli Hill Region accounts for a highly positive and significant relationship between the number of urban settlements and the number of industrial areas. Thus, much of the growth in these two regions may be attributable to industrial development. As far as the demographic factor is concerned, the Arid and the East Rajasthan Plains shows a high positive relationship between the number of urban settlements and the percentage of urban population while for the other two regions the relationship has turned out to be negative between these two variables. The social factor being reflected through literacy rates also shows interesting results with only the Aravalli Hill Region accounting for a highly positive and significant relationship; the other three regions though exhibits a moderately positive relationship but in all cases the relationship is too insignificant.

Thus, we see that, the growth of urban settlements in Rajasthan as a whole, may be largely attributed to economic and demographic factors and for her different regions different factors play their role, but nowhere all the three factors selected holds good together so far as their influence over the growth of urban settlements is concerned.

REFERENCES

1. **Census of India (2001)**, "*Provisional Population Tables*", Paper 2, Series-9, Ministry of Home Affairs, India.
2. **Statistical Abstract of Rajasthan (1962, 1972, 1982, 1992, 2002)**, Directorate of Economics and Statistics, Jaipur.
3. **Census of India**, *op.cit.*
4. **Statistical Abstract of Rajasthan**, *op.cit.*
5. **Census of India (1991)**, "*Town Directory of Rajasthan*", Series-21, Ministry of Home Affairs, India.
6. **Statistical Abstract of Rajasthan**, *op.cit.*
7. **Census of India (1991)**, "*Town Directory of Rajasthan*" *op. cit.*
8. **Statistical Abstract of Rajasthan**, *op.cit.*
9. **Census of India (1991)**, "*Census Volumes on Urban Population*", Ministry of Home Affairs, India.
10. *ibid.*
11. **Aziz, A. (1955)**, "*A Study of Indian Towns*", *Geographer*, Vol.7(1), Summer.
12. **Bose, Ashish (1980)**, "*India's Urbanisation:1901-2001*", Tata Mc Graw Hill, New Delhi.
13. **Davis, Kingsley (1962)**, "*Urbanisation in India:Past and Future*", Roy Turner(ed.), India's Urban Future, Berkeley University of California Press.
14. **Ghosh, Sumita (1998)**, "*Introduction to Settlement Geography*", Orient Longman Ltd., Calcutta.
15. **Misra, A.B. (1956)**, "*Some Trends in Urbanisation in India*", Paper Submitted to the 39th Conference of the Indian Economic Association, Cuttack, Indian Economic Journal Conference
16. **Ramachandran, R (1989)**, "*Urbanisation and Urban Systems in India*", OUP, New Delhi.
17. **Sovani, N.V. (1966)**, "*Urbanisation and Urban India*", Asia Publishing House, Bombay.
18. **Tripathi, R.M. (1999)**, "*Urbanisation and Urban Hierarchy in U.P.*", *Geographical Review of India*, September.

CHAPTER 5: CHARACTERISTICS AND CLASSIFICATION OF URBAN SETTLEMENTS IN RAJASTHAN

5.1: INTRODUCTION

In the previous two chapters, we have seen how urban settlements vary with space as well as over time. There are other parameters as well, in which a single urban unit may vary from one another. These parameters may be broadly called the characteristics of the urban settlements, in which too, like time and space one settlement can be considered different from the other. It is these differences in the characteristics that ultimately lead us to classifying them for the ease of our understanding. Hence, this chapter would concentrate on the characteristics of urban settlements in Rajasthan and thereby trying to classify them on the basis of such characteristics.

Several attributes, not being exhaustive, may be taken into account, each of which can be considered as a characteristic of the urban settlements, thus, also providing a basis for their classification.

Broadly speaking, any urban settlement may be said to have set up against a *physical landscape*, have a particular *demographic feature*, certain *social set up* and also an *economic and functional background*. Thus, we may consider all these characteristics and thereby attempt a classification of them on these bases.

5.2: CHARACTERISTICS AND CLASSIFICATION OF URBAN SETTLEMENTS

Towns and cities are too varied in number and too varied in their characteristics. It is this varying characteristics of the towns which makes each different from the other. At the same time it also adds to their uniqueness. But they being too many in number, our understanding becomes difficult without a meaningful categorisation, and thus classification of them on some basis

becomes essential. "The classification of urban places, as such, is a fundamental first step in scientific enquiry into the character of urban places".¹

For the purpose of differentiating the urban settlements and thence classifying them, several indicators have been chosen catering to different aspects of a settlement like physical aspect, demographic, social and economic. The division of the state into four broad geographical regions conforming to the administrative boundaries of the districts gives us the foremost idea as to which urban settlement is set against which physical background as any urban settlement located within a particular district coming under a particular geographical region shall have the same physical setting.

So far as the demographic feature is concerned, population density, also exhibiting great variations across the state has been chosen as the characteristics of the urban settlements.

Literacy rates have been selected as social characteristics, while percentage of workers in each industrial category highlights the economic aspect of the urban settlements.

Having maintained a regional approach so far, in which four geographical regions have carved out in Rajasthan, we shall try to follow the same thing in this chapter as well. However, for the purpose of maintaining unanimity in scale while classifying the urban settlements, all the 222 urban settlements (as per 1991 census) shall be taken into account.

Physical Characteristics

In this, we shall consider the location type or the physical setting of an urban settlement and as per the geographical regions carved out, there are four location types viz., hill towns, plateau towns, and considering the Aravallis as the dividing line, the humid plain towns to its east and the dry plain towns to its west.

Therefore, the 222 towns of 1991 in Rajasthan can be classified according to their location types as:

TABLE 5.1: CLASSIFICATION OF URBAN SETTLEMENTS ON THE BASIS OF THEIR LOCATION TYPES

Characteristics of Urban Settlement (Location Type)	Name of Urban Centers		
Dry Plain Towns	1. Ganganagar	2. Hanumangarh	3. Suratgarh
	4. Nohar	5. Bhadra	6. Pilibanga
	7. Sangaria	8. Raisinghnagar	9. Rawatsar
	10. Anupgarh	11. Karanpur	12. Sadulshahar
	13. Vijainagar	14. Padampur	15. Kesrisinghpur
	16. Gajsinghpur	17. Bikaner	18. Nokha
	19. Napasar	20. Deshnoke	21. Churu
	22. Sujangarh	23. Sardarshahar	24. Ratangarh
	25. Rajgarh	26. Dungargarh	27. Bidasar
	28. Taranagar	29. Rajaldesar	30. Chhapar
	31. Ratannagar	32. Jhunjhunu	33. Nawalgarh
	34. Chirawa	35. Gothra	36. Udaipurwati
	37. Pilani	38. Khetri	39. Bissau
	40. Surajgarh	41. Mandawa	42. Mukandgarh
	43. Baggar	44. Vidyavihar	45. Sikar
	46. Fatehpur	47. Lachhmangarh	48. Ramgarh
	49. Sri Madhopur	50. Neem-ka-Thana	51. Khandela
	52. Losal	53. Reengus	54. Jaisalmer
	55. Pokaran	56. Jodhpur	57. Phalodi
	58. Bilara	59. Pipar City	60. Nagaur
	61. Makrana	62. Ladnu	63. Kuchaman City
	64. Deedwana	65. Merta City	66. Kuchera
	67. Nawa	68. Mundwa	69. Parbatsar
	70. Goredi Chancha	71. Pali	72. Sojat
	73. Sumerpur	74. Sadri	75. Phalna
	76. Bali	77. Nimaj	78. Jaitaran
	79. Raipur	80. Takhatgarh	81. Marwar Junction

	82.Rani	83.Sojat Road	84.Barmer
	85.Balotra	86.Siwana	87.Samdari
	88.Jalore	89.Bhinmal	90.Sanchore
Humid Plain Towns	1.Alwar	2.Khairthal	3.Rajgarh
	4.Behror	5.Tijara	6.Bhiwadi
	7.Kherli	8.Govindgarh	9.Bharatpur
	10.Deeg	11.Bayana	12.Kaman
	13.Nadbal	14.Kumher	15.Nagar
	16.Weir	17.Bhusawar	18.Sewar Kalan
	19.Dhaulpur	20.Bari	21.Rajakhera
	22.Sawai Madhopur	23.Hindaun	24.Gangapur City
	25.Karauli	26.Todabhim	27.Mahwa
	28.Todra	29.Jaipur	30.Dausa
	31.Chomu	32.Sanganer	33.Kotputli
	34.Amber	35.Kishangarh Renwal	36.Lalsot
	37.Manoharpur	38.Sambhar	39.Chaksu
	40.phulera	41.Shahpura	42.Bandikui
	43.Baswa	44.Bagru	45.Bassi
	46.Viratnagar	47.Naraina	48.Jobner
	49.Tonk	50.Malpura	51.Niwai
	52.Todaraisingh	53.Deoli	54.Uniara
Hill Towns	1.Ajmer	2.Beawar	3.Kishangarh
	4.Nasirabad	5.Kekri	6.Vijainagar
	7.Sarwar	8.Pushkar	9.Abu Road
	10.Sirohi	11.Sheoganj	12.Mount Abu
	13.Pindwara	14.Bhawri	15.Udaipur
	16.Rajsamand	17.Nathdwara	18.Fatehnagar
	19.Bhinder	20.Amet	21.Salumber
	22.Deogarh	23.Kanod	24.Dhariawad

	25. Rewa Talai	26. Rikhabdeo	27. Bhalariya
	28. Dungarpur	29. Sagwara	30. Galiyakot
	31. Banswara	32. Partapur	33. Kushalgarh
	34. Borkhera		
Plateau Towns	1. Bhilwara	2. Shahpura	3. Gulabpura
	4. Mandal	5. Mandalgarh	6. Gangapur
	7. Jahazpur	8. Asand	9. Beejoliya Kalan
	10. Chittaurgarh	11. Nimbahera	12. Pratapgarh
	13. Rawatbhata	14. Kapasan	15. Begun
	16. Chhoti Sadri	17. Bari Sadri	18. Bundi
	19. Lakheri	20. Keshoraipatan	21. Kaprain
	22. Nainwa	23. Indergarh	24. Kota
	25. Baran	26. Ramganj Mandi	27. Antah
	28. Mangrol	29. Chhabra	30. Kaithoon
	31. Sangod	32. Chhipabarod	33. Suket
	34. Satalkheri	35. Udpura	36. Jhalawar
	37. Bhawani Mandi	38. Jhalrapatan	39. Aklera
	40. Sunel	41. Khanpur	42. Pirawa
	43. Manoharthana	44. Kolvi@Rajendrapur	

From the above table, we can infer that maximum of the urban settlements have the location of dry plain towns while the hill towns are minimum in number.

Demographic Characteristics

In the demographic characteristic, nothing can be a better characteristic than the population density, being expressed as the number of persons per square unit of area, taking into consideration the 'space' concept in the form of area.

Here too, like in the case of the amount of rainfall received discussed under the head of physical characteristics above, a similar approach is followed, whereby the whole range of

population density of all the 222 towns, the highest being 9,913 persons/sq.km and the lowest 198. With such a huge range it is impossible to divide them into classes of equal intervals because that would end up in too many classes. Therefore, it would be judicious to go for classes of unequal intervals. Thus, we may have 5 classes as---<500 suggesting very low density, 500.1-1,000 showing low density, 1,000.1-4,000 indicating medium density, 4,000.1-8,000, a high density and above 8,000 a very high density.

Again the settlements may be divided according to the geographical regions they come under to understand the spatial variations even better.

TABLE 5.2: CLASSIFICATION OF TOWNS ON THE BASIS OF POPULATION DENSITY

Geographical Region	Name of the Urban Unit	Population Density (persons/sq.km)(1991)	Characteristics
Arid Region	1.Ganganagar	7738	High
	2.Hanumangarh	6151	High
	3.Suratgarh	4170	High
	4.Nohar	1907	Medium
	5.Bhadra	1565	Medium
	6.Pilibanga	885	Low
	7.Sangaria	9913	Very high
	8.Raisinghnagar	5227	High
	9.Rawatsar	3249	Medium
	10.Anupgarh	4529	High
	11.Karanpur	3759	Medium
	12.Sadulshahar	8895	Very high
	13.Vijainagar	4250	High
	14.Padampur	3864	Medium
	15.Kesrisinghpur	5390	High
	16.Gajsinghpur	5256	High
	17.Bikaner	2512	Medium
	18.Nokha	3213	Medium

	19.Napasar	5326	High
	20.Deshnoke	4474	High
	21.Churu	2877	Medium
	22.Sujangarh	3676	Medium
	23.Sardarshahar	4195	High
	24.Ratangarh	1097	Medium
	25.Rajgarh	3414	Medium
	26.Dungargarh	852	Medium
	27.Bidasar	2584	Low
	28.Taranagar	3436	Medium
	29.Rajaldesar	3908	Medium
	30.Chhapar	1554	Medium
	31.Ratannagar	1869	Medium
	32.Jhunjhunu	3437	Medium
	33.Nawalgarh	2844	Medium
	34.Chirawa	3087	Medium
	35.Gothra	2520	Medium
	36.Udaipurwati	628	Medium
	37.Pilani	5357	Low
	38.Khetri	1567	High
	39.Bissau	1088	Medium
	40.Surajgarh	1378	Medium
	41.Mandawa	8245	Medium
	42.Mukandgarh	1159	Very high
	43.Baggar	3022	Medium
	44.Vidyavihar	2336	Medium
	45.Sikar	6569	High
	46.Fatehpur	7327	High
	47.Lachhmangarh	2740	Medium
	48.Ramgarh	9613	Very high
	49.Sri Madhopur	1493	Medium
	50.Neem-ka-Thana	1114	Medium

	51.Khandela	5124	High
	52.Losal	271	Very low
	53.Reengus	535	Low
	54.Jaisalmer	307	Very low
	55.Pokaran	1858	Medium
	56.Jodhpur	8477	Very high
	57.Phalodi	4363	High
	58.Bilara	283	Very low
	59.Pipar City	2783	Medium
	60.Nagaur	1804	Medium
	61.Makrana	5963	High
	62.Ladnu	787	Low
	63.Kuchaman City	1498	Medium
	64.Deedwana	2140	Medium
	65.Merta City	1322	Medium
	66.Kuchera	9526	Very high
	67.Nawa	399	Very low
	68.Mundwa	266	Very low
	69.Parbatsar	624	Low
	70.Goredi Chancha	1765	Medium
	71.Pali	1630	Medium
	72.Sojat	2632	Medium
	73.Sumerpur	2282	Medium
	74.Sadri	247	Very low
	75.Phalna	3231	Medium
	76.Bali	1931	Medium
	77.Nimaj	1832	Medium
	78.Jaitaran	401	Very low
	79.Raipur	1258	Medium
	80.Takhatgarh	513	Low
	81.Marwar Junction	698	Low
	82.Rani	1195	Medium

	83. Sojat Road	996	Low
	84. Barmer	6669	High
	85. Balotra	3905	Medium
	86. Siwana	3166	Medium
	87. Samdari	402	Very low
	88. Jalore	1981	Medium
	89. Bhinmal	2091	Medium
	90. Sanchore	1177	Medium
East Rajasthan Plains	1. Alwar	3615	Medium
	2. Khairthal	1078	Medium
	3. Rajgarh	809	Low
	4. Behror	1074	Medium
	5. Tijara	1540	Medium
	6. Bhiwadi	764	Low
	7. Kherli	2453	Medium
	8. Govindgarh	1598	Medium
	9. Bharatpur	3052	Medium
	10. Deeg	2268	Medium
	11. Bayana	2948	Medium
	12. Kaman	4032	High
	13. Nadbal	1149	Medium
	14. Kumher	1140	Medium
	15. Nagar	7958	High
	16. Weir	1653	Medium
	17. Bhusawar	677	Low
	18. Sewar Kalan	838	Low
	19. Dhaulpur	2475	Medium
	20. Bari	1686	Medium
	21. Rajakhera	2276	Medium
	22. Sawai Madhopur	1223	Medium

	23. Gangapur City	6923	High
	24. Hindaun	1266	Medium
	25. Karauli	1400	Medium
	26. Todabhim	3347	Medium
	27. Mahwa	3740	Medium
	28. Todra	1025	Medium
	29. Jaipur	7278	High
	30. Dausa	3507	Medium
	31. Chomu	1710	Medium
	32. Sanganer	2835	Medium
	33. Kotputli	1587	Medium
	34. Amber	4658	High
	35. Kishangarh Renwal	550	Low
	36. Lalsot	2227	Medium
	37. Manoharpur	4749	High
	38. Sambhar	2020	Medium
	39. Chaksu	1540	Medium
	40. Phulera	1820	Medium
	41. Shahpura	1783	Medium
	42. Bandikui	5174	High
	43. Baswa	575	Low
	44. Bagru	476	Very low
	45. Bassi	1009	Medium
	46. Viratnagar	424	Very low
	47. Naraina	340	Very low
	48. Jobner	955	Low
	49. Tonk	6888	High
	50. Malpura	549	Low
	51. Niwai	511	Low
	52. Todaraisingh	326	Very low
	53. Deoli	581	Low

	54.Uniara	2308	Medium
Plateau Region	1.Bhilwara	1553	Meium
	2.Shahpura	418	Very low
	3.Gulabpura	1604	Medium
	4.Mandal	982	Low
	5.Mandalgarh	198	Very low
	6.Gangapur	2537	Medium
	7.Jahazpur	754	Low
	8.Asind	443	Very low
	9.Beejoliya Kalan	676	Low
	10.Chittaurgarh	1714	Medium
	11.Nimbahera	8384	Very high
	12.Pratapgarh	1202	Medium
	13.rawatbhata	1351	Medium
	14.Kapasan	599	Low
	15.Begun	1200	Medium
	16.Chhoti Sadri	2089	Medium
	17.Bari Sadri	1024	Medium
	18.Bundi	2858	Medium
	19.Lakheri	916	Low
	20.Keshoraipatan	608	Low
	21.Kaprain	209	Very low
	22.Nainwa	868	Low
	23.Indergarh	339	Very low
	24.Kota	2428	Medium
	25.Baran	4158	High
	26.Ramganj Mandi	1929	Medium
	27.Antah	789	Low
	28.Mangrol	618	Low
	29.Chhabra	1820	Medium
	30.Kaithoon	931	Low

	31.Sangod	1048	Medium
	32.Chhipabarod	2248	Medium
	33.Suket	1940	Medium
	34.Satal Kheri	3205	Medium
	35.Udpura	3772	Medium
	36.Jhalawar	2986	Medium
	37.Bhawani Mandi	4797	High
	38.Jhalrapatan	1144	Medium
	39.Aklera	2477	Medium
	40.Sunel	3813	Medium
	41.Khanpur	930	Low
	42.Pirawa	1371	Medium
	43.Manoharthana	576	Low
	44.Kolvi @ Rajendrapur	1868	Medium
Aravalli Hill Region	1.Ajmer	1667	Medium
	2.Beawar	6016	High
	3.Kishangarh	3265	Medium
	4.Nasirabad	6382	High
	5.Kekri	3197	Medium
	6.Vijainagar	2060	Medium
	7.Sarwar	2463	Medium
	8.Pushkar	704	Low
	9.Sirohi	1357	Medium
	10.Abu Road	2981	Medium
	11.Sheoganj	4139	High
	12.Mount Abu	1003	Medium
	13.Pindwara	1519	Medium
	14.Bhawri	605	Low
	15.Udaipur	4800	High
	16.Rajsamand	706	Low

	17.Nathdwara	735	Low
	18.Fatehnagar	1099	Medium
	19.Bhinder	3789	Medium
	20.Amet	1827	Medium
	21.Salumber	3495	Medium
	22.Deogarh	4142	High
	23.Kanor	1884	Medium
	24.Dhariawad	2679	Medium
	25.Rewa Talai	3035	Medium
	26.Rikhabdeo	7435	High
	27.Bhalariya	2283	Medium
	28.Dungarpur	3484	Medium
	29.Sagwara	3177	Medium
	30.Galiyakot	588	Low
	31.Banswara	4006	High
	32.Partapur	2387	Medium
	33.Kushalgarh	9341	Very high
	34.Borkhera	672	Low

From the above table it is evident that majority of the urban settlements taken Rajasthan as a whole, have medium density of population ranging between 1,000-4,000 persons/sq.km. Even, if individual regions are considered, all of them mostly accounts for medium density of population density.

