STRUCTURE OF URBAN SETTLEMENTS IN HARYANA

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CERTIFICATE

This is to certify that the dissertation entitled **"STRUCTURE OF URBAN SETTLEMENTS IN HARYANA** submitted by Kuldip Singh in fulfilment of six credits out of the total requirement of twenty four credits for the degree of Master of Philosophy is a bonafide work to the best of my knowledge and may be placed before the examiners for their consideration.

Nangia 21st July '94
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Supervisor.

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

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Kskait
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New Delhi, 1994. ***(KULDIP SINGH)***

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CHAPTER - I

INTRODUCTION

1.1 Introduction of Haryana and its Physiography

Position :- Haryana State (Latitude 27°39' to 30°55'5" N and Longitude 74°27'8" to 77°36'5"E) came into being with effect from Ist November, 1966. It is one of the north-western State of India adjoining Delhi, the Capital of India. Haryana state is bounded by Himachal Pradesh in the north by Uttar Pradesh and Delhi in the east by Rajasthan on its south and south west, by Punjab and Chandigarh on the north-west. The total area of the state of 44,212 Km^2 which forms 1.35 percent of the total area of the country. The State with a population of 16,317,715 persons forms 1.93 percent of the India's population and population-wise its rank is 15th among the States of India.

Administrative Divisions, 1991 :- At the time of formation of Haryana State on Ist November 1966, there were seven districts, viz., Ambala, Karnal, Rohtak, Gurgaon, Mahendragarh, Hisar and Jind. In the decade of 1971-81, five new districts formed out of old districts viz., Bhiwani from Mahindergarh district, Sonipat from Rohtak, Kurukshetra from Karnal, Sirsa from Hisar and Faridabad from Gurgaon district. In 1991, the number of tahsils has increased from 39 in 1981 to 53 in 1991 and the number of districts was also increased from 12 in 1981 to 16 in 1991. The new districts formed are as Yamunanagar from Ambala, Kaithal from Kurukshetra, Panipat from Karnal and Rewari from Mahindergarh districts. District Panipat was abolished and merged in Karnal