However, interestingly, the Arid Region also records for the maximum number of urban units with very high(above 8,000 persons/sq.km) and high(4,000-8,000 persons/sq.km) population density. This is so because this region in general not being favourable for human settlements and development of urban units, most of the population is concentrated in few favoured pockets having maximum urban facilities. At the same time, this region also shows maximum urban units with low and very low population density which speaks of the true physical character of the region also finding expression through demographic characteristics .In the other regions generally, as mentioned before, medium population density is observed, specially the Plain and the Plateau Regions which being favourable for human settlements and urban facilities available throughout, the population is uniformly distributed.

Social Characteristics

Population of any settlement, specially towns and cities being of a heterogeneous nature, adding to their cosmopolitan nature makes the classification of towns on the basis of their social structure a real difficult task. However, individual aspect of social milieu can be considered for their classification. Hence, urban units may be classified on the basis of their social characteristics like dominant language or languages, religious composition of the population etc. But 'urban' being considered as a reflection of development, thus, those characteristics may be chosen which speaks of social development as well. Therefore, literacy rates (defined by the Indian Census as the ability to read and write with understanding among all those who are aged 7 years and above) showing the advancement of the society in terms of knowledge, may be chosen for classifying the urban settlements on the basis of their social characteristics.

Therefore, following the same regional approach, first of all the literacy rates in 1991 may be taken into account and urban units classified thereby. Here too, the literacy rates were broken into five ranges as---<40 meaning very low level of literacy, 40.1-50 low literacy rates, 50.1-60 showing medium literacy level, 60.1-70 suggesting high literacy rates and above 70 showing very high level of literacy.

TABLE 5.3: CLASSIFICATION OF URBAN SETTLEMENTS ON THE BASIS OF LITERACY RATES

Geographical Regions	Name of the Urban Unit	Literacy Rate	Characteristics
Arid Region	1.Ganganagar	58.70	Medium
	2.Hanumangarh	52.18	Medium
	3.Suratgarh	49.33	Low
	4.Nohar	48.10	Low
	5.Bhadra	44.87	Low
	6.Pilibanga	41.42	Low

	7.Sangaria	59.04	Medium
	8.Raisinghnagar	55.05	Medium
	9.Rawatsar	36.60	Very low
	10.Anupgarh	49.76	Low
	11.Karanpur	51.11	Medium
	12.Sadulshahar	48.50	Low
	13.Vijainagar	50.71	Medium
	14.Padampur	55.79	Medium
	15.Kesrisinghpur	50.18	Medium
	16.Gajsinghpur	50.01	Medium
	17.Bikaner	56.94	Medium
	18.Nokha	47.96	Low
	19.Napasar	43.82	Low
	20.Deshnoke	42.55	Low
	21.Churu	43.75	Low
	22.Sujangarh	44.26	Low
	23.Sardarshahar	46.22	Low
	24.Ratangarh	49.86	Low
	25.Rajgarh	43.48	Low
	26.Dungargarh	43.85	Low
	27.Bidasar	32.19	Very low
	28.Taranagar	36.68	Very low
	29.Rajaldesar	33.50	Very low
	30.Chhapar	39.79	Very low
	31.Ratannagar	38.33	Very low
	32.Jhunjhunu	42.97	Low
	33.Nawalgarh	37.77	Very low
	34.Chirawa	52.10	Medium
	35.Gothra	69.93	High
	36.Udaipurwati	35.92	Very low
	37.Pilani	54.48	Medium
	38.Khetri	55.58	Medium

	39.Bissau	39.32	Very low
	40.Surajgarh	47.42	Low
	41.Mandawa	38.28	Very low
	42.Mukandgarh	41.72	Low
	43.Baggar	51.90	Medium
	44.Vidyavihar	81.30	Very high
	45.Sikar	44.48	Low
	46.Fatehpur	41.17	Low
	47.Lachhmangarh	42.01	Low
	48.Ramgarh	37.96	Very low
	49.Sri Madhopur	50.63	Medium
	50.Neem-ka-Thana	54.48	Medium
	51.Khandela	38.45	Very low
	52.Losal	36.75	Very low
	53.Reengus	44.01	Low
	54.Jaisalmer	58.83	Medium
	55.Pokaran	43.99	Low
	56.Jodhpur	56.44	Medium
	57.Phalodi	47.88	Low
	58.Bilara	41.31	Low
	59.Pipar City	36.03	Very low
	60.Nagaur	46.51	Low
	61.Makrana	32.75	Very low
	62.Ladnu	40.17	Low
	63.Kuchaman City	40.25	Low
	64.Deedwana	42.95	Low
	65.Merta City	48.48	Low
	66.Kuchera	30.18	Very low
	67.Nawa	43.23	Low
	68.Mundwa	32.70	Very low
	69.Parbatsar	44.52	Low
	70.Goredi Chancha	49.81	Low

	71.Pali	49.32	Low
	72.Sojat	44.53	Low
	73.Sumerpur	49.66	Low
	74.Sadri	33.61	Very low
	75.Phalna	48.90	Low
	76.Bali	44.57	Low
	77.Nimaj	27.45	Very low
	78.Jaitaran	42.11	Low
	79.raipur	37.14	Very low
	80.Takhatgarh	41.82	Low
	81.Marwar Junction	52.06	Medium
	82.Rani	53.53	Medium
	83.Sojat Road	51.91	Medium
	84.Barmer	52.64	Medium
	85.Balotra	48.13	Low
	86.Siwana	36.18	Very low
	87.Samdari	43.04	Low
	88.Jalore	47.62	Low
	89.Bhinmal	42.25	Low
	90.Sanchore	37.57	Very low
East Rajasthan Plains	1.Alwar	60.52	High
	2.Khairthal	56.87	Medium
	3.Rajgarh	52.84	Medium
	4.Behror	56.04	Medium
	5.Tijara	46.91	Low
	6.Bhiwadi	55.63	Medium
	7.Kherli	67.05	High
	8.Govindgarh	53.36	Medium
	9.Bharatpur	56.13	Medium
	10.Deeg	46.24	Low

	11.Bayana	53.81	Medium
	12.Kaman	47.21	Low
	13.Nadbal	50.37	Medium
	14.Kumher	43.10	Low
	15.Nagar	46.98	Low
	16.Weir	45.78	Low
	17.Bhusawar	48.11	Low
	18.Sewar Kalan	40.63	Low
	19.Dhaulpur	46.60	Low
	20.Bari	40.98	Low
	21.Rajakhera	35.42	Very low
	22.Sawai Madhopur	52.11	Medium
	23.Gangapur City	54.07	Medium
	24.Hindaun	47.58	Low
	25.Karauli	40.43	Low
	26.Todabhim	37.02	Very low
	27.Mahwa	46.91	Low
	28.Todra	49.38	Low
	29.Jaipur	58.46	Medium
	30.Dausa	51.43	Medium
	31.Chomu	44.65	Low
	32.Sanganer	52.37	Medium
	33.Kotputli	47.37	Low
	34.Amber	34.81	Very low
	35.Kishangarh Renwal	40.77	Low
	36.Lalsot	34.23	Very low
	37.Manoharpur	32.17	Very low
	38.Sambhar	49.69	Low
	39.Chaksu	38.41	Very low
	40.Phulera	60.89	High
	41.Shahpura	40.11	Low
	42.Bandikui	63.23	High

	43. Baswa	37.21	Very low
	44. Bagru	34.73	Very low
	45. Bassi	42.41	Low
	46. Viratnagar	31.67	Very low
	47. Naraina	35.79	Very low
	48. Jobner	51.25	Medium
	49. Tonk	40.90	Low
	50. Malpura	44.22	Low
	51. Niwai	51.12	Medium
	52. Todaraisingh	46.27	Low
	53. Deoli	64.41	High
	54. Uniara	45.12	Low
Plateau Region	1. Bhilwara	53.39	Medium
	2. Shahpura	51.37	Medium
	3. Gulabpura	53.31	Medium
	4. Mandal	37.49	Very low
	5. Mandalgarh	35.20	Very low
	6. Gangapur	51.16	Medium
	7. Jahazpur	43.87	Low
	8. Asind	45.14	Low
	9. Beejoliya Kalan	54.95	Medium
	10. Chittaurgarh	58.50	Medium
	11. Nimbahera	50.94	Medium
	12. Pratapgarh	62.53	High
	13. Rawatbhata	63.18	High
	14. Kapasan	50.62	Medium
	15. Begun	51.26	Medium
	16. Chhoti Sadri	59.48	Medium
	17. Bari Sadri	55.67	Medium
	18. Bundi	56.88	Medium
	19. Iakheri	50.94	Medium

	20.Keshoraipatan	48.99	Low
	21.Kaprain	39.87	Very low
	22.Nainwa	45.94	Low
	23.Indergarh	49.76	Low
	24.Kota	60.15	High
	25.Baran	53.80	Medium
	26.Rmganj Mandi	56.34	Medium
	27.Antah	46.23	Low
	28.Mangrol	38.03	Very low
	29.Chhabra	48.44	Low
	30.Kaithoon	40.55	Low
	31.Sangod	49.55	Low
	32.Chhipabarod	52.67	Medium
	33.Suket	39.29	Very low
	34.Satal Kheri	24.47	Very low
	35.Udpura	50.47	Medium
	36.Jhalawar	59.68	Medium
	37.Bhawani Mandi	56.91	Medium
	38.Jhalrapatan	58.42	Medium
	39.Aklera	44.96	Low
	40.Sunel	53.40	Medium
	41.Khanpur	52.65	Medium
	42.Pirawa	47.76	Low
	43.Manoharthana	50.30	Medium
	44.Kolvi@Rajendrapur	60.17	High
Aravalli Hill Region	1.Ajmer	67.63	High
	2.Beawar	62.95	High
	3.Kishangarh	52.42	Medium
	4.Nasirabad	67.82	High
	5.Kekri	53.71	Medium
	6.Vijainagar	60.47	High

	7.Sarwar	38.09	Very low
	8.Pushkar	62.32	High
	9.Abu Road	60.35	High
	10.Sirohi	56.10	Medium
	11.Sheoganj	56.75	Medium
	12.Mount Abu	59.40	Medium
	13.Pindwara	44.83	Low
	14.Bhawri	41.06	Low
	15.Udaipur	66.24	High
	16.Rajsamand	54.22	Medium
	17.Nathdwara	61.98	High
	18.Fatehnagar	48.24	Low
	19.Bhinder	53.88	Medium
	20.Salumber	61.23	Medium
	21.Deogarh	49.81	High
	22.Kanor	54.31	Low
	23.Dhariawad	56.83	Medium
	24.Rewa Talai	61.40	Medium
	25.Rikhabdeo	61.59	High
	26.Amet	52.72	High
	27.Bhalariya	64.74	High
	28.Dungarpur	68.46	High
	29.Sagwara	54.34	Medium
	30.Galiyakot	44.18	Low
	31.Banswara	65.27	High
	32.Partapur	61.95	High
	33.Kushalgarh	60.37	High
	34.Borkhera	56.44	Medium

The above table shows that for the state as a whole, most of the urban units shows a low level of literacy (84 out of 222, i.e. almost 40%) with the literacy rate ranging between 40.1-50 percent. However, if the different regions are considered separately, then the scenario is different for different regions. In that case, while most of the urban units in the Arid Region and the East Rajasthan Plains accounts for low level of literacy (44 out of 90 and 24 out of 54 respectively),

in the Plateau Region majority of the Urban settlements have medium literacy level(23 out of 44 units) and the Aravalli Hill Region has most of the urban settlements accounting for high level of literacy(16 out of 34).

Thus, that this region having a highly positive correlation between the literacy rates and the number of urban units as we have seen in the previous chapter proves to be true here too. No region records very high level of literacy excepting the Arid Region, with Vidyavihar standing as an exceptional case with 81.30% literacy rate.

Thus, we notice that so far as the social characteristics of the urban settlements of Rajasthan is concerned, expressed through literacy rates, the situation is not very satisfactory because, even the urban units being considered as seats of development mostly have low level of literacy.

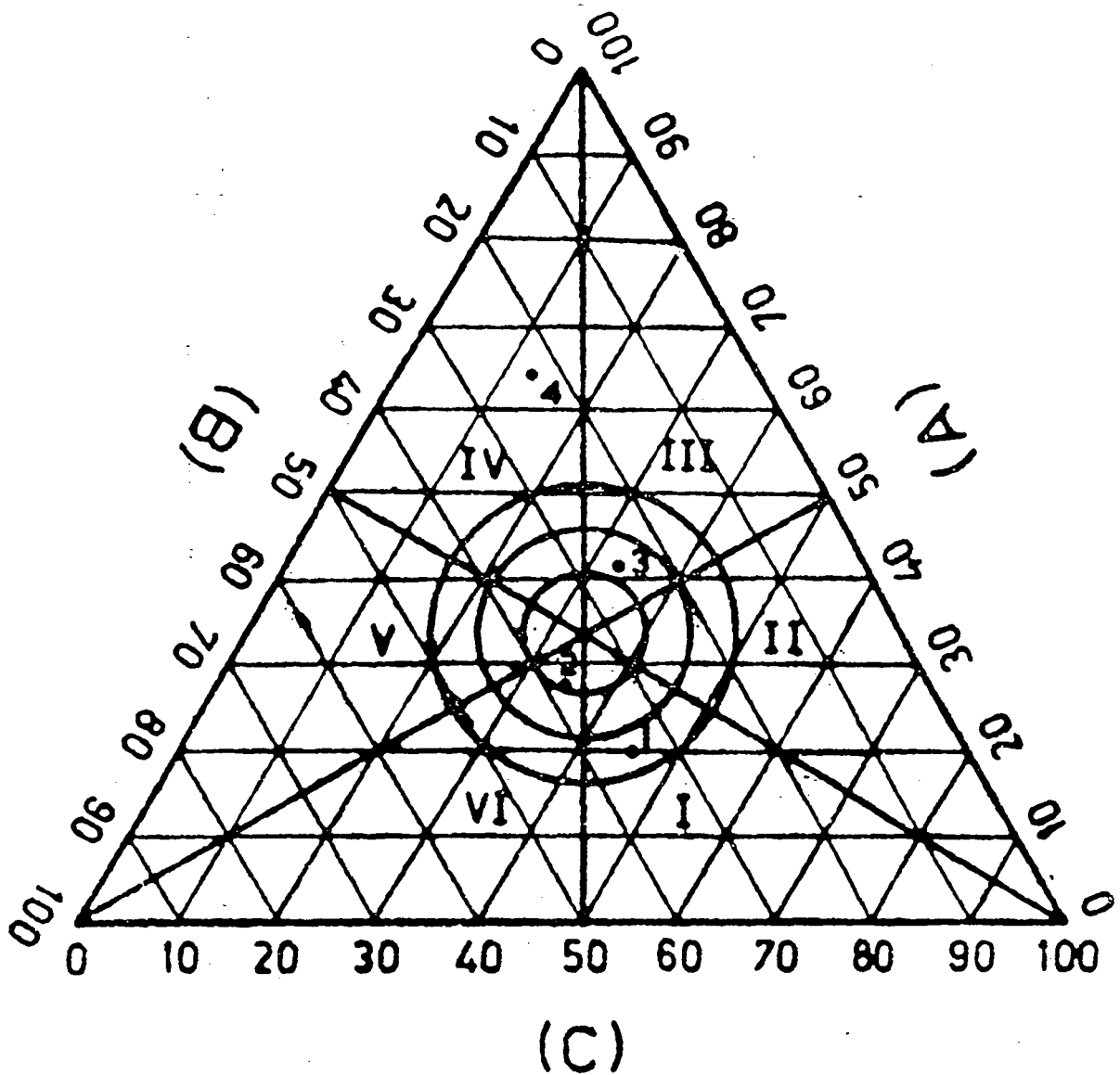
Economic Characteristics

Every urban unit performs some function or have some dominant economic activity which can be considered as the economic characteristic of the towns. The range of economic characteristics in any urban unit covers the entire spectrum of primary, secondary and tertiary activities; however, often there is tendency among scholars to exclude primary activities being characteristic of rural areas. In general, tertiary activities are the most significant followed by secondary activities of manufacturing while primary activities in urban places are least important.

The classification of the towns on the basis of their economic activities or dominant functions may be considered as the most meaningful method of classification. Different scholars have put several methods of functional classification of urban places forth.

Aurousseau², in 1921, presented with a non-quantitative categorization, with six classes and twenty-eight sub-types. But any descriptive classification suffers from the drawback of not having a sufficient theoretical base, which might enable its wider application, and hence, later on statistical techniques were taken into use. Therefore, C.D.Harris³, in his paper, 'A Functional Classification of Cities in the United States' (1943) determined the dominant functions of the cities using occupation and employment figures and identified 9 principal categories as—i. Manufacturing, ii. Diversified, iii. Wholesaling, iv. Transportation, v. Mining, vi. Educational,

TERNARY DIAGRAM



3. Ternary Diagram on the basis of which the function of any urban centre is determined.

Fig 5.1

vii. Retail, viii. Resort or retirement, and ix. Others. This method was further advanced by H.J.Nelson⁴, who in his paper, 'A Service Classification of American Cities' (1955) based the classification of cities on the average percentage of employment for each activity group and the deviation from that in a city.

Amrit Lal⁵ using 1951 Census data including 67 one-lakh cities classified Indian cities. Qazi Ahmed⁶ tried another attempt of functional classification of Indian cities in 1961 using factor analysis for 63 variables.

A composite classification system based on the predominant functions of the urban settlements was worked out by Ashok Mitra⁷(the then Registrar General of India) in 1964. His method was based on the dominant function of the city. Seven Census categories of workers were grouped into three broad non-agricultural categories as:

Group	Census Industrial Category
A. Industry	III, IV, V and VI
B. Trade and Transport	VII and VIII
C. Services	IX

Categories of agricultural labourers and cultivators (I and II) were excluded, they being involved in primary activities.

A ternary diagram, that is, an equilateral triangle, the sides of which form three scales graduated 0 to 100 percent, so that each apex forms 0 on two scales and 100 percent on the third and the three variables can be converted into percentages summing 100, then the position of a town, in the triangle is taken as the main determinant of its functions.

The ternary diagram was divided into six sub- triangles, also to determine the subsidiary functions.

TABLE 5.4: SIX SUB-TRIANGLES AND THEIR PREDOMINANT AND SUBSIDIARY FUNCTIONS

Sub-Triangle	Predominant Function	Subsidiary Functions		
		Low	Medium	High
I	Service	Industry	Trade and Transport	Services
II	Service	Trade and Transport	Industry	Services
III	Industrial	Trade and Transport	Services	Industry
IV	Industrial	Services	Trade and Transport	Industry
V	Trade and Transport	Services	Industry	Trade and Transport
VI	Trade and Transport	Industry	Services	Trade and Transport

These sub-triangles were further divided into four parts by the three circles with center at the middle of the triangle (representing 33.3% of each group) and radius equal to 6 , 11 , and 16 , intersecting the axes at 40%, 45% and 50% marks respectively. This was done to show the degree of specialization.

TABLE 5.5: FUNCTIONAL TYPES AND PERCENTAGE OF TOTAL WORKFORCE

Functional Type	Code	Position	% of Total Workforce
1. Functions Highly Diversified	FHD	Within 1 st circle	No groups (A, B or C) more than 40%
2. Functions Moderately Diversified	FMD	Between 1 st and 2 nd circle	One group has 40%-45%
3. Predominant Function Accentuated	PFA	Between 2 nd and 3 rd circle	One group has 45%-50%
4. Predominant Function Highly Accentuated	PFHA	Outside 3 rd circle	Dominant function has over 50%

This method of functional classification is most widely used in Indian context, and we shall use this method only to classify the urban settlements in Rajasthan.

TABLE 5.6: CLASSIFICATION OF URBAN SETTLEMENTS ON THE BASIS OF THEIR ECONOMIC CHARACTERISTICS OR FUNCTIONS

Geographical Region	Name of the Urban Unit	Industrial Category			Characteristics
		A	B	C	
Arid Region	1. Anupgarh	29	46	25	FMD, with medium I, high T&T, low S
	2. Baggar	27	33	40	FHD, with low I, medium T&T, high S
	3. Bali	38	30	32	FHD, with high I, low T&T, medium S
	4. Balotra	53	33	14	PFHA, with high I, medium T&T, low S
	5. Barmer	31	36	33	FHD, with low I, high T&T, medium S
	6. Bhadra	28	48	24	FMD, with medium I, high T&T, low S
	7. Bhinmal	35	41	24	FMD, with medium I, high T&T, low S
	8. Bidasar	50	32	18	PFA, with high I, medium T&T, low S
	9. Bikaner	36	29	35	FHD, with high I, low T&T, medium S
	10. Bilara	34	31	35	FHD, with medium I, low T&T, high S
	11. Bissau	45	29	26	FMD, with high I, medium T&T, low S
	12. Chhapar	28	52	20	PFHA, with medium I, high T&T, low S
	13. Chirawa	34	39	27	FHD, with medium I, high T&T,

					low S
	14.Churu	33	39	28	FHD, with medium I, high T&T, low S
	15.Deshnoke	29	47	24	FMD, with medium I, high T&T, low S
	16.Deedwana	32	37	31	FHD, with medium I, high T&T, low S
	17Dungargah	32	47	21	FMD, with medium I, high T&T, low S
	18.Fatehpur	50	28	22	PFA, with high I, medium T&T, low S
	19.Gajsinghpur	20	51	29	PFHA, with low I, high T&T, medium S
	20.Ganganagar	29	51	31	FHD, with low I, high T&T, medium S
	21.Goredi Chancha	29	40	24	FMD, with medium I, high T&T, low S
	22Hanumangarh	32	47	21	FMD, with medium I, high T&T, low S
	23.Jaisalmer	25	23	52	PFHA, with medium I, low T&T, high S
	24.Jaitaran	39	33	28	FHD, with high I, medium T&T, low S
	25.Jalore	31	29	40	FHD, with medium I, low T&T, high S
	26.Jhunjhunu	39	34	27	FHD, with high I, medium T&T, low S
	27.Jodhpur	34	30	36	FHD, with medium I, low T&T, high S
	28.Karanpur	24	45	31	FMD, with low I, high T&T, medium S
	29.Kesrisinghpur	24	50	26	PFA. with low I, high T&T, medium S

	30.Khandela	60	28	22	PFHA, with high I, medium T&T, low S
	31.Khetri	47	27	26	FMD, with high I, medium T&T, low S
	32.Gothra	73	6	21	PFHA, with high I, low T&T, medium S
	33.Kuchaman City	37	38	25	FHD, with medium I, high T&T, low S
	34.Kuchera	42	34	24	FMD, with high I, medium T&T, low S
	35.Lachhmangarh	45	34	21	FMD, with high I, medium T&T, low S
	36.Ladnu	40	34	26	FHD, with high I, medium T&T, low S
	37.Losal	32	47	21	FMD, with medium I, high T&T, low S
	38.Makrana	58	33	9	PFHA, with high I, medium T&T, low S
	39.Mandawa	45	31	24	FMD, with high I, medium T&T, low S
	40.Marwar Junction	28	48	24	FMD, with medium I, high T&T, low S
	41.Merta City	36	37	27	FHD, with medium I, high T&T, low S
	42.Mukandgarh	47	29	24	FMD, with high I, medium T&T, low S
	43.Mundwa	38	36	26	FHD, with high I, medium T&T, low S
	44.Nagaur	37	31	32	FHD, with high I, low T&T, medium S
	45.Napasar	35	41	24	FMD, with medium I, high T&T, low S
	46.Nawa	49	29	22	FMD, with high I, medium T&T,

					low S
	47.Nawalgarh	44	35	21	FMD, with high I, medium T&T, low S
	48.Neem-ka-Thana	30	34	36	FHD, with low I, medium T&T, high S
	49.Nimaj	38	26	36	FHD, with high I, low T&T, medium S
	50.Nohar	28	49	23	FMD, with medium I, high T&T, low S
	51.Nokha	30	50	20	PFA, with medium I, high T&T, low S
	52.Padampur	26	54	20	PFHA, with medium I, high T&T, low S
	53.Pali	67	12	21	PFHA, with high I, low T&T, medium S
	54.Parbatsar	35	34	31	FHD, with high I, medium T&T, low S
	55.Phalna	43	36	21	FMD, with high I, medium T&T, low S
	56.Phalodi	35	34	31	FHD, with high I, medium T&T, low S
	57.Pilani	32	28	40	FHD, with medium I, low T&T, high S
	58.Vidyavihar	9	10	81	PFHA, with low I, medium T&T, high S
	59.Pilibanga	26	50	24	PFA, with medium I, high T&T, low S
	60.Pipar City	44	34	22	FMD, with high I, medium T&T, low S
	61.Pokaran	37	30	33	FHD, with high I, low T&T, medium S
	62.Raipur	41	31	28	FMD, with high I, medium T&T, low S

	63.Raisinghpur	19	44	37	FMD, with low I, high T&T, medium S
	64.Kajaldesar	40	38	22	FHD, with high I, medium T&T, low S
	65.Rajgarh	23	47	30	FMD, with low I, high T&T, medium S
	66.Ramgarh	49	31	20	FMD, with high I, medium T&T, low S
	67.Rani	35	44	21	FMD, with medium I, high T&T, low S
	68.Ratangarh	31	42	27	FMD, with medium I, high T&T, low S
	69.Ratannagar	46	30	24	FMD, with high I, medium T&T, low S
	70.Rawatsar	32	42	26	FMD, with medium I, high T&T, low S
	71.Reengus	39	36	25	FHD, with high I, medium T&T, low S
	72.Sadri	44	33	23	FMD, with high I, medium T&T, low S
	73.Sadulshahar	27	47	26	FMD, with medium I, high T&T, low S
	74.Samdari	39	41	20	FMD, with medium I, high T&T, low S
	75.Sanchore	37	42	21	FMD, with medium I, high T&T, low S
	76.Sangaria	22	46	32	FMD, with low I, high T&T, medium S
	77.Sardarshahar	33	44	23	FMD, with medium I, high T&T, low S
	78.Sikar	41	36	23	FMD, with high I, medium T&T, low S
	79.Siwana	38	41	21	FMD, with medium I, high T&T,

					low S
	80.Sojat	38	35	27	FHD, with high I, medium T&T, low S
	81.Sojay Road	42	39	19	FMD, with high I, medium T&T, low S
	82.Sri Madhopur	31	40	29	FHD, with medium I, high T&T, low S
	83.Sujangarh	37	41	22	FMD, with medium I, high T&T, low S
	84.Sumerpur	30	54	16	PFHA, with medium I, high T&T, low S
	85.Surajgarh	42	34	24	FMD, with high I, medium T&T, low S
	86.Takhatgarh	43	35	22	FMD, with high I, medium T&T, low S
	87.Taranagar	26	41	33	FMD, with low I, high T&T, medium S
	88.Udaipurwati	37	34	29	FHD, with high I, medium T&T, low S
	89.Vijainagar	28	48	24	FMD, with medium I, high T&T, low S
	90.Suratgarh	34	37	29	FHD, with medium I, high T&T, low S
East Rajasthan Plains	1.Alwar	32	33	35	FHD, with low I, medium T&T, high S
	2.Bagru	56	23	21	PFHA, with high I, medium T&T, low S
	3.Bandikui	22	46	32	FMD, with low I, high T&T, medium S
	4.Bari	23	34	43	FMD, with low I, medium T&T, high S

	5.Bassi	47	24	29	FMD, with high I, low T&T, medium S
	6.Baswa	35	26	39	FHD, with medium I, low T&T, high S
	7.Bayana	31	42	27	FMD, with medium I, high T&T, low S
	8.Behror	43	30	27	FMD, with high I, medium T&T, low S
	9.Bharatpur	33	32	35	FHD, with medium I, low T&T, high S
	10.Sewar Kalan	27	16	57	PFHA, with medium I, low T&T, high S
	11.Bhiwadi	87	7	6	PFHA, with high I, medium T&T, low S
	12.Bhusawar	28	27	45	FMD, with medium I, low T&T, high S
	13.Chaksu	46	28	26	FMD, with high I, medium T&T, low S
	14.Chomu	38	35	27	FHD, with high I, medium T&T, low S
	15.Dausa	34	35	31	FHD, with medium I, high T&T, low S
	16.Deeg	33	36	31	FHD, with medium I, high T&T, low S
	17.Deoli	21	27	52	PFHA, with low I, medium T&T, high S
	18.Dhaulpur	30	28	42	FMD, with medium I, low T&T, high S
	19.Gangapur City	26	46	28	FMD, with low I, high T&T, medium S
	20.Govindgarh	25	45	30	FMD, with low I, high T&T, medium S
	21.Hindaun	32	44	24	FMD, with medium I, high T&T,

					low S
	22.Jaipur	35	34	31	FHD, with high I, medium T&T, low S
	23.Sanganer	56	23	21	PFHA, with high I, medium T&T, low S
	24.Amber	54	18	28	PFHA, with high I, low T&T, medium S
	25.Jobner	30	31	39	FHD, with low I, medium T&T, high S
	26.Kaman	33	35	32	FHD, with medium I, high T&T, low S
	27.Karauli	39	30	31	FHD, with high I, low T&T, medium S
	28.Khairthal	28	46	26	FMD, with medium I, high T&T, low S
	29.Kherli	19	55	26	PFHA, with low I, high T&T, medium S
	30.Kishangarh Renwal	41	37	22	FMD, with high I, medium T&T, low S
	31.Kotputli	29	44	27	FMD, with medium I, high T&T, low S
	32.Kumher	31	33	36	FHD, with low I, medium T&T, high S
	33.Lalsot	33	41	26	FMD, with medium I, high T&T, low S
	34.Mahwa	27	45	28	PFA, with low I, high T&T, medium S
	35.Malpura	24	33	43	FMD, with low I, medium T&T, high S
	36.Manoharpur	53	18	29	PFHA, with high I, low T&T, medium S
	37.Nadbal	34	37	29	FHD, with medium I, high T&T, low S

	38.Nagar	28	39	33	FHD, with low I, high T&T, medium S
	39.Naraina	50	26	24	PFA, with high I, medium T&T, low S
	40.Niwai	26	33	41	FMD, with low I, medium T&T, high S
	41.Phulera	31	46	23	FMD, with medium I, high T&T, low S
	42.Rajakhera	22	30	48	FMD, with low I, medium T&T, high S
	43.Rajgarh	31	32	37	FHD, with low I, medium T&T, high S
	44.Sambhar	36	30	34	FHD, with high I, low T&T, medium S
	45.Sawai Madhopur	35	34	31	FHD, with high I, medium T&T, low S
	46.Shahpura	34	36	30	FHD, with medium I, high T&T, low S
	47.Tijara	30	38	32	FHD, with low I, high T&T, medium S
	48.Todabhim	24	35	41	FMD, with low I, medium T&T, high S
	49.Todaraisingh	39	31	30	FHD, with high I, medium T&T, low S
	50.Todra	66	17	18	PFHA, with high I, low T&T, medium S
	51.Tonk	48	24	28	FMD, with high I, low T&T, medium S
	52.Uniara	38	29	33	FHD, with high I, low T&T, medium S
	53.Viratnagar	29	38	33	FHD, with low I, high T&T, medium S
	54.Weir	21	25	54	PFHA, with low I, medium T&T,

					high S
Plateau Region	1.Aklera	25	44	31	FMD, with low I, high T&T, medium S
	2.Antah	32	29	39	FHD, with medium I, low T&T, high S
	3.Asind	25	42	33	FMD, with low I, high T&T, medium S
	4.Baran	33	40	27	FHD, with medium I, high T&T, low S
	5.Bari Sadri	28	40	32	FHD, with low I, high T&T, medium S
	6.Beejoliya Kalan	42	34	24	FMD, with high I, medium T&T, low S
	7.Begun	35	34	31	FHD, with high I, medium T&T, low S
	8.Bhawani Mandi	48	30	22	FMD, with high I, medium T&T, low S
	9.Bhilwara	48	30	22	FMD, with high I, medium T&T, low S
	10.Bundi	32	33	35	FHD, with low I, medium T&T, high S
	11.Chhabra	29	41	30	FMD, with low I, high T&T, medium S
	12.Chhipabarod	35	40	25	FHD, with medium I, high T&T, low S
	13.Chhoti Sadri	30	38	32	FHD, with low I, high T&T, medium S
	14.Chittaurgarh	37	34	29	FHD, with high I, medium T&T, low S
	15.Gangapur	42	32	26	FMD, with high I, medium T&T, low S
	16.Gulabpura	64	20	16	PFHA, with high I, medium T&T,

					low S
	17.Jahazpur	33	32	35	FHD, with medium I, low T&T, high S
	18.Jhalawar	35	28	37	FHD, with medium I, low T&T, high S
	19.Jhalrapatan	26	39	35	FHD, with low I, high T&T, medium S
	20.Kaithoon	64	16	20	PFHA, with high I, low T&T, medium S
	21.Kaprain	37	32	31	FHD, with high I, medium T&T, low S
	22.Kapasan	22	38	40	FHD, with low I, medium T&T, high S
	23.Khanpur	25	38	37	FHD, with low I, high T&T, medium S
	24.Kolvi@Rajendra pur	25	45	30	FMD, with low I, high T&T, medium S
	25.Kota	37	31	32	FHD, with high I, low T&T, medium S
	26.Lakheri	52	21	27	PFHA, with high I, low T&T, medium S
	27.Indergarh	31	34	35	FHD, with low I, medium T&T, high S
	28.Mandal	38	29	33	FHD, with high I, low T&T, medium S
	29.Mandalgarh	37	40	23	FHD, with medium I, high T&T, low S
	30.Mangrol	55	19	26	PFHA, with high I, low T&T, medium S
	31.Manoharthana	31	34	35	FHD, with low I, medium T&T, high S
	32.Nainwa	31	30	39	FHD, with medium I, low T&T, high S