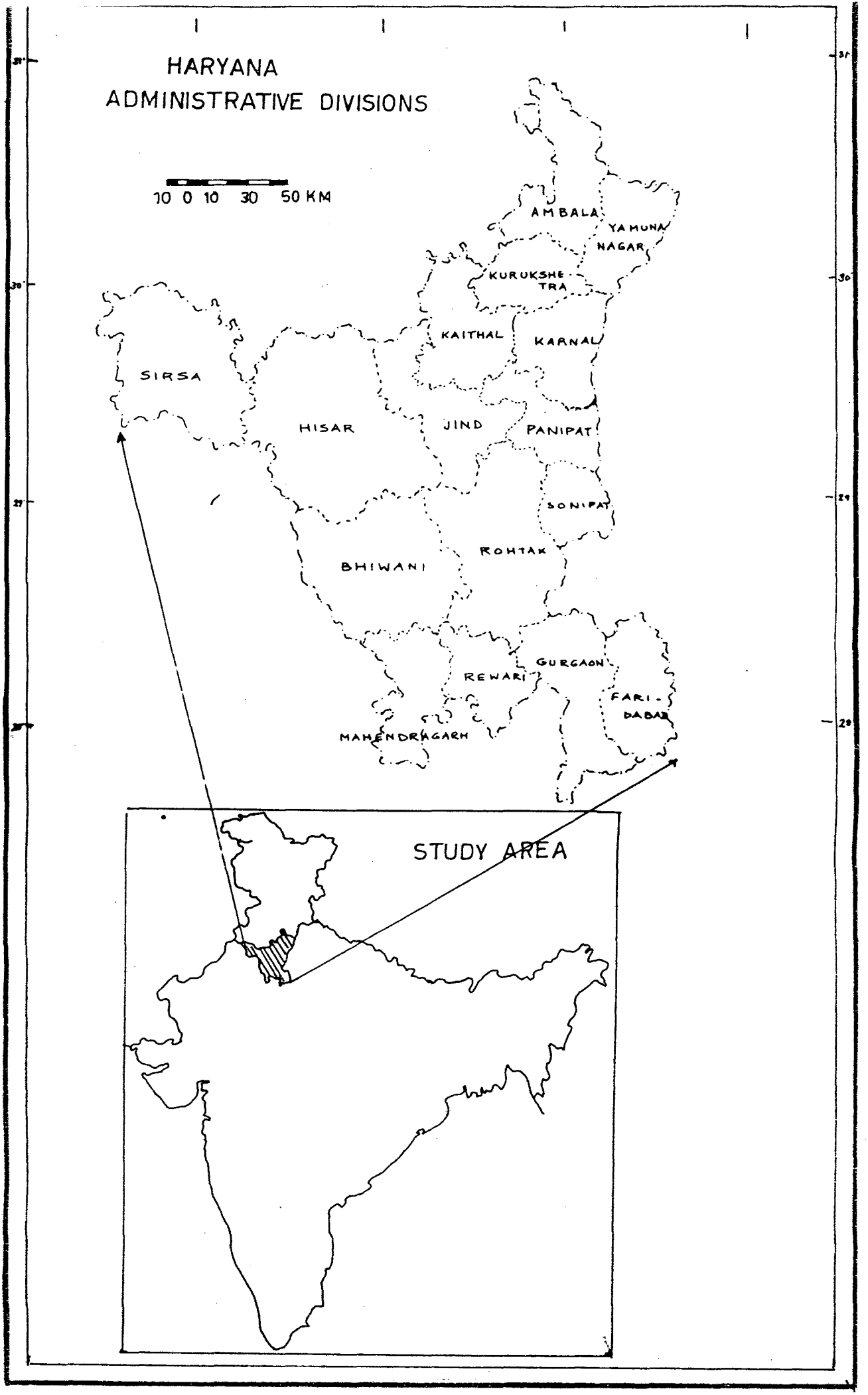
HARYANA
ADMINISTRATIVE DIVISIONS
10 0 10 30 50 KM
AMBALA
YAMUNA NAGAR
KURUKSHETRA
KAITHAL
KARNAL
SIRSA
HISAR
JIND
PANIPAT
SONIPAT
ROHTAK
BHIWANI
GURGAON
REWARI
FARIDABAD
MAHENDRAGARH
STUDY AREA

Fig 1.1

vide State Govt. notification dated 24th July, 1991, but was created again w.e.f. 1-1-1992, vide notification on dated the 31st Dec. 1991.[1] Amongst the districts the largest district continues to be Hisar with an area of 6279 km^2 while Kurukshetra is still the smallest district with an area of 1217 $km.^2$.

Influence of Relief and Drainage in the Urban Settlements in the Study area :- To Understand the influence of relief and drainage on the settlements, it is necessary to study relief and drainage thoroughly. Haryana is a plain area except some hills of the Siwalik systems in the South. On the basis of aridity, this plain can further be sub divided into eastern and western plains. The 50 cms isohyet is the dividing line between the two. The western plains which has a higher aridity mainly covers Hisar, Sirsa and Bhiwani districts. It has a well marked boundary on the east marked by the Aravalli range. It has a thirsty land and is clothed by steppe vegetation and with sand dunes of various slopes and sizes. As wind erosion is active and water-table is deep, the western part has dispersed urban settlements. Because water is the most essential requirement of man and ever since the beginning of humanity people have tried to be near the bodies of water. This part contains only 21 percent of the total towns of Haryana. The western part of the state is known as 'Bagar'.

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1. Statistical Abstract of Haryana, 1991-92, Issued by Economic & Statistical Organisation Planning Department, Government of Haryana 1993.