	33.Nimbahera	45	34	21	FMD, with high I, medium T&T, low S
	34.Pirawa	21	40	39	FHD, with low I, high T&T, medium S
	35.Pratapgarh	27	39	34	FHD, with low I, high T&T, medium S
	36.Ramganj Mandi	33	41	26	FHD, with medium I, high T&T, low S
	37.Rawatbhata	34	10	56	PFHA, with medium I, low T&T, high S
	38.Sangod	26	33	41	FMD, with low I, medium T&T, high S
	39.Satalkheri	92	7	1	PFHA, with high I, medium T&T, low S
	40.Shahpura	30	32	38	FHD, with low I, medium T&T, high S
	41.Suket	75	14	11	PFHA, with high I, medium T&T, low S
	42.Sunel	28	38	34	FHD, with low I, high T&T, medium S
	43.Udpura	50	32	18	PFA, with high I, medium T&T, low S
	44.Keshoraipatan	45	28	27	FMD, with high I, medium T&T, low S
Aravalli Hill Region	1.Abu Road	31	46	23	FMD, with medium I, high T&T, low S
	2.Ajmer	35	34	31	FHD, with high I, medium T&T, low S
	3.Amet	31	46	23	FMD, with medium I, high T&T, low S
	4.Banswara	32	33	35	FHD, with low I, medium T&T, high S

	5.Beawar	44	34	22	FMD, with high I, medium T&T, low S
	6.Bhawri	33	44	23	FMD, with medium I, high T&T, low S
	7. Bhinder	33	38	29	FHD, with medium I, high T&T, low S
	8. Borkhera	77	14	9	PFHA, with high I, medium T&T, low S
	9. Deogarh	31	41	28	FMD, with medium I, high T&T, low S
	10. Dungarpur	27	38	35	FHD, with low I, high T&T, medium S
	11.Fatehnagar	38	41	21	FMD, with medium I, high T&T, low S
	12.Galiyakot	31	32	37	FHD, with low I, medium T&T, high S
	13.Kekri	36	39	25	FHD, with medium I, high T&T, low S
	14.Kishangarh	49	28	23	FMD, with high I, medium T&T, low S
	15.Kushalgarh	20	38	42	FMD, with low I, medium T&T, high S
	16.Mount.Abu	10	30	60	PFHA, with low I, medium T&T, high S
	17.Nasirabad	16	21	63	PFHA, with low I, medium T&T, high S
	18.Nathdwara	29	36	35	FHD, with low I, high T&T, medium S
	19.Partapur	25	46	29	FMD, with low I, high T&T, medium S
	20.Pindwara	39	35	26	FHD, with high I, medium T&T, low S
	21.Pushkar	23	34	43	FMD, with low I, medium T&T,

					high S
	22.Rajsamand	51	21	28	PFHA, with high I, low T&T, medium S
	23.Rewa Talai	88	5	7	PFHA, with high I, low T&T, medium S
	24.Bhalariya	66	14	20	PFHA, with high I, low T&T, medium S
	25.Rikhabdeo	27	35	38	FHD, with low I, medium T&T, high S
	26.Sagwara	31	44	25	FMD, with medium I, high T&T, low S
	27.Salumbar	21	45	34	FMD, with low I, high T&T, medium S
	28.Sarwar	48	30	22	FMD, with high I, medium T&T, low S
	29.Sheoganj	27	48	25	FMD, with medium I, high T&T, low S
	30.Sirohi	20	31	49	FMD, with low I, medium T&T, high S
	31.Udaipur	31	36	33	FHD, with low I, high T&T, medium S
	32.Vijainagar	42	38	20	FHD, with high I, medium T&T, low S
	33.Kanor	33	31	36	FHD, with medium I, low T&T, high S
	34.Dhariwad	32	35	33	FHD, with medium I, high T&T, low S

I= Industry T&T= Trade and transport S= Services

From the above table we observe that, most of the urban settlements in Rajasthan, are trade and transport towns amounting to 91 out of 222 towns followed by industrial towns which are 87 in number, almost equivalent to the trade and transport towns while the least are service towns, only 44 in number.

Even at the regional level the picture is much the same, like the state as a whole, with most of the regions accounting for majority of trade and transport towns, 42 out of 90 in the Arid Region and 15 out of 34 in the Aravalli Hill Region while in the East Rajasthan Plains, the industrial towns and the trade and transport towns are equal in number i.e. 19 each and in the Plateau Region, the industrial towns are more in number i.e. 18 out of 44 than the trade and transport towns which are 15 in number. The service towns are the least everywhere speaking of the low development of the tertiary sector with only 8 out of 90 in the Arid Region, 16 out of 54 in the east Rajasthan Plains, 11 out of 44 in the Plateau Region and 9 out of 34 in the Aravalli Hill Region.

Hence, we may say that so far as the economic or the functional characteristics of the urban settlements in Rajasthan is concerned, most of them are trade and transport towns or industrial towns, while service towns are very few in number.

5.3: CONCLUSION

Towns and cities as already said are too varied in their characteristics, which necessitates and provides a scope for their classification. These characteristics may be their physical, demographic, social or economic characteristics based on each of which we may classify them.

Rajasthan being a land of diversity, her urban settlements have grown against different physical backgrounds, largely against the background of the arid plains, coming under the Arid Region, which occupies the largest areas of the state. Hence, the rainfall amount again largely varying within the state, most of the urban settlements being located in the arid plains accounts for low amount of average annual rainfall. The demographic characteristics of the urban settlements exhibits a close match with their physical characteristics with most of the urban units having a medium density of population. On the social front, the state accounts for a low level of literacy and a moderate sex ratio while on the economic front, most of the towns have developed as seats of trade and transport or as industrial towns with the service sector being largely undeveloped.

Though the state exhibits a high degree of diversity, yet so far as the characteristics of the urban settlements are concerned, even going down at the regional level much of the scenario remains the same with the state as a whole.

REFERENCES

1. **Ramachandran, R.** (1989), "*Urbanisation and Urban Systems in India*", OUP, New Delhi.
2. **Aurousseau, A.** (1921), "*The Distribution of Population: A Constructive Problem*",
Geographical Review, Vol.II.
3. **Harris, C.D.** (1943), "*A Functional Classification of the Cities in the United States*",
Geographical Review, Vol.33.
4. **Nelson, H.J.** (1955), "*A Service Classification of American Cities*", Economic Geography,
Vol.11.
5. **Ahmed, Qazi** (1965), "*Indian Cities: Characteristics and Correlates*", The Department of
Geography Monograph Series, University of Chicago.
6. **Lal, Amrit** (1959), "*Some Aspects of Functional Classification of Cities and a Proposed
Scheme for Classifying Indian Cities*", The National Geographical
Journal of India, Vol.5.
7. **Mitra, Ashok** (1964), "*A Functional Classification of Indian Towns*", Institute of Economic
Growth, India.

CHAPTER 6: RELATIONSHIP AND HIERARCHY OF URBAN SETTLEMENTS

6.1: INTRODUCTION

Having discussed about the urban settlements of Rajasthan from different aspects in our previous chapters, treating them as discrete objects and trying to differentiate them across space speaking about their spatial patterns and its variations in the different geographical regions of the state; over time through their temporal growth in different size classes as well on the basis of their characteristics, an effort would now be made in this chapter to establish some sort of relationship between these urban settlements as well as arrange them into some form of hierarchy with a view to integrate them, because no matter how much a settlement may be different from the other, they cannot exist in isolation and there ought to exist a kind of interdependence between them, thus constituting a unified whole or a 'settlement system'. It is this notion of interdependence, which is of fundamental importance in the study of urban settlements.

6.2: SETTLEMENT SYSTEMS---MODELS AND THEORIES

When we talk of settlement system, what we conceive is, a balanced system of settlements with a stepped hierarchy and uniform distribution over space, this being considered as the ideal state. Several models have been used to demonstrate this balanced system explaining the relationship between the individual units. While some of these are normative and suggest the state of an ideal relationship where the system is in equilibrium, others explain real situations and the nature of interaction. Again, while some are spatial, others are a-spatial dealing with inter-settlement relationships only. But, since we have already dealt with the spatial aspect before, in this chapter, we shall

concentrate only on the a-spatial models, and, before we try to find out as to what kind of relationship exist between our studied urban settlements of Rajasthan, it is essential to briefly discuss about these models for our better understanding.

6.2.1: THE RANK-SIZE RULE

The credit for the formulation of the Rank-Size Rule goes to *G.K.Zipf*¹(1940), his study being based on the 100 largest metropolitan districts in U.S.

Zipf viewed the total settlement system as a balance between the two forces of unification and diversification. It is observed that, in any region, large settlements like cities are fewer in number than smaller settlements like villages, and that, there is normally found a gradation in the size of settlements between the smallest and the largest, size in this case being measured by population figures. Such observations have led to the formulation of the Rank-Size Rule, describing the relationship between the 'size' of a settlement and its 'rank' with reference to the largest city in the region.

Zipf further postulated that the rank-size relationship of settlements could be expressed in the following mathematical form:

$P_r = P_1/r^q$, where, P_r = population of the r ranking city;

P_1 = population of the first ranking city;

q= an exponent which can take any value but is often assumed to be unity.

The exponent 'q', however, cannot assume a negative value, or then, the rule will be disturbed, as the latter ranking settlements would then have larger population than the first; and, when the value of 'q' ranges between 0 and 1, decline in population with rank is gradual while a value greater than unity suggests a rapid decline.

Assuming the value of 'q' to be unity, the rule suggests that the second ranking settlement would have half the population of the first ranking settlement, the third ranking settlement one-third, and so on.

$y = ae^{(-b \log x)^2}$, where, x = logarithmic values of the rank (R) of the city;
 y = logarithmic values of the corresponding population (P_r) of the city;
 a = intercept of the equation; and,
 b = slope of the equation.

Statistically, the rank-size rule can be examined by fitting a regression equation Log P on Log R. The regression coefficient of this line reflects the degree of primacy in the entire urban system and the coefficient of determination may be taken as a measurement of its goodness fit to the system of the rank-size regularity.

6.2.2: THE PRIMATE CITY MODEL: A CONTRAST TO RANK-SIZE RULE

The concept of a 'primate city' was formulated by *Mark Jefferson*², in his paper entitled 'Law of the Primate City' (1939), which conceives of a first city, several times larger than the second, which is super-eminent not only in size, but is also likely to dominate the cultural, political and economic scenario of the entire region. This idea is hence in direct contrast to the Rank-Size Rule.

In a study by *Berry and Horton*³, it was found that, primacy mostly occurs in:

- i. small countries engaged in the production of a relatively few commodities;
- ii. countries with commercialization superimposed on a subsistence level peasant agricultural system;
- iii. small countries with single subsistence economies; and,
- iv. countries which, traditionally had been empires.

Primacy can be measured using the '*primacy index*' which can be a----

i. *two-city index*, whereby,

Primacy Index (PI) = P_1/P_2 , where, P_1 = population of the first ranking city; and
 P_2 = population of the second ranking city.

ii. *four-city index*, whereby,

Primacy Index (PI) = $P_1/P_2+P_3+P_4$, where, P_1 and P_2 are same as above,

P_3 = population of the third ranking city; and,

P_4 = population of the fourth ranking city.

Urban primacy develops largely due to agglomerative tendencies of various functions. Therefore, higher the degree of concentration of urban functions, higher is the primacy index.

6.2.3: BINARY PATTERN

Haggett speaks of a third pattern, namely, '*binary pattern*', with several large cities that are roughly equal in size and a tail of smaller cities, generally observable in small settlement systems that evolve under a homogeneous environment.

6.2.4: THE CONCEPT OF URBAN HIERARCHY

A settlement system is formed of different classes of settlements and thereby these settlements can be arranged into some form of hierarchy. Thus, we may have administrative hierarchy of settlements, (like, in India, starting with the national capital, then state capitals, district headquarters and so on); or we may have demographic hierarchy (as in India, provided by the Census as metropolitan cities first, then, one-lakh cities, intermediate towns, medium towns, small towns etc). But a better way of arranging the urban settlements into a hierarchy is on the basis of their functions. Hence, when we speak of urban hierarchy, we can very well arrange the urban settlements on the basis of their functions. The urban settlements may be

ranked according to their functions, there being also a relation between rank and population of these urban settlements and the number of people usually increasing with the increasing rank of the settlements. Therefore, we get a functional hierarchy of settlements.

6.3: APPLICATION OF SETTLEMENT SYSTEM MODELS IN THE DIFFERENT GEOGRAPHICAL REGIONS OF RAJASTHAN

Since we had always so far followed a regional approach, hence, here too, before we deal with urban settlements of the state as a whole, we would like to highlight on the different geographical regions first and then go for the state as a whole; because, beginning with, in the 3rd chapter our approach was from unification to diversification whereby we had divided the state as a single unit into four geographical regions. In this chapter our approach would just be the reverse i.e. from diversification to unification, proceeding from the individual regions to the state as a unified whole.

We had already seen that in 1991, there were 34, 44, 54 and 90 urban centers in the Aravalli Hill Region, Plateau Region, East Rajasthan Plains and Arid Region respectively.

As the Rank-Size Rule portrays an ideal equilibrium state, whereby, the forces of unification and diversification of settlements are in a perfect balance, we had first tested the applicability of this rule in each of these regions. The outcoming results were really interesting. Just as the settlements had exhibited variations amongst themselves before, even in case of inter-settlement relationship across the regions, marked variations were observable (refer to Appendices VI—I, II, III and IV), for while of the two regions---Aravalli Hill Region and the Arid Region showed rank-size relationship, the other two regions---the Plateau Region and the East Rajasthan Plains exhibited primacy patterns.

From Appendices VI—I, II, III and IV, we get the population of the urban centers in the different regions according to the rank-size rule. Let us now consider each of the regions separately.

Aravalli Hill Region

The 34 urban centers here were arranged according to rank-size rule, using the formula,

$P = KR^b$, where, P is the population of the town whose rank is R, and,
K and b are constants.

Thereafter the relationship was transformed into a linear relationship by taking the logarithmic values of both the sides. The regression equation of Log P (Y) on Log R (X) was obtained as

$\text{Log } P = 5.689559 - 1.219200 \text{ Log } R$, where, Log K= 5.689559, and,
B= 1.219200.

The value of 'b' here is significant at .01% level of significance and the coefficient of determination was found to be 0.9598 i.e. 95.98% variations in Log P are being explained by Log R which may be treated as a very high level of explanation.

It is evident from Appendix VI-I that the estimated population according to rank-size rule sums to 14,95,110 while the actual population is 14,77,811 i.e. less than what it should be according to the rule. However, there is not much difference between the actual and the estimated population, only a difference of 17,299 indicating a deviation of 64.12%.

Moreover, considering individual urban units, nowhere the difference between the actual and the estimated population is that high except in the case of the second ranking city, but that also does not exceed 50% and it has been balanced by positive

deviations in other urban centers. Also, conforming to the rule, while the estimated population shows the first ranking city Ajmer having twice the population (2.33 times) the population of the second ranking city, thrice (3.81 times) the population of the third ranking city and so on, for actual population also, though the first ranking city may not have twice (1.31 times) the population of the second ranking city here the deviation being the maximum, both Ajmer and Udaipur being big and important cities, but for the latter ranking cities it has thrice (3.77 times) the population of the third ranking city, four times (4.91 times) the population of the fourth ranking city and so on. Hence, we may well say that, this particular region very well conforms to the rank-size regularity.

The Plateau Region

Using the same formula as above, we get the regression equation of Log P (Y) on Log R (X) as

$$5.638854 - 0.947169 \text{ Log R.}$$

The value of 'b' here is significant at .01% level of significance and the coefficient of determination was found to be 0.9388 i.e. 93.88%.

From Appendix VI- II, we see that, when the urban centers have been arranged according to rank-size rule, the actual populations of the cities are not the same as their estimated values, with the summation of the actual population exceeding that of the estimated population. While the actual population of the 44 urban centers is 13,46,068, the estimated population is 15,67,214, which means that the total population of all the urban centers has an excess of 2,21,146 people than what it should be according to the rank-size rule, showing a deviation of almost 100% i.e. 94.43%.

The deviation becomes all the more prominent in case of the first city, Kota, if we consider the individual urban units, where the deviation is almost nearing 100% i.e. 90.67% with Kota having an excess of 2,55,541 people. Also, in reality, Kota has almost thrice (2.92 times) the population of the second ranking city Bhilwara and almost 8 times (7.51 times) the population of the third ranking city, Chittaurgarh.

Thus, this region shows a deviation from rank-size regularity exhibiting a kind of primate trend (as has been worked out from the primacy index in Appendix VI-II).

The East Rajasthan Plains

The regression equation of Log P (Y) on Log R (X) here is

$$5.696067 - 0.989564 \text{ Log R.}$$

The value of 'b' in this case is significant at .01% level of significance and the coefficient of determination was found to be 0.9361 i.e. 93.61% indicating the lowest level of explanation among all the four regions.

A look at Appendix VI-III shows that after the 54 urban centers had been arranged as per the rank-size rule, the estimated population sums to 23,06,827 while the actual population amounts to 31,18,223 i.e. the actual population has an excess of 8,11,396 from what it should have been conforming to the rank-size regularity and showing a deviation of more than 100%, almost nearing to 200% i.e. 175.7%.

The deviation is highly prominent for the first city, Jaipur showing a difference of almost 200% i.e. 193.65%, the actual population being greater than the estimated population. All the more, deviating from the regularity, Jaipur shadows the other urban centers of the region with its population being 7 times (6.94 times) the population of the second ranking city, Alwar if a two-city primacy index is worked out (as has been in Appendix VI-III). Even a four-city primacy index may be found which equals to 3.168.

Thus, the East Rajasthan Plain greatly shows a primate pattern with Jaipur standing as the apex city.

The Arid Region

The regression equation of Log P (Y) on Log R (X) for this region is

$$5.758317 - 0.871642 \text{ Log R.}$$

The value of 'b' was found to be significant at .01% level of significance and the coefficient of determination as 0.9770 i.e. 97.7%, the highest among all the regions and an explanation which is rarely found in any bivariate case.

Appendix VI-IV shows that with 90 urban centers being arranged according to the rank-size rule, the estimated population totals to 38,22,157 while the actual population totals to 38,96,699, the difference here being the minimum amidst all the geographical regions i.e. 74,542 indicating a deviation of only 63.37%. Also, conforming to the Rule, the population of the first ranking city, Jodhpur is almost twice (1.6 times) the population of the second ranking city, and so on.

Therefore, while the Arid Region may be considered as best exemplifying the Rank-Size Rule, the East Rajasthan Plains may be treated as exhibiting primacy *par excellence*.

After having discussed the nature of relationship among the urban settlements in the different geographical regions we may now proceed for the process of unification in which we shall see as to which of the models of the settlement systems are applicable for the state of Rajasthan as a whole considering the year 1991.

6.4: APPLICATION OF SETTLEMENT SYSTEM MODELS IN THE STATE OF RAJASTHAN AS A WHOLE

While testing as to which of the settlement system models are applicable in the entire state of Rajasthan, as is evident from Appendix VI- V, it was found out that, when all the 222 urban centers of 1991 were arranged as per rank-size rule, the actual population amounted to 1,00,67,172 while the estimated population was much more i.e. 1,61,29,238, an excess of 60,62,065. Therefore, in reality, the actual population is less than what it should be according to the Rule.

Also, even in case of Jaipur, the largest and the only million –plus city in the state, a high positive deviation is indicated, meaning that the actual population is much less than it should have been conforming to the rank- size regularity. Almost all the big cities show a positive deviation till the city with the rank 83rd, after which negative deviations i.e. actual population being larger than the estimated population, is exhibited generally in those cities with population around 20,000 and below. These are mainly the class III and IV towns, which as evident from the previous chapters has shown maximum growth over the years. However, again from the 209th ranking city a positive deviation is shown till the last ranking city.

With the regression equation of Log P (Y) on Log R (X) being $6.574814689 - 1.149769229 \text{ Log R}$, the different urban centers of the state was arranged according to rank- size rule. The value of 'b' was found to be significant at .01% level of significance and the coefficient of determination was found to be very high -.

Conforming to the Rule, it was also determined that the actual population of the first ranking city, Jaipur was exactly twice the population (2.1 times) the population of the second ranking city, Jodhpur, almost thrice (2.7 times) the population of the third ranking city, Kota, four times that of the fourth ranking city (3.5 times), Bikaner and so on.

Thus, the year 1991 portrays an ideal situation of equilibrium, a situation very close to the Rank- Size Regularity with the size of the urban centers having a high relationship with their respective ranks.

6.5: ARRANGEMENT OF URBAN CENTERS INTO A HIERARCHICAL ORDER

With all the urban centers being arranged according to the Rank-Size Rule, an effort was then made to arrange them into some form of hierarchy as well. Several scholars having devised various methods of finding out urban hierarchy, what was done here is that, 5 functions were chosen viz., primary schools, medical facilities, banking facilities, road length and cinema halls. On the basis of their importance, these were assigned the weightage of 1,2,3,4 and 5 respectively, the functions belonging to educational, health and financial, facilities, civic amenities and cultural facilities respectively. Thence each of the weights was multiplied by their corresponding ranks (each urban center being ranked separately for each individual functions) and the summing the products, a **composite score** was obtained (Appendix VI-VI). For the purpose of making the composite scores scale- free, each were divided by 5 to get a **composite index** for each urban center. These composite indices were then grouped into different ranges and the urban units then categorized depending on the rank they belong to, with an aim of arranging them into an hierarchy based on the ranges of the composite indices.

Thus, all the 222 urban settlements of Rajasthan were arranged into the following form of hierarchical order.

**TABLE 6.1: HIERARCHICAL ORDER OF URBAN SETTLEMENTS IN
RAJASTHAN**

Composite Index Value	Hierarchical Order	Name of the Urban Settlement
600 and above	I	Jaipur, Jodhpur, Kota, Bikaner, Udaipur, Alwar, Bhilwara, Ganganagar, Bharatpur, Sikar, Pali, Tonk and Hanumangarh.
480 – 599.99	II	Ajmer, Beawar, Churu, Kishangarh, Sawai Madhopur, Jhunjhunu, Chittaurgarh, Gangapur City, Barmer, Dhaulpur, Nagaur, Sardar Shahar, Banswara, Makrana, Fatehpur, Hindaun, Balotra, Suratgarh, Rajsamand, Jaisalmer, Chomu, Sanganer, Dungarpur, Kotputli, Nathdwara, Bhawani Mandi, Pratapgarh, Sirohi, Raisinghnagar and Sumerpur,
360 – 479.99	III	Sujangarh, Bundi, Baran, Ratangarh, Karauli, Rajgarh, Nasirabad, Nimbahera, Abu Road, Kuchaman

		City, Dungargarh, Nokha, Deeg, Jalore, Deedwana, Nohar, Merta City, Bilara, Bhinmal, Sojat, Chirawa, Bayana, Pilibanga, Kekri, Sangaria, Sri Madhopur, Shahpura, Jhalrapatan, Lakheri, Khairthal, Neemka-Thana, Sagwara, Anupgarh, Rawatsar, Pilani, Ranigang Mandi, Chaksu, Rajgarh, Sadul Shahr, Nadbal, Deoli, Kumher, Phalna, Kapasan, Begun, Mount Abu, Bagru, Bassi, Vijainagar, Chhipabarod, Kaprain and Beejoliya Kalan,
240 – 359.99	IV	Nawalgarh, Ladnu, Lachhmangarh, Phalodi, Jhalawar, Dausa, Bari, Rawatbhata, Bhadra, Pipar City, Kaman, Malpura, Gothra, Amber, Bidasar, Niwai, Kishangarh, Renwal, Sadri, Lalsot, Sambhar, Vijainagar, Khandela, Sheoganj, Gulabpura, Phulera, Sanchore, Antah, Karanpur, Shahpura,

		<p>Khetri, Reengus, Mandal, Todabhim, Mandalgarh, Surajgarh, Bandikui, Chhabra, Behror, Nagar, Siwana, Keshoraipatan, Sangod, Chhapar, Gangapur, Jahazpur, Pokharan, Bhinder, Chhoti Sadri, Amet, Aklera, Salumbar, Deogarh, Padampur, Mahwa, Raipur, Nainwa, Kesrisinghpur, Sojat Road and Bhawri,</p>
120- 239.99	V	<p>Ramgarh, Rajakhera, Taranagar, Udaipurwati, Manoharpur, Rajaldesar, Losal, Todaraisingh, Bissau, Fatehnagar, Baswa, Kaithoon, Napasar, Bali, Tijara, Bhiwadi, Pindwara, Mukandgarh, Weir, Nawa, Jaitaran, Bhusawar, Kuchera, Bari Sadri, Viratnagar, Samdari, Mundwa, Sarwar, Takhatgarh, Kherli, Vidyavihar, Pushkar, Sunal, Kanod, Asind, Khanpur, Parbatsar, Pirawa, Rani, Jobner,</p>

		Partapur, Ratannagar, Kushalgarh, Uniara, Dhariawad, Gajsinghpur, Rewa Talai, Rikhabdeo, Manohar Thana, Goredi Chancha and Kolvi@ Rajendrapur,
Below 120	VI	Mangrol, Mandawa, Nimaj, Deshnoke, Naraina, Baggar, Suket, Satal Kheri, Marwar Junction, Govindgarh, Bhalariya, Sewar Kalan, Udpura, Galiyakot, Todra, Indergarh and Borkhera.

A look at the hierarchical order of the urban centers suggests that, like a relationship existing between rank and size of an urban unit, there also exists a kind of relationship between the rank, size and the hierarchical order of the urban settlements in Rajasthan, with the higher ranking cities in the beginning with larger population standing at the top of the order contrary to which, the tail enders with fewer population occupying the bottom position and those being medium in rank and size standing at the medium level. This is because, it is quite but natural, that where more population is concentrated, the facilities will be more and *vice versa*.

6.6: CONCLUSION

From this chapter we see, that though there exists inter- regional differences in the relationship of urban settlements, but when all the urban settlements of the state are integrated into a single settlement system, they exhibit a close conformity to Rank-Size Regularity. Thereafter, when all the urban settlements were arranged into a hierarchy, there seemed to exist a relationship between the size and hierarchical order of the settlements as well.

Thus, the urban settlements in Rajasthan beautifully portray a trio relationship of rank, size and hierarchical order of urban settlements.

REFERENCES

1. **Zipf, G.K.** (1941), "*National Unity and Disunity*", Principia Press, Bicomington, Illinois.
2. **Jefferson, Mark** (1939), "*The Law of Primate Cities*", Geographical Review, Vol.29.
3. **Berry, B.J.L and F.E Horton** (1970), "*Geographic Perspective on Urban Systems*", Prentice Hall Inc., New Jersey.
4. **Haggett, Peter** (1972), "*Geography: A Modern Synthesis*", Harper and Row Publishers, New York.
5. **Brush, J.E.** (1953), "*The Hierarchy of Central Places in South Western Wisconsin*", Geographical Review, Vol.XLL.
6. **Christaller, W.** (1933), "*Central Places in Southern Germany*", (translated in English by **C.W.Baskin**), Englewood Cliffs, Prentice Hall.
7. **Jaffe, A.J.** (1945), "*Population Trends and City Growth*", The Annals of the American Academy of Political and Social Sciences, Vol.242, November.
8. **Losch, A.**(1954), "*The Economics of Location*", Yale University Press, New Haven(translated in English by **Woglom, W.H and W.F Stopler**).
9. **Philbrick, A.K** (1957), "*Areal Functional Organisation*", Regional Geography, Vol.33.
10. **Sen, L.K** (1971), "*Planning of Rural Growth Centres for Integrated Development: A Study in Miryalguda Taluka*", NIDC, Hyderabad.
11. **Singh, B.L** (1985), "*Rank Size Relationship in the Central Place System of Mithila Plain, North Bihar*", National Geographical Journal of India, Vol.31.
12. **Smailes, A.E.** (1944), "*The Urban Hierarchy of England and Wales*", Geography, Vol.29.

13. **Stewart, J.Q** (1947), "*Empirical Mathematical Rules Concerning the Distribution and Equilibrium of Population*", The Geographical Review, Vol.37, No.3.
14. **Stewart, Charles, T. Jr.** (1958), "*The Size and Spacing of Cities*", The Geographical Review, Vol.48.
15. **Tripathi, R.M.** (1999), "*Urbanisation and Urban Hierarchy in U.P.*", Geographical Review of India, September.

CHAPTER 7: SUMMARY AND CONCLUSION

Rajasthan is a land of diversity which finds expression in her physical as well as cultural landscape. In this study of urban settlements much of the same is reflected.

This study of urban settlements was undertaken, to look into their spatial pattern, growth and characteristics because development of urban settlements may be treated as a fair index of the level of socio-economic development of any area. Though Rajasthan occupies a low position in terms of percentage share of the country's urban population, yet her potentialities of mineral and power resources provides much scope for expansion of the secondary and the territory sectors and consequent growth of urban settlements.

The study of any aspect of an area requires a thorough understanding of the geographical background of that place and especially in a land, which is so diverse. Hence, a broad study of the geographical settings of the state was undertaken in **Chapter 2** named "*Geographical Background*", which revealed how one part of the state varies from the other.

The study of the geographical background was essential because 'space' being a fundamental concept in geography, with each minutest unit of space varying from each other, again some showing common features as well. Thus, space can be divided into several regions on the basis of some likeness among its different spatial units, and the variations across space can be even understood better. The whole state of Rajasthan was divided into four-geographical regions, namely , the Arid Region, the East Rajasthan Plains, the Plateau Region and the Aravalli Hill Region.

The study began with an approach of differentiation where the state was divided into several regions and each region studied separately which had been maintained throughout and it ended with an approach of integration with the settlements being treated as a part of a single unified system. As already mentioned, 'space' being of fundamental importance for geographers, hence, the first and foremost aspect of this study that was taken up was the "*Spatial Pattern of Urban Settlements in Rajasthan*", in **Chapter 3** and how they varied across

the four different regions. Both a descriptive approach based on geographical understanding of different areas as well as quantitative approach using nearest neighbour analysis were undertaken and the results of both were found to be matching with one another. A land of diversity, each of the four regions presented with different spatial pattern of urban settlements. The Arid Region, with hostile environment and unfavorable conditions for human settlements, had shown random pattern of urban settlements. Here settlements have grown wherever favourable condition particularly with scope of industrial development and development of means of transportation and communication may be found. On the other hand, the East Rajasthan Plains, the entire region presenting with favourable conditions for human settlement and uniform development of all places being close to the main hinterland of the Northern Plains; there approaching uniform spatial pattern of urban settlements were found. The Plateau Region also exhibited an approaching uniform spatial pattern. The Aravalli Hill Region considered to be a negative area for being hilly, theoretically, had shown clustered pattern, with most urban settlements concentrated in the northern part, than in the south.

Another concept which is integrally related with space in the concept of time, which was expressed in terms of 'growth' of the urban settlements over a specified period, as we often speak of 'space-time framework'. In **Chapter 4** titled "*Growth of Urban Settlements in Rajasthan*", it was observed that, taking the time period of 1961 to 2001, there has always been a growth of urban settlements over the years which was slow in the initial decade of 1961 to 1971, as the state had just come into existence in 1956. Again there was a rapid spurt in growth in between 1971-1981 and again a downward trend was noticed from 1981 –1991 and finally in the last decade, no growth of urban settlements were observed.

Growth of urban settlements being a function of several socio-economic and demographic factors, growth of urban settlements in Rajasthan was discussed in light of these factors. Several indicators belonging to each of the broad factors affecting growth of urban settlements were selected and growth of urban

settlements analysed in light of those, like number of industrial areas as representing economic factor, then, percentage of urban population being treated to represent demographic factor, and literacy rates as representing social factor. Considering each of these indicators as independent variables and the number of urban settlements as the dependent variable, correlation was run separately for each of them. It was found that, while the relationship of the number of urban settlements with the number of industrial areas and the percentage of urban population were highly positive and significant, that with literacy rates though highly positive was insignificant.

At the regional level, in all the regions, trend of the growth was much the same as that of the state. However, so far as their relationship with different factors was concerned they greatly differed from each other. The Arid Region, in spite of accounting for the maximum number of urban settlements and the maximum number of industrial areas did not reveal any significant relationship between the two and much of these can be attributed to the space factor. As it covers the largest area with majority districts, so it ought to have maximum number of settlements or most of the industrial areas. In this region, as well as in the East Rajasthan Plains, much of the growth of urban settlements may be attributed to the demographic factor which however, indicates a negative relationship in other two regions. In the other two regions i.e. the Plateau and the Aravalli Hill Regions, growth of urban settlements may be largely attributed to industrial factor. So far as literacy rate is concerned, only the Aravalli Region showed a highly positive and significant relationship with number of urban settlements while in the other regions, they were highly insignificant.

Growth of urban settlements in different size classes had revealed that, over the years, maximum growth of urban settlements had taken place in classes III, IV+ V with class IV leading till 1991 and taken over by class III towns in 2001. This is because in Rajasthan the infrastructure had not been developed to the extent to support big cities and thus, most of the urban units had been smaller size excepting few. The different regions show like feature as the whole state in this context.

Having seen how urban settlements vary across space and over time, next was **Chapter 5** dealing with the *“Characteristics of Urban Settlements in Rajasthan”*. With any urban unit being considered to be developed against a definite physical background, having a particular demographic scenario, a social set up and performing some distinct function or a definite economic activity, each of these may be treated as their characteristics. Hence, location type was selected as physical characteristic and it was found that most of the urban units had developed against the background of arid plains. The demographic characteristics expressed through population density showed a close match with the physical characteristics with majority of the urban centers in Rajasthan having only a medium density of population. Even at the regional level, the same thing is highlighted. However, interestingly the Arid Region also recorded for the maximum numbers of urban units with high population density because urban facilities being available in few favoured pockets, the population is concentrated in those areas, and in the rest of the area the low population density speaks of the true character of this region. Elsewhere, the population density had not very high, the regions, especially the Plains and the Plateau, that had favourable situation for human settlements throughout, with the urban facilities being almost evenly distributed in the all towns, and hence, the population need not to be concentrated in few areas. On the social front, that considers literacy rates, the urban settlements, even being seats of development, did not portray a satisfactory scenario. The Arid Region and the East Rajasthan Plains, in spite of containing the majority of the urban settlements within them, had low level of literacy. It was only the Aravalli Hill Region accounting for a high level of literacy. On the economic front, when a functional classification of the towns was attempted, it was found that most of the towns were either trade and transport towns, or were industrial towns, while the service towns had been minimum thus speaking of the poor development of the service sector.

Finally, **Chapter 6** named *“Relationship and Hierarchy of Urban Settlements”*, had tried to portray on a hierarchy of urban settlements in the state

based on certain selected functions they perform and calculating a composite index on that basis. Hence, the concluding part of this study dealt with this.

However, the same regional approach was followed here too, apart from dealing with all the urban units in Rajasthan as a whole. It was observed that urban units in Rajasthan exhibited rank-size rule *par excellence* with Jaipur being the first ranking city followed by Jodhpur having almost half the population of Jaipur, then Kota, with one-third and so on,. However, when different regions were considered, while the Arid and the Aravalli Hill Regions showed cases of rank-size rule, the East Rajasthan Plains and the Plateau Region exhibited primate pattern with Jaipur and Kota being the primate cities respectively. Based on composite indices as the urban centres were arranged into an hierarchical order, a beautiful relationship came out between the ranks, size and hierarchical order of the urban units with higher ranking towns with larger population occupying higher position in the hierarchy and vice versa.