The eastern plain extends from the west of the Yamuna upto 50 cms. isohyet line. The plain is remarkably flat and its general elevation varies only between 200 and 230 meters above sea level, within it some areas are more fertile consisting of narrow strips of low lying flood plains. This belt lying close to the old west bank of the river Yamuna with a comparatively heavier rainfall and adequate sub soil water resources has become a major area of attraction for the new urban growth. The Eastern Haryana plain covering the districts of Ambala, Yamunanagar, Jind, Kurukshetra, Kaithal, Karnal, Panipat, Sonipat and Rohtak, is bordered by the hills of Siwalik tract consisting of a broad tableland which is composed of sand, silt, clay and Conglomerates ranging in age from the middle Eocene to lower Pleistocene. The slope is generally from the north - east to the south-west in which direction most of the rivers flow; Of these streams, the Ghaggar, the Markanda, the chutang and the Saraswati are the important ones. The State is devoid of any perennial river except Yamuna, which provides irrigation facilities and flows along the extreme eastern side of the state. Eastern part has 55.43 percent of the total towns of Haryana.

The Southern Haryana plain covering the districts of Mahendergarh, Rewari, Gurgaon and Faridabad. It differs from the Western Haryana plain because of the presence of Aravalli offshoots and its slope towards the north and undulating character. Yet this area is generally unfavourable to habitations due to its rocky nature. The range contains some minerals. This part of the state is also dotted with sand dunes of varying sizes. A number

of small rivulets carry the water from Rajasthan. Among them the Sahibi, the Krishnavati, the Indoris, the Dohan and the Landoha are worth mentioning here. The Southern plain contains 24 percent of the total towns of Haryana.

The Haryana plain is a part of the Indo-Gangetic plain, which was formed by deposition of the alluvial sediments, brought by the Himalayan rivers. It slopes from north - east to south - west and all the rivers of the region flow in this direction. The floodplains of these rivers commonly known as 'Khadar'. The soils of these flood plain consists of river borne sand, silt and clay. In the southern and south western parts of Haryana plain, there are extensive areas covered with sand dunes.

Effects of Climate :-There is monsoon type of climate in Haryana. But owing to the situation at a long distance from the seas at the meeting point of Arabian Sea and Bay of Bengal currents, it fails to get the full benefits from either of them. There is thus a shortage of rainfall over its greater part and coupled with the high summer temperatures, the evaporation is also high. It is thus characterised by a semi-arid type of monsoon climate which is essentially a transitional one between that of the arid desert of Rajasthan and the moderately humid Western Ganga plain. It however experiences the usual three seasons (Indian) in the year - the winter, the summer and the rainy. Both, the heat in summer and cold in winter, are extreme. Moreover, there are not only considerable differences in the weather from season to season but also from year to year. These changeful weather conditions though

have repercussions on its agriculture have partly been responsible for producing hardy people and good physique.

The growth of settlements was facilitated by various geographical factors like relief, which provides an absence of mountains and climate which was perhaps less dry than that of the present day. Domestication of animals and the growth of agricultural practices had reached a stage, when they can induce urban settlements to grow and prosper along the river banks on their high bluffs. River navigation and the use of wheeled carts were further aids to urbanisation.

Effects of Rail and Road Network :- Routes both roads and railroads have greatly halped in fixing the sites of the townships. Half of the townships are situated alongside the towns which are on the Grand Trunk Road. They are from North to South. In the North, the National Highway number 1, connects the important towns of Haryana. National Highway number 1, the Grand Trunk road passes through Ambala, Karnal, Panipat, Samalkha and reaches upto Delhi.National Highway number 2, passes South of Delhi, connecting Faridabad Complex Administration, Palwal and Hodal moving southern out of the boundary of the region. This road has always been a very important and extensive urban development has been taking place along it.

The township of Hisar is situated along the road from Delhi at a distance of nearly two miles from the walled town. On the same Delhi - Hisar road, Rohtak town has witnessed great areal

expansion since partition. The residential township here occupies a site formerly under the plough.

National Highway number 8 passes to the north of Bawal and National Highway number 10 connects Rohtak, Bahadurgarh and Delhi. As far Railway network is concerned, branches of Northern Railways, Central Railways and Western Railways Connect the towns of Haryana.