Thus, the study of urban settlements in Rajasthan offered a very interesting study. Diversity being another name of the land, it was reflected in each and every aspect of the urban settlements.

Before concluding, one thing that can be said is that, though the state occupies a bottom position in the country, in the urban aspect yet, there are much scope for the growth and development of more urban settlements here, provided her rich potentialities of industrial resources of mineral and wealth are harnessed properly and efficiently for industrial development, as often it is considered that urbanization and industrialization go hand-in-hand.

APPENDIX - IV-I

Correlation Between Number Of Urban Settlements & Number Of Industrial Areas In Rajasthan, (1961-2001).

X-Variable : Number Of Industrial Areas

Y-Variable : Number Of Urban Settlements

Correlation Coefficient : +0.92

't' Value : 4.043

Level Of Significance: 0.05

APPENDIX - IV-II

Correlation Between Number Of Urban Settlements & Percentage Of Urban Population In Rajasthan, (1961-2001).

X-Variable : Percentage Of Urban Population

Y-Variable : Number Of Urban Settlements

Correlation Coefficient : + 0.99

't' Value : 12.155

Level Of Significance: 0.01

APPENDIX - IV-III

Correlation Between Number Of Urban Settlements & Literacy Rates In Rajasthan, (1961-2001)

X-Variable: Literacy Rates

Y-Variable: Number Of Urban Settlements

Correlation Coefficient : +0.81

't' Value : 2.43

Level Of Significance: 0.50

APPENDIX - IV - IVa

Correlation Between Number Of Urban Settlements & Number Of Industrial Areas In Arid Region Of Rajasthan (1961-2001).

X- Variable : Number Of Industrial Areas

Y- Variable : Number Of Urban Settlements

Correlation Coefficient : +0.80

't' Value : 2.309

Level Of Significance : 0.50

APPENDIX - IV - IVb

Correlation Between Number Of Urban Settlements & Number Of Industrial Areas In East Rajasthan Plains (1961-2001)

X- Variable: Same as Appendix-IV-IVa

Y- Variable: "

Correlation Coefficient : + 0.83

't' Value : 2.577

Level Of Significance : 0.10

APPENDIX - IV - IVc

Correlation Between Number Of Urban Settlements & Number Of Industrial Areas In Plateau Region Of Rajasthan (1961-2001)

X- Variable : Same as Appendix-IV-IVa

Y- Variable: "

Correlation Coefficient : +0.95

't' Value : 5.269

Level Of Significance : 0.02

APPENDIX - IV - IVd

Correlation Between Number Of Urban Settlements & Number Of Industrial Areas In Aravalli Hill Region Of Rajasthan, (1961-2001).

X- Variable : Same as Appendix-IV-IVa

Y- Variable: "

Correlation Coefficient : +0.99

't' Value : 12.155

Level Of Significance : 0.01

APPENDIX-IV-Va

Correlation Between Number Of Urban Settlements & Percentage Of Urban Population In Arid Region Of Rajasthan, (1961-2001).

X-Variable: Percentage Of Urban Population

Y- Variable: Number Of Urban Settlements

Correlation Coefficient: +0.92

't' Value: 4.066

Level Of Significance: 0.05

APPENDIX-IV-Vb

Correlation Between Number Of Urban Settlements & Percentage Of Urban Population In East Rajasthan Plains, (1961-2001).

X- Variable: Same as Appendix IV-Va

Y- Variable: ”

Correlation Coefficient: + 0.96

't' Value: 5.938

Level Of Significance: 0.01

APPENDIX - IV-Vc

Correlation Between Number Of Urban Settlements & Percentage Of Urban Population In Plateau Region Of Rajasthan, (1961-2001).

X- Variable: Same as Appendix - IV-Va.

Y- Variable: ”

Correlation Coefficient: -0.051

't' Value: 0.867

Level Of Significance: 0.50

APPENDIX - IV-Vd

Correlation Between Number Of Urban Settlements & Percentage Of Urban Population In Aravalli Hill Region Of Rajasthan, (1961-2001).

X-Variable: Same as Appendix - IV-Va.

Y- Variable: ”

Correlation Coefficient: -0.89

't' Value: 3.381

Level Of Significance: 0.10

APPENDIX - IV - VIa

Correlation Between Number Of Urban Settlements & Literacy Rates In Arid Region Of Rajasthan, (1961-2001)

X- Variable: Literacy Rates

Y- Variable: Number Of Urban Settlements

Correlation Coefficient: +0.59

't' Value: 1.262

Level Of Significance: 0.50

APPENDIX - IV - VIb

Correlation Between Number Of Urban Settlements & Literacy Rates In East Rajasthan Plains, (1961-2001).

X- Variable: Same as Appendix - IV - VIa

Y- Variable: ”

Correlation Coefficient: +0.79

't' Value: 2.232

Level Of Significance: 0.50

APPENDIX - IV - VIc

Correlation Between Number Of Urban Settlements & Literacy Rates In Plateau Region Of Rajasthan (1961-2001).

X- Variable: Same as Appendix - IV - VIa.

Y- Variable: ”

Correlation Coefficient: +0.76

't' Value: 2.009

Level Of Significance: 0.50

APPENDIX - IV - VI d

Correlation Between Number Of Urban Settlements & Literacy Rates In Aravalli Hill Region Of Rajasthan, (1961-2001).

X- Variable: Same as Appendix - IV - VIa.

Y- Variable: ”

Correlation Coefficient: +0.98

't' Value: 8.085

Level Of Significance: 0.01

APPENDIX-VI-T

Rank Size Rule In The Aravalli Hill Region Of Rajasthan, 1991.

Station	Rank	Estimated Population	Actual Population	Difference	% Difference
Ajmer	1	4,89,282	4,02,700	+ 86,582	+ 17.69
Udaipur	2	2,10,157	3,08,571	- 98,414	- 46.83
Beawar	3	1,28,190	1,06,721	+ 21,469	+ 16.75
Kishangark	4	90,267	81,948	+ 8,319	+ 9.22
Banswara	5	68,766	67,908	+ 858	+ 1.25
Nasirabad	6	55,060	42,208	+ 12,852	+ 23.34
Abu Road	7	45,626	39,802	+ 5,824	+ 12.76
Rajsamand	8	38,771	38,831	- 60	- 0.15
Dungarpur	9	33,585	35,681	- 2,096	- 6.24
Nathdwara	10	29,536	30,878	- 1,342	- 4.54
Sirohi	11	26,296	28,117	- 1,821	- 6.93
Kekri	12	23,649	25,573	- 1,924	- 8.14
Sagwara	13	21,451	22,240	- 789	- 3.68
Vijainagar	14	19,597	20,603	- 1,006	- 5.13
Sheoganj	15	18,016	19,866	- 1,850	- 10.27
Fatehnagar	16	16,653	16,485	+ 168	+ 1.01
Mount Abu	17	15,467	15,593	- 126	- 0.81
Pindwara	18	14,425	15,185	- 760	- 5.27
Bhinder	19	13,505	14,739	- 1,234	- 9.14
Amet	20	12,687	14,614	- 1,927	- 15.19
Salumber	21	11,954	13,981	- 2,027	- 16.96
Deogarh	22	11,295	13,933	- 2,638	- 23.36
Sarwar	23	10,699	12,305	- 1,606	- 15.01
Pushkar	24	10,158	11,364	- 1,206	- 11.87
Kanod	25	9,665	11,080	- 1,415	- 14.64
Partapur	26	9,213	9,477	- 264	- 2.87
Kushalgark	27	8,799	9,341	- 542	- 6.16
Bhawri	28	8,418	9,019	- 601	- 7.14
Dhariawad	29	8,065	8,812	- 747	- 9.26
Rewa Talai	30	7,738	7,588	+ 150	+ 1.94
Rikhabdeo	31	7,435	7,435	0	0
Bhalariya	32	7,153	6,849	+ 304	+ 4.25
Galiyakot	33	6,889	5,996	+ 993	+ 14.41
Borkhera	34	6,643	2,468	+ 4,175	+ 62.85

APPENDIX - VI - II

So far as the inter-settlement relationship in the Plateau Region of Rajasthan in 1991 was concerned, the first-ranking city, Kota had a population of 5,37,371 which was almost thrice the population of the second-ranking city Bhilwara, with a population of 1,83,965.

Hence, a two-city primacy index was worked out.

$$\begin{aligned} \text{Primacy Index (PI)} &= \frac{5,37,371}{1,83,965} \\ \text{(Two-City)} & \\ &= 2.92 \end{aligned}$$

Hence, primate pattern seems to be operative in this region.

APPENDIX - VI - III

In the East Rajasthan Plains, the first ranking city in 1991, that is, Jaipur, had a population of 14,58,483, while the second ranking city, Alwar, a population of only 2,10,146.

Therefore, again a two-city primacy index was worked out.

$$\begin{aligned} \text{Primacy Index (PI)} &= \frac{14,58,483}{2,10,146} \\ \text{(Two-City)} & \\ &= 6.94 \end{aligned}$$

Even when a four-city primacy index was worked out, here combining the population of Alwar, Bharatpur with a population of 1,50,042 and Tonk with a population of 1,00,235, the primacy index was —

$$\begin{aligned} \text{Primacy Index (PI)} &= \frac{14,58,483}{(2,10,146 + 1,50,042 + 1,00,235)} \\ \text{(Four-City)} & \\ &= 3.168 \end{aligned}$$

Therefore, a high level of primacy may be observed in this region.

APPENDIX - IV - IV

Rank-Size Rule In The Arid Region Of Rajasthan, 1991

Station	Rank	Estimated Population	Actual Population	Difference	% Difference.
Jodhpur	1	5,73,216	6,66,279	- 93,063	- 16.24
Bikaner	2	3,13,276	4,16,289	- 1,03,013	- 32.88
Ganganagar	3	2,20,008	1,61,482	+ 58,526	+ 26.60
Sikar	4	1,71,213	1,48,272	+ 22,941	+ 13.39
Pali	5	1,40,950	1,36,842	+ 4,108	+ 2.91
Churu	6	1,20,240	82,852	+ 37,388	+ 31.09
Hanumangarh	7	1,05,122	82,733	+ 22,389	+ 21.29
Thunjhunu	8	93,572	72,187	+ 21,385	+ 22.85
Sujangarh	9	84,442	70,843	+ 13,599	+ 16.10
Barmer	10	77,033	68,625	+ 8,408	+ 10.91
Nagaur	11	70,892	68,194	+ 2,698	+ 3.81
Bardar Shakar	12	65,714	67,954	- 2,240	- 3.41
Makrana	13	61,285	66,720	- 5,435	- 8.87
Fatehpur	14	57,452	66,387	- 8,935	- 15.55
Batangarh	15	54,099	55,779	- 1,680	- 1.81
Nawalgarh	16	51,139	51,190	- 51	- 0.09
adnu	17	48,507	48,295	+ 212	+ 0.44
Balotra	18	46,150	46,858	- 708	- 1.53
Juratgarh	19	44,025	45,870	- 1,845	- 4.19
achhmangarh	20	42,100	44,560	- 2,460	- 5.84
Rajgarh	21	40,347	43,696	- 3,349	- 8.30
Taisalmer	22	38,744	39,286	- 542	- 1.39
Kuchaman City	23	37,272	38,735	- 1,463	- 3.93
Jungargarh	24	35,914	36,740	- 826	- 2.29
Vokha	25	34,659	36,463	- 1,804	- 5.20
Talove	26	33,494	35,854	- 2,360	- 7.05
Deedwana	27	32,410	33,650	- 1,240	- 3.83
Johar	28	31,399	32,889	- 1,490	- 4.75

APPENDIX - VI-V

Rank Size Rule Of The Urban Centres Of Rajasthan, 1991

Urban Centre	Rank	Estimated Population	Actual Population	Difference	% Difference
Jaiपुर	1	37,56,771	14,58,483	+ 22,98,288	+ 61.18
Jodhpur	2	16,93,166	6,66,274	+ 10,26,887	+ 60.65
Kota	3	10,62,271	5,37,371	+ 5,24,900	+ 49.41
Bikaner	4	7,63,106	4,16,289	+ 3,46,817	+ 45.45
Ajmer	5	5,90,419	4,02,700	+ 1,87,719	+ 31.79
Udaipur	6	4,78,763	3,08,571	+ 1,70,192	+ 35.55
Alwar	7	4,01,002	2,10,146	+ 1,90,856	+ 47.59
Bhilwara	8	3,43,930	1,83,965	+ 1,59,965	+ 46.51
Ganganagar	9	3,00,370	1,61,482	+ 1,38,888	+ 46.24
Bharatpur	10	2,66,100	1,50,042	+ 1,16,058	+ 43.61
Sikar	11	2,38,481	1,48,272	+ 90,209	+ 37.83
Pali	12	2,15,777	1,36,842	+ 78,935	+ 36.58
Beawar	13	1,96,805	1,06,721	+ 90,084	+ 45.77
Tonk	14	1,80,731	1,00,235	+ 80,496	+ 44.54
Churu	15	1,66,948	82,852	+ 84,096	+ 50.37
Hanumangarh	16	1,55,008	82,733	+ 72,275	+ 46.63
Kishangarh	17	1,44,571	81,948	+ 62,623	+ 43.32
Sawai Madhopur	18	1,35,376	77,690	+ 57,686	+ 42.61
Thunhuru	19	1,27,216	72,187	+ 55,029	+ 43.26
Chittaurgarh	20	1,19,931	71,569	+ 48,362	+ 40.32
Sijangarh	21	1,13,388	70,843	+ 42,545	+ 37.52
Bangapur City	22	1,07,483	68,886	+ 38,597	+ 35.91
Barmer	23	1,02,127	68,625	+ 33,502	+ 32.80
Dhaulpur	24	97,250	68,533	+ 28,717	+ 29.53
Nagaur	25	92,791	68,194	+ 24,597	+ 26.51
Sardar Shahr	26	88,700	67,954	+ 20,746	+ 23.39
Banswara	27	84,933	67,908	+ 17,025	+ 20.05
Makrana	28	81,455	66,720	+ 14,735	+ 18.09
Fatehpur	29	78,234	66,387	+ 11,847	+ 15.14
Bundi	30	75,243	65,047	+ 10,196	+ 13.55
Hindaun	31	72,459	60,780	+ 11,679	+ 16.12
		124,68,100	63,08,992	61,59,108	+ 1203.61

Rank	Urban Centre	Estimated Population	Actual Population	Difference	% Difference
34	Nawalgarh	65158	51190	+13968	+21.44
35	Keriali	63023	49008	+14015	+22.24
36	Ladnu	61014	48295	+12719	+20.85
37	Balotra	59121	46858	+12263	+20.74
38	Suratgarh	57336	45870	+11466	+19.99
39	Lachmangarh	55649	44560	+11089	+19.93
40	Rajgarh	54052	43696	+10356	+19.16
41	Nasirabad	52539	42208	+10331	+19.66
42	Nimbehara	51104	41921	+9183	+17.97
43	Abu Road	49740	39802	+9938	+19.98
44	Phalodi	48442	39286	+9156	+18.90
45	Rajsamand	47207	38831	+8376	+17.74
46	Jaisalmer	46029	38735	+7294	+15.85
47	Jhalwar	44904	38671	+6233	+13.88
48	Dausa	44342	38576	+5766	+13.00
49	Chomu	42803	38523	+4280	+9.99
50	Bari	41821	37537	+4284	+10.24
51	Kuchaman City	40879	36740	+4139	+10.13
52	Dungargarh	39977	36463	+3514	+8.79
53	Sanganer	39111	36462	+2649	+6.77
54	Nokha	38279	35854	+2425	+6.34
55	Dungarpur	37480	35681	+1799	+4.79
56	Deeg	36711	34083	+2628	+7.16
57	Jalore	35972	33650	+2322	+6.46
58	Deedwana	35260	32889	+2371	+6.72
59	Nohar	34574	32722	+1852	+5.36
60	Kotputli	33912	31749	+2163	+6.38
61	Merta City	33273	31728	+1545	+4.64
62	Bilara	32657	31157	+1500	+4.59
63	Nathdwara	32062	30878	+1184	+3.69
64	Bhimmal	31487	30731	+756	+2.40
65	Sijat	30930	30168	+762	+2.46
66	Bhawan Mandi	30392	29740	+652	+2.15
		1447240	1254262	+192978	+390.39

67.	Pratapgarh	29871	29443	+428	+1.43
68.	Rawatbhata	29367	29086	+281	+0.96
69.	Bhadra	28878	28912	-34	-0.12
70.	Sirohi	28704	28117	+287	+1.01
71.	Pipari City	27944	27828	+116	+0.42
72.	Chirawa	27499	27787	-288	-1.05
73.	Bayana	27066	26529	+537	+1.98
74.	Pilibanga	26646	26140	+506	+1.89
75.	Kekri	26580	25573	+1007	+3.79
76.	Saugaria	25841	25290	+551	+2.13
77.	Ranigarh	25456	24706	+750	+2.95
78.	Kaman	25081	24190	+891	+3.55
79.	Sri Madhopur	24716	23891	+825	+3.34
80.	Shahpura	24361	23644	+717	+2.94
81.	Malpura	24016	23618	+398	+1.66
82.	Grothra	23679	23465	+214	+0.90
83.	Amber	23352	23289	+63	+0.27
84.	Bidasar	23032	23256	-224	-0.97
85.	Thalapatam	22721	23067	-346	-1.52
86.	Raisinghnagar	22418	22894	-476	-2.12
87.	Lakheri	22122	22891	-769	-3.48
88.	Niwai	21833	22889	-1056	-4.84
89.	Rajakhera	21551	22755	-1204	-5.59
90.	Khairthal	21276	22741	-1465	-6.89
91.	Neemkathana	21007	22274	-1267	-6.03
92.	Sagwara	20745	22240	-1495	-7.21
93.	Rewatsar	20489	22126	-1637	-7.99
94.	Udaipurwati	20238	21982	-1744	-8.62
95.	Kishanganj Rewal	19994	21601	-1607	-8.04
96.	Taranagar	19754	21477	-1723	-8.72
97.	Pilani	19520	21430	-1910	-9.78
98.	Sumerpur	19291	21221	-1930	-10.00
99.	Anupgarh	19068	21194	-2126	-11.15
		783816	797546	-13730	-74.9

100	Sadri	18848	21151	-2303	-12.22
101	Lalsat	18634	20975	-2341	-12.56
102	Rangaj Mandi	18424	20875	-2451	-13.30
103	Manoharpur	18219	20754	-2535	-13.91
104	Sambhar	18017	20684	-2667	-14.80
105	Vijainagar	17820	20603	-2783	-15.62
106	Khendela	17627	20495	-2868	-16.27
107	Chakm	17438	20408	-2970	-17.03
108	Rajgarh	17252	20224	-2972	-17.23
109	Shogarij	17070	19866	-2796	-16.38
110	Rajaldesar	16892	19538	-2646	-15.66
111	Lasal	16717	19283	-2566	-15.35
112	Gulabpura	16546	19253	-2707	-16.36
113	Phulera	16378	19106	-2728	-16.66
114	Sanchole	16212	18827	-2615	-16.13
115	Antol	16050	18526	-2476	-15.43
116	Kanarpur	15891	18231	-2340	-14.73
117	Shahpura	15735	17833	-2098	-13.33
118	Khetri	15582	17725	-2143	-13.75
119	Sadul Shahan	15432	17702	-2270	-14.71
120	Keengus	15284	17653	-2369	-15.49
121	Todarisingh	15139	17641	-2502	-16.53
122	Bissau	14996	17413	-2417	-16.18
123	Nadhal	14856	17126	-2270	-15.28
124	Maugrol	14718	16957	-2239	-15.21
125	Mandat	14583	16844	-2261	-15.50
126	Deoli	14450	16779	-2329	-16.12
127	Todashim	14319	16736	-2417	-16.88
128	Mandalgarh	14191	16635	-2444	-17.22
129	Surajgarh	14064	16534	-2470	-17.56
130	Mandawa	13940	16490	-2550	-18.29
131	Fatehnagar	13818	16485	-2667	-19.30
132	Bandikui	13698	16452	-2754	-20.11
		528840.	611804	-82964	-521.04

133.	Chakera	13579	16384	-2805	-20.66
134.	Kumher	13463	16355	-2892	-21.48
135.	Behror	13348	16238	-2890	-21.65
136.	Nagar	13235	16235	-3000	-22.67
137.	Phalna	13124	16154	-3030	-23.09
138.	Raswa	13015	16153	-3138	-24.11
139.	Keethoon	12908	16040	-3132	-24.26
140.	Kapasau	12802	16028	-3226	-25.19
141.	Sisana	12697	15830	-3133	-24.68
142.	Keshoripatan	12594	15748	-3154	-25.04
143.	Bejun	12493	15641	-3148	-25.19
144.	Napasau	12394	15604	-3210	-25.89
145.	Saugad	12295	15603	-3308	-26.91
146.	Mount Abu	12199	15593	-3394	-27.82
147.	Chapar	12103	15535	-3432	-28.36
148.	Bagru	12009	15509	-3500	-29.14
149.	Bali	11917	15446	-3529	-29.61
150.	Tijara	11825	15399	-3574	-30.22
151.	Bhisadi	11735	15285	-3500	-30.25
152.	Gangapur	11647	15224	-3577	-30.71
153.	Pindwara	11559	15185	-3626	-31.37
154.	Bassi	11473	15135	-3662	-31.92
155.	Jalapur	11388	15080	-3692	-32.42
156.	Mukandgarh	11304	15073	-3769	-33.34
157.	Weir	11221	14881	-3660	-32.62
158.	Pokaran	11140	14865	-3725	-33.44
159.	Bhinder	11059	14739	-3680	-33.28
160.	Nunaj	10980	14653	-3673	-33.45
161.	Chhoti Sadri	10901	14621	-3720	-34.13
162.	Amet	10824	14614	-3790	-35.01
163.	Taitaran	10748	14532	-3784	-35.21
164.	Bhisawar	10672	14526	-3852	-36.09
165.	Aklara	10598	14490	-3892	-36.72
		395249	508396	-113147	-955.93

166.	Kuchera	10525	14479	-3954	-37.57
167.	Salunbar	10452	13981	-3529	-33.76
168.	Nawa	10381	13967	-3586	-34.54
169.	Deogarh	10310	13933	-3623	-35.14
170.	Vijainagar	10240	13813	-3573	-34.89
171.	Chhipabarod	10171	13489	-3318	-32.62
172.	Deshroke	10104	13395	-3291	-32.57
173.	Kaprain	10036	13370	-3334	-33.22
174.	Padampur	9970	13368	-3398	-34.08
175.	Bari Sadri	9905	13318	-3413	-34.46
176.	Viratnagar	9840	13169	-3329	-33.83
177.	Mahwa	9776	13091	-3315	-33.91
178.	Sandari	9713	12853	-3140	-32.33
179.	Raipur	9651	12582	-2931	-30.37
180.	Mundwa	9589	12521	-2932	-30.58
181.	Sarwas	9528	12316	-2788	-29.26
182.	Takhatgarh	9468	12305	-2837	-29.96
183.	Kherli	9408	12263	-2855	-30.35
184.	Naraina	9350	12231	-2881	-30.81
185.	Nainwa	9292	12148	-2856	-30.74
186.	Bagar	9234	12088	-2854	-30.91
187.	Kesri Singhpur	9177	11751	-2574	-28.05
188.	Vidyavihar	9121	11680	-2559	-28.06
189.	Pushkar	9066	11506	-2440	-26.91
190.	Sumel	9011	11364	-2353	-26.11
191.	Kanod	8957	11303	-2346	-26.19
192.	Asind	8903	11080	-2177	-24.45
193.	Siket	8850	11056	-2206	-24.93
194.	Khanpur	8798	10657	-1859	-21.13
195.	Parbatsar	8746	10134	-1388	-15.87
196.	Satal Kheri	8695	9742	-1047	-12.04
197.	Marwar Junction	8644	9634	-990	-11.45
198.	Pirawa	8594	9594	-1000	-11.64
		313505	404181	-90716	-942.73

199	Rani	8544	9556	-1012	-11.84
200	Talner	8495	9546	-1051	-12.37
201	Partapur	8446	9477	-1031	-12.21
202	Beejoliya Kelan	8398	9419	-1021	-12.16
203	Katamagar	8351	9346	-995	-11.91
204	Kushalgarkh	8304	9341	-1037	-12.49
205	Unjara	8257	9233	-976	-11.82
206	Sojat Road	8211	9100	-889	-10.83
207	Bhawri	8166	9019	-853	-10.45
208	Dhariawad	8120	8812	-692	-8.52
209	Gairdgarh	8076	7991	+85	+1.05
210	Gajasinghpur	8032	7884	+148	+1.84
211	Rawa Talai	7988	7588	+400	+5.01
212	Rikhasdeo	7944	7435	+509	+6.41
213	Manoharthera	7902	7161	+741	+9.38
214	Choredi Chancha	7859	7059	+800	+10.18
215	Bhalariya	7817	6849	+968	+12.38
216	Sewar Kelan	7776	6838	+938	+12.06
217	Kalni@Kajendrapur	7734	6278	+1456	+18.83
218	Udpara	7694	6073	+1621	+21.07
219	Baliyakot	7653	5896	+1757	+22.96
220	Todra	7613	5083	+2530	+33.23
221	Indergarkh	7574	4540	+3034	+40.06
222	Borkhera.	7534	2468	+5066	+67.24
		192488	181992	10496	147.1

APPENDIX - VI - VI

Composite Index Based On Different Functions Of The Towns/Urban Centres

Urban Centres	Primary School	Hospital	Bank	Road Length	Cinema	Composite Score	Composite Index.
Jaipur	588	129	154	975.0	16	3330	666.0
Jodhpur	173	52	64	388.2	8	3309	661.8
Kota	196	40	52	442.0	6	3298	659.6
Bikaner	142	44	38	208.4	5	3248	649.6
Ajmer	175	37	45	16.0	6	2813	562.6
Udaipur	46	28	47	375.87	5	3251	650.2
Alwar	72	17	29	190.0	5	3205.5	641.1
Bhilwara	70	26	21	264.0	5	3230	646.0
Ganganagar	60	14	32	177.25	6	3209	641.8
Bharatpur	102	26	29	226.9	4	3212.5	642.5
Sikar	20	17	17	63.41	3	3041.5	608.3
Pali	22	20	19	164.76	3	3114	622.8
Beawar	37	12	5	66.13	3	2923.5	584.7
Tonk	56	13	10	169.0	4	3096	619.2
Churu	33	24	11	44.0	2	2860	572.0
Hanumangarh	16	8	12	130.0	5	3061.5	612.3
Kishangarh	9	7	10	25.0	2	2503.5	500.7
Sawai Madhopur	17	15	11	49.5	3	2960.5	592.1
Jhunjhunu	36	14	10	16.59	4	2701	540.2
Chittaurgarh	67	14	10	145.0	2	2945.5	589.1
Sujangarh	27	14	3	30.0	2	2391.5	478.3
Gangapur City	35	7	5	52.0	3	2811.5	562.3
Barmer	22	9	9	36.56	2	2723.5	544.7
Dhaulpur	17	19	7	44.0	3	2917	583.4
Nagaur	13	5	10	50.0	3	2780	556.0
Sardar Shekhar	15	5	6	42.0	2	2586	517.2
Banswara	26	19	12	102.68	2	2955	591.0
Makrana	10	5	5	45.0	3	2640	528.0
Fatehpur	15	29	5	70.0	1	2543.5	508.7
Bundi	25	9	9	24.0	1	2306.5	461.3
Hindaw	9	6	5	54.0	3	2704.5	540.9
Baran	8	5	8	15.0	2	2197	439.4

Surajgarh	62	15,703	16,274	-1451	-2.87
Mandawa	63	15,486	15,830	-344	-2.22
Nagar	64	15,275	15,604	-329	-2.15
Phalna	65	15,070	15,603	-533	-3.54
Siwana	66	14,871	15,535	-664	-4.47
Napasar	67	14,677	15,446	-769	-5.24
Bali	68	14,489	15,073	-584	-4.03
Mukandgarh	69	14,305	14,865	-560	-3.91
Pokaran	70	14,127	14,621	-494	-3.49
Nimaj	71	13,953	14,532	-579	-4.15
Jaitaran	72	13,784	14,479	-695	-5.04
Kuchera	73	13,620	13,967	-347	-2.55
Nawa	74	13,459	13,813	-354	-2.63
Deshnoke	75	13,303	13,395	-92	-0.69
Padampur	76	13,150	13,368	-218	-1.66
Vijainagar	77	13,001	12,853	+148	+1.14
Sandari	78	12,855	12,582	+273	+2.12
Raipur	79	12,714	12,521	+193	+1.52
Mundwa	80	12,575	12,305	+270	+2.15
Takhatgarh	81	12,439	12,088	+351	+2.82
Baggar	82	12,307	11,751	+556	+4.52
Kesrisinghpur	83	12,178	11,630	+548	+4.49
Vidyavihar	84	12,051	10,334	+1,717	+15.91
Rani	85	11,928	9,634	+2,294	+19.23
Ratanagar	86	11,807	9,556	+2,251	+19.06
Sojat Road	87	11,688	9,346	+2,342	+20.04
Gajsinghpur	88	11,572	9,100	+2,472	+21.36
Soredi Chancha	89	11,459	7,884	+3,575	+31.19
Borkhera	90	11,348	7,059	+4,289	+37.79

Merta City	29	30,453	32,722	- 2,269	- 7.45
Bilara	30	29,566	31,728	- 2,162	- 7.31
Bhinmal	31	28,733	31,157	- 2,424	- 8.44
Sojat	32	27,949	30,731	- 2,782	- 9.95
Bhadra	33	27,209	30,168	- 2,959	- 10.88
Pipar City	34	26,510	28,912	- 2,402	- 9.06
Jirawa	35	25,849	27,828	- 1,979	- 7.66
Libanga	36	25,222	27,787	- 2,565	- 10.17
Kalodi	37	24,627	26,140	- 1,513	- 6.14
Sangaria	38	24,061	25,290	- 1,229	- 5.11
Ramgarh	39	23,522	24,706	- 1,184	- 5.03
Sri Madhopur	40	23,009	23,891	- 882	- 3.83
Gothra	41	22,519	23,465	- 946	- 4.20
Bidasar	42	22,051	23,256	- 1,205	- 5.46
Raisingh Nagar	43	21,603	22,894	- 1,291	- 5.98
Rambhatsar	44	21,175	22,126	- 951	- 4.49
Veem-ka-Thana	45	20,764	21,982	- 1,218	- 5.87
Udaipurwati	46	20,370	21,477	- 1,107	- 5.43
Taranagar	47	19,992	21,430	- 1,438	- 7.19
Hani	48	19,628	21,221	- 1,593	- 8.12
Sumerpur	49	19,278	21,194	- 1,916	- 9.94
Anupgarh	50	18,942	21,151	- 2,209	- 11.66
Sadri	51	18,618	20,495	- 1,877	- 10.08
Khandela	52	18,305	19,538	- 1,233	- 6.74
Rajaldesar	53	18,004	19,283	- 1,279	- 7.10
Losal	54	17,713	18,827	- 1,114	- 6.29
Phulera	55	17,432	18,231	- 799	- 4.58
Sanchole	56	17,160	17,725	- 565	- 3.29
Karanpur	57	16,898	17,702	- 804	- 4.76
Khetri	58	16,643	17,653	- 1,010	- 6.07
Sadul Shehar	59	16,397	17,413	- 1,016	- 6.19
Reengus	60	16,159	16,534	- 375	- 2.32
Bissau	61	15,928	16,490	- 562	- 3.52

Phalna	7	13	5	16.9	1	2038.5	407.7
Baswa	7	1	3	5.0	0	683.0	136.6
Kaithoon	4	4	2	18.0	0	1017.0	203.4
Kapasari	9	9	3	17.2	1	1804.5	360.9
Siwana	5	7	3	11.0	0	1121.0	224.2
Keshoraiptan	5	3	3	20.0	1	1559.5	311.9
Begun	11	2	3	25.0	2	1941.0	388.2
Napasari	7	5	1	12.0	0	876.0	175.2
Sangod	4	2	3	23.0	1	1516.5	303.3
Mount Abu	6	9	6	56.0	0	1376.5	395.3
Chhapar	6	10	1	13.0	1	1413.5	282.7
Bagru	30	3	3	30.0	3	2242.0	448.4
Bali	5	4	2	13.75	0	910.0	182.0
Tijara	4	3	3	21.0	0	1161.0	232.2
Bhiwadi	11	1	2	10.10	1	1140.0	228.0
Gangapur	6	8	2	11.5	1	1424.5	284.9
Pindwara	4	1	2	11.0	0	651.0	130.2
Bassi	8	3	3	20.0	2	1897.0	379.4
Jahazpur	10	6	2	18.0	1	1610.0	322.0
Mukandgarh	5	2	3	7.0	0	740.0	148.0
Weir	7	2	1	16.0	0	809.0	161.8
Pokaran	5	5	1	23.0	1	1476.5	295.3
Bhinder	3	5	3	12.5	1	1455.0	291.6
Nimaj	3	2	2	6.0	0	523.5	104.7
Chhoti Sadri	5	10	4	1.0	1	1471.0	294.2
Amet	2	3	2	21.0	1	1378.5	275.7
Jaitaran	5	4	3	7.2	0	880.0	176.0
Bhusawar	8	4	3	10.0	0	1016.5	203.3
Aklara	3	1	3	25.0	1	1485.0	297.0
Kuchera	6	2	2	7.0	0	608.0	121.6
Salumbar	7	6	3	11.02	1	1535.5	307.1
Nawa	11	3	2	18.0	0	1060.5	212.1
Deogarh	13	3	2	14.0	1	1357.0	271.4
Vijainagar	14	5	4	16.5	1	1870.0	374.0
Chhipabarod	6	4	3	18.0	1	1599.5	319.9
Deshnoke	2	2	1	8.0	0	493.0	98.6
Kaprain	13	8	2	42.0	1	1946.0	389.2

Manoharpur	11	2	2	12.0	0	836.5	167.3
Sambhar	0	10	3	13.0	1	1576.5	315.3
Vijainagar	6	4	3	23.56	1	1687.5	337.5
Khandela	9	2	3	9.33	1	1291.5	258.3
Chaksu	12	3	4	28.34	1	1913.0	382.6
Rajgarh	10	7	4	20.0	1	1979.5	395.9
Sheoganj	10	6	5	18.0	0	1710.5	342.1
Rajaldesar	18	5	1	4.0	0	742.5	148.5
Losal	9	6	2	13.0	0	1067.0	213.4
Gulabpura	4	3	5	20.0	1	1782.5	356.5
Phulera	9	5	3	22.0	1	1772.5	354.5
Sanchore	8	4	2	30.0	1	1654.0	330.8
Antak	13	1	5	42.0	0	1613.5	322.7
Karanpur	10	4	3	27.0	0	1319.5	278.3
Shahpura	8	4	4	11.0	1	1583.5	316.7
Khetri	6	11	4	9.0	1	1697.0	339.4
Badal Shaker	4	3	3	58.6	2	2117.5	423.5
Reengus	7	4	4	13.0	1	1630.0	326.0
Todaraisingh	6	4	3	2.02	1	1171.5	234.3
Bissau	6	5	3	5.0	0	893.0	178.6
Nadbal	4	4	3	38.0	1	1800.5	360.1
Mangrol	3	2	2	8.0	0	595.5	119.1
Mandal	7	2	2	47.0	0	1227.0	245.4
Deoli	7	3	3	18.7	3	1980.5	396.1
Todabhim	11	3	2	28.0	0	1202.5	240.5
Mandalgarh	16	4	4	30.0	0	1624.5	324.9
Surajgarh	8	6	3	25.0	0	1445.5	289.1
Mandawa	11	2	2	2.5	0	582.5	116.5
Fatehnagar	3	3	2	28.0	0	1077.5	215.5
Bardikui	3	5	3	8.0	2	1611.0	322.2
Chhabra	9	6	4	14.9	0	1392.5	278.5
Kumher	7	4	2	16.0	1	1820.5	364.1
Behror	7	5	3	11.0	1	1481.5	296.3
Nagar	4	2	3	10.0	2	1505.5	301.1

Pratapgarh	11	9	4	43.7	3	2660.5	532.1
Rawatbhata	8	4	3	7.0	1	1314.0	262.0
Bhadra	8	6	3	8.0	1	1455.0	291.0
Sirohi	12	13	8	41.0	1	2436.5	487.3
Pipar City	12	4	4	7.0	1	1509.0	301.8
Chirawa	7	20	5	16.0	1	2046.5	409.3
Bayana	11	4	3	18.0	2	1957.0	391.4
Alibanga	7	3	4	42.0	1	1950.0	390.0
Kekri	11	6	5	70.9	1	2369.0	473.8
Sangaria	18	3	4	27.0	2	2207.5	441.5
Ramgarh	10	11	2	4.5	0	923.5	184.7
Kaman	6	3	3	15.0	2	1730.5	346.1
Sri Madhopur	6	2	4	19.0	3	2055.0	411.0
Shahpura	12	8	3	12.8	1	1694.5	338.9
Malpura	9	4	3	6.2	1	1303.5	260.7
Gothra	5	10	1	12.0	1	1365.5	273.1
Amber	11	2	2	16.0	1	1350.0	270.0
Bidasar	6	8	3	3.0	1	1346.5	269.3
Jhalrapatan	19	8	5	8.0	2	2112.5	422.5
Raisingh Nagar	10	4	5	36.66	2	2416.0	483.2
† Lakheri	8	6	3	30.0	1	1905.0	381.0
Niwai	30	2	3	25.0	0	1312.5	262.5
Rejakkhera	14	5	2	14.75	0	1101.0	220.2
Khairthal	4	5	4	30.27	1	1957.0	391.4
Neem-ka-Thana	4	5	5	32.0	2	2342.5	468.5
Sagwara	12	7	4	15.5	2	2175.0	435.0
Rawatसर	6	2	4	57.0	1	1943.0	388.6
Udaipurwati	6	2	4	14.7	0	1111.5	222.3
Kishangarh Renwal	15	4	3	57.0	0	1627.0	325.4
Taranagar	13	5	4	7.75	0	1198.0	239.6
Pilani	6	5	5	4.97	2	1803.5	360.7
Sumerpur	6	4	4	160.0	2	2422.0	484.4
Anupgarh	6	6	3	17.0	2	1965.5	393.1
Sadri	11	8	3	12.0	0	1265.5	253.1
Lalsot	14	4	3	23.3	1	1781.5	356.3
Rangarj Mandi	13	3	4	10.25	2	1849.5	369.9

Katangark	15	18	6	25.0	0	1931.5	386.3
Nawalgarh	20	16	4	5.0	1	1713.0	342.6
Karauli	11	9	3	30.0	2	2300.0	460.0
Ladnu	7	6	5	8.84	0	1310.0	262.0
Balotra	10	7	8	67.59	1	2449.0	489.8
Suratgarh	5	8	6	46.0	2	2587.0	517.4
Lachmangark	25	7	4	32.0	0	1797.0	359.4
Rajgarh	13	7	4	137.1	1	2349.5	469.9
Nasirabad	14	10	5	9.5	1	1897.5	379.5
Nimbahera	15	5	5	58.0	2	2614.5	522.9
Abu Road	16	4	8	56.3	3	2741.5	548.3
Phalodi	7	4	3	15.0	1	1528.5	305.7
Rajsamand	13	4	5	101.5	2	2580.0	516.0
Jaisalmer	21	9	5	50.0	1	2419.5	483.9
Jhalwar	10	13	6	20.0	1	2194.5	438.9
Dausa	24	8	5	15.0	1	2025.5	405.1
Chonu	11	7	4	54.0	2	2541.5	508.3
Bari	12	3	3	18.0	1	1619.5	323.9
Kuchaman City	8	3	5	35.21	1	2034.0	406.8
Dungargarh	11	22	5	9.0	1	1907.0	381.4
Sanganer	9	5	4	60.0	2	2473.0	494.6
Nokha	10	10	4	33.42	0	1803.0	360.6
Dungarpur	20	16	8	33.0	2	2729.5	545.9
Jalsre	8	7	4	33.13	1	2116.5	423.3
Deeg	11	9	5	30.0	1	2255.0	451.0
Deedwana	14	3	5	35.0	0	1692.0	338.4
Nohar	7	4	4	150.0	1	2152.0	430.4
Kotputli	6	7	4	35.0	3	2504.0	500.8
Merta City	6	3	6	14.34	2	1994.0	398.8
Bilara	23	5	4	71.0	1	2284.0	456.8
Natdwara	12	4	4	50.90	2	2410.0	482.0
Bhinmal	8	6	4	30.0	1	2050.5	410.1
Sojat	5	4	5	35.0	1	2037.5	407.5
Bhawani Mandi	8	16	5	15.6	3	2437.0	487.4

Padampur	6	2	4	15.0	1	1531.0	306.2
Bari Sadri	2	6	3	9.0	0	1041.0	208.2
Viratnagar	13	4	3	19.0	0	1298.5	259.7
Mahwa	6	2	2	29.0	1	1525.5	305.1
Sandari	5	6	2	12.0	0	936.5	187.3
Reipur	11	1	2	25.0	1	1369.5	273.9
Mundwa	9	4	2	20.0	0	1059.0	211.8
Sarwar	3	4	2	7.0	0	679.5	135.9
Takhatgarh	5	1	2	8.0	0	621.0	124.2
Kheri	4	1	3	12.0	0	815.5	163.1
Naraina	3	2	1	6.0	0	486.0	97.2
Nainwa	7	7	4	16.0	0	1480.5	296.1
Beggar	3	3	1	7.0	0	560.0	112.0
Kesrisinghpur	6	2	2	27.9	1	1509.5	301.9
Vidyanhar	9	6	1	9.23	1	1159.5	231.9
Pushkar	5	4	3	15.95	0	1085.5	217.1
Sunel	9	3	3	15.2	0	1081.0	216.2
Kanod	2	2	1	4.0	1	893.5	178.7
Asind	3	2	3	8.77	0	787.0	157.4
Suket	7	5	1	2.0	0	516.5	103.3
Khanpur	9	2	3	2.2	1	979.0	195.8
Parbatsar	4	1	3	5.0	0	629.0	125.8
Satal Kheri	1	1	0	8.0	0	411.0	82.2
Marwar Junction	1	2	2	6.75	0	462.0	92.4
Pirawa	4	6	2	6.5	0	780.0	156.0
Rani	2	2	3	6.5	1	1085.0	217.0
Tobner	5	3	2	15.0	0	833.0	166.6
Partapur	4	5	2	11.0	0	838.0	167.6
Beejoliya Kalan	3	6	3	22.0	2	2016.5	403.3
Katanagar	0	7	1	1.5	0	606.5	121.3
Kushalgarh	8	4	4	8.31	0	1122.0	224.4
Uniwara	4	3	3	3.0	0	695.0	139.0

Sejat Road	4	1	3	26.0	1	695.0	139.0
Bhawri	2	6	1	16.0	1	1518.5	303.7
Dhariawad	1	4	2	3.5	1	1347.5	269.5
Govindgarh	1	3	1	6.0	0	979.0	195.8
Gajsinghpur	4	2	2	23.0	0	473.5	94.7
Rewa Talai	1	1	0	2.5	1	969.0	193.8
Rikhabdeo	3	2	3	12.0	0	663.0	132.6
Manoharthana	3	4	3	3.0	0	861.5	172.3
Coreti Chaucha	2	9	1	8.0	0	741.5	148.3
Bhalariya	5	3	1	0.5	0	790.0	158.0
Sewar Kelan	0	1	2	7.0	0	428.0	85.6
Kelvi @ Rajendrapur	3	2	1	19.0	0	485.0	97.0
Udhpura	1	4	0	5.0	0	809.5	161.9
Galiyakot	4	2	1	8.0	0	485.5	97.1
Todra	2	3	1	3.5	0	523.0	104.6
Indergarh	3	2	2	1.3	0	435.0	87.0
Berkhera	2	1	1	10.0	0	507.0	101.4

BIBLIOGRAPHY

1. **Ahmed, Qazi** (1965), "*Indian Cities: Characteristics and Correlates*", The Department of Geography Monograph Series, University of Chicago.
2. **Aurousseau, M.** (1921), "*The Distribution of Population—A Constructive Problem*", Geographical Review, Vol. XI.
3. **Aziz, A.** (1955), "*A Study of Indian Towns*", Geographer, Vol.7(1), Summer.
4. **Berry, B.J.L.** (1956), "*Geographical Aspects of the Size and Arrangements of Urban Centres*", (M.A.Thesis, University of Washington).
5. **Berry, B.J.L and F.E. Horton** (1970), "*Geographic Perspective on Urban Systems*", Prentice Hall Inc., New Jersey.
6. **Bhalla, L.R.** (1996), "*Geography of Rajasthan*", Kuldeep Publications, Ajmer.
7. **Bose, Ashish.** (1978), "*India's Urbanisation: 1901-2001*", 2nd edition, Tata Mc Graw Hill Publishing Co. Ltd., New Delhi.
8. **Brush, J.E.** (1953), "*The Urban Hierarchy in Europe*", Geographical Review, Vol.43.
9. **Brush, J.E.** (1953), "*The Hierarchy of Central Places in South Western Wisconsin*", Geographical Review, Vol.XLL.
10. **Census of India** (1991), *Series I, Paper I, Vol. II*, Registrar General and Census Commissioner, Ministry of Home Affairs, India.
11. **Census of India** (1991), "*Census Volumes on Urban Population*", Ministry of Home Affairs, New Delhi.
12. **Census of India** (1991), "*Town Directory of Rajasthan*", Series-21, Ministry of Home Affairs, India.
13. **Census of India** (2001), "*Provisional Population Tables*", Paper 2, Series-9, Ministry of Home Affairs, India.
14. **Chatterjee, S.P.** (1965), "*Physiography*" in the Gazetteer of India, Ministry of Information and Broadcasting, Delhi.
15. **Christaller, W.** (1933), "*Central Places in Southern Germany*", (translated in English by **C.W. Baskin**), Englewood Cliffs, Prentice Hall.

16. **Clark, P.J and F.C. Evans** (1954), "*Distance to Nearest Neighbour as a Measure of Spatial Relations*", Ecology, Vol.35.
17. **Crane, R.I** (1955), "*Urbanism in India*", The American Journal of Sociology, Vol.60, No.5.
18. **Dacey, M.F.** (1960), "*A Note on the Derivation of the Nearest Neighbour Distances*", Journal of Regional Science Association, Vol.2.
19. **Dacey, M.F.** (1962), "*Analysis of Central Place and Point Patterns by a Nearest Neighbour Method*", Land Studies in Geography, Series B, Vol.24.
20. **Davis, Kingsley** (1962), "*Urbanisation in India: Past and Future*", Roy Turner (ed.), India's Urban Future, Berkeley University of California Press.
21. **Dickinson, R.E.** (1932), "*The Distribution and Functions of Smaller Urban Settlements in East Anglia*", Geography, Vol.17, No.95, Part I.
22. **Dickinson, R.E.** (1947), "*City, Region and Regionalism*", OUP, New York.
23. **Diego, Puga** (1998), "*Trends in Urbanisation and Urban Growth in Haryana: 1901-1991*", Geographical Review of India, Vol.60(1).
24. **Doxiadis, C.A.** (1976), "*Action for Human Settlements*", Athens Publishing Centre, Athens.
25. **Gananathan, V.S.** (1952), "*Distribution of Urban Settlements in India*", Proceedings of the 17th International Geographical Congress, Washington.
26. **Ghosh, Sumita** (1998), "*Introduction to Settlement Geography*", Orient Longman Ltd., Calcutta.
27. **Gibbs, J.P.** (1961), "*Urban Research Methods*", D.Van Nostrand Co. (Canada) Ltd., Toronto.
28. **Haggett, Peter** (1972), "*Geography: A Modern Synthesis*", Harper and Row Publishers, New York.

29. **Harris, C.D.** (1943), "*A Functional Classification of Cities in the United States*",
Geographical Review, Vol.33.
30. **Heron, A.M.** (1938), "*The Physiography of Rajputana*", Proceedings of the 25th
Indian Science Congress, Calcutta.
31. **Hoffer, Charles, R.** (1929), "*A Study of Town-Country Relationship*", East Lansing,
Michigan State College Agricultural Experiment Station,
Special Bulletin No.181, October.
32. **Hudson, F.S.** (1976), "*Geography of Settlements*", Mac Donald and Evans Ltd.,
Plymouth, U.K.
33. **Jaffe, A.J.** (1945), "*Population Trends and City Growth*", The Annals of the
American Academy of Political and Social Sciences, Vol.242,
November.
34. **Jefferson, Mark** (1939), "*The Law of Primate Cities*", Geographical Review,
Vol.29.
35. **Jones, Emrys** (1966), "*Towns and Cities*", OUP, London.
36. **King, L.J.** (1962), "*A Quantitative Expression of the Pattern of Urban Settlements in
Selected Areas of U.S*", Tijdschrift voor Economische en Sociale
Geographie, Vol.53.
37. **Lal, Amrit** (1959), "*Some Aspects of Functional Classification of Cities and a
Proposed Scheme for Classifying Indian Cities*", The National
Geographical Journal of India, Vol.5.
38. **Lall, A and R. Tirtha** (1971), "*Spatial Analysis of Urbanisation in India*",
Tijdschrift voor Economische en Sociale
Geographie, Vol.62(4).
39. **Losch, A.** (1954), "*The Economics of Location*", Yale University Press, New Haven,
(translated in English by **Woglom, W.H and W.F Stopler**).
40. **Madden, C.H.** (1956), "*Some Spatial Aspects of Urban Growth in the United
States*", Economic Development and Cultural Change,
Vol.4.
41. **Maunier**, (1910), "*The Definition of City*", American Journal of Sociology, Vol.15.

42. **Mazumdar, P.** (1998), "*Trends in Urbanisation and Urban Growth in Haryana: 1901-1991*", Geographical Review of India, Vol.60(1).
43. **Misra, A.B.** (1956), "*Some Trends in Urbanisation in India*", Paper Submitted to the 39th Conference of the Indian Economic Association, Cuttack, Indian Economic Journal Conference.
44. **Misra, V.C.** (1968), "*The Marusthali*" in R.L. Singh(ed.), India Regional Studies, New Delhi, 21st I.G.U Publication.
45. **Mitra, Ashok** (1964), "*A Functional Classification of Indian Towns*", Institute of Economic Growth, India.
46. **Murphy, R.E.** (1966), "*The American City: An Urban Geography*", Mc.Graw Hill Book Co., New York.
47. **Nelson, H.J.** (1955), "*A Service Classification of American Cities*", Economic Geography, Vol.11.
48. **Penalosa, Enrique** (1976), "*Habitat*", The U.N Conference on Human Settlements, Published by Regional Congress on Local Authorities for Development of Human Settlements in Asia and Pacific, 9-16 June, 1982, Yokohama, Japan.
49. **Philbrick, A.K.** (1957), "*Areal Functional Organisation*", Regional Geography, Vol.33.
50. **Raheja, P.C and A.K. Sen** (1964), "*Resources in Perspective: Recent Developments in Rajasthan*", Souvenir, Govt. of India, Jodhpur.
51. **Ramachandran, R.** (1989), "*Urbanisation and Urban Systems in India*", OUP, New Delhi.
52. **Rao, R.R.M.** (1981), "*Growth of Cities--A Case Study of Warangal*", Inter India Publications, New Delhi.
53. **Raza, Moonis** (1951), "*Urbanisation in Pre-Historic India*", Geographer, Vol.5.
54. **Sen, L.K.** (1971), "*Planning of Rural Growth Centres for Integrated Development: A Study of Miryalguda Tahuka*", NICD, Hyderabad.
55. **Singh, B.L.** (1985), "*Rank Size Relationship in the Central Place System of Mithila Plain, North Bihar*", National Geographical Journal of India, Vol.31.

56. **Smailes, A.E.** (1944), "*The Urban Hierarchy of England and Wales*", Geography, Vol.XXIX.
57. **Sovani, N.V.** (1966), "*Urbanisation and Urban India*", Asia Publishing House, Bombay.
58. **Spate, O.H.K and T.A. Learmouth** (1967), "*India and Pakistan*".
59. **State Gazetteer of Rajasthan** (1986), "*Land and People*", Vol.I, Jaipur.
60. **Statistical Abstract of Rajasthan** (1962, 1972, 1982, 1992, 2002), Directorate of Economics and Statistics, Jaipur.
61. **Statistical, Descriptive and Historical Account of U.P** (1876), Vol.9.
62. **Stewart, J.Q** (1947), "*Empirical Mathematical Rules Concerning the Distribution and Equilibrium of Population*", The Geographical Review, Vol.37, No.3.
63. **Stewart, Charles, T. Jr.** (1958), "*The Size and Spacing of Cities*", The Geographical Review, Vol.48.
64. **Trewartha, G.T.** (1969), "*A Geography of Population : World Pattern*", John Wiley and Sons Inc., New York.
65. **Tripathi, R.M.** (1999), "*Urbanisation and Urban Hierarchy in U.P*", Geographical Review of India, September.
66. **United Nations** (1955), "*Demographic Yearbook for 1952*", New York.
67. **Wirth, L.** (1938), "*Urbanisation as a Way of Life*", American Journal of Sociology, Vol.44.
68. **Zipf, G.K.** (1941), "*National Unity and Disunity*", Principia Press, Bicomington, Illinois.