The broad gauge Railway from point beyond Delhi to the Pathankot, which runs Parallel to Grand Trunk road is another major advantage due to which the region has gained considerable economic and commercial significance. Sonipat township which lies at a distance of nearly 3 miles from the Grant Trunk road derives greater advantage from the railway lines, which is not far from it. The important towns of Karnal, Panipat, Samalkha, Faridabad Complex Administration derive greater advantages both from railways and Grand Trunk road. Of the remaining townships - Palwal, Gurgaon, Rohtak and Hisar are situated along principal routes - roads and railways leading to Delhi, from South, South-West and West. With the exception of the towns of Hisar and Sirsa districts and the town of Rewari, all are situated within a radius of fity miles from Delhi. Delhi though a separate unit politically, yet geographically is a part of Haryana and much of the region surrounding Delhi border has an intimate connections with it both culturally and economically.

In several of the newly developed towns 'mandies' have been established close to the railway stations. These mandies were

required to handle the trade in agricultural produce, so that the villagers may find easily accessible markets for their produce.

The situation of the town of Radaur is very similar. It lies along the Ladwa - Jagandhri road. It being situated neither along any railways nor any major highway suffers from handicaps and the development has been rather slow.

The condition of these towns suggests that settlements which are side tracked by major highways are very often thrown into oblivion and their development is retarded.

Ease of transport, better commercial opportunities, the growth of non-agricultural population with the settling down of non-cultivating people and establishment of new industries gave filip to the old existing villages to towns lie along the railway lines.

These towns thus had not only of adequate supplies of water for the towns requirements but they must have occupied points, where the east-west roads would have been crossed by north-south routes following the stream courses.

Objectives :-

The main objectives of this study are as follows :-

(1) To study the spatio-temporal trends of urban population in terms of growth, density and distribution.

(2) To study and analyse the functional classification of urban settlements and their development and change in functional character.

(3) To study the distribution of social, cultural and educational facilities in the urban settlements of Haryana. The hierarchy of urban centres have also been examined.

As the structure of urban settlements is a vast topic, a few major aspects have been selected for analysis so as to focus the development of the urban settlements.

Data-Base :-

For this study, the secondary data have been used. The main data are from Census of India Publications for the years 1971, 1981 and 1991. The following census reports have been consulted for the data collection.

(1) Census of India, 1971, Series 6, Haryana, District Census Handbooks, Part X A, Villages and Town Directory, Part X B Village and Townwise Primary Census Abstracts.

(2) Census of India, 1971, series 6, Haryana District Census Handbooks, Part X C.

(3) Census of India, 1981, Series 6, Haryana, Town Directory, Part X-A.

(4) Census of India, 1991, Final Population Tables, India, Series No. 1, Paper 1 of 1992, Vol. I.

The data for the seven non-agricultural categories (III to IX) of 1991, have been collected from the computer floppy which is available at the office of Registrar General, Census of India, New Delhi.

Methodology :

For this study, Secondary data have been used. The main data are from Census of India Publications for the years 1971, 1981 and 1991. This data have been processed according to the requirements of various aspects of the structure of Urban settlements.

The chapter on spatial distribution of towns involves the study of topographical sheets so as to study the location and distribution of the urban settlements in the space. For the demographic characteristics-growth rate of urban population has been discussed for the period of 1971-81 and 1981-91, and maps have been used to show the trend of population in districts. The density of Urban population for the period of 1991 has not been worked out, as the data on area is unpublished. Nearest Neighbour analysis has also been conducted to study the distribution of urban settlements in the space. The Rank-size rule has also been discussed.

Asok Mitra's method of 'Functional Classification of Towns has been used to discuss the functional aspects of the urban settlement's Ternary diagram are shown on the maps for the period of 1971 and 1991. The data for 1981 was not suitable for this method.

The data for social, cultural and educational facilities in all the towns of Haryana for 1971 and 1981 have been worked out for the hierarchy of urban settlements. The exercise identified the towns developing at a very fast rate and those towns also which are either growing slowly or are stagnating. In the end, a brief summary and a number of conclusions have been derived.

Literative Survey:-

The study of settlements has been one of the most significant themes in human geography. The term settlement geography is derived from German 'siedlung geographie,'[2] which involves the study of visual imprints made by man upon the cultural landscape in the process of occupying. These imprints vary from one culture to another according to the physico-cultural settings and man's ability to change the natural features.

In Germany the work of Ritter was prominent in this direction and his contribution are the base of settlement geography even to this day. According to Ratzel, German Geographers mainly examined two aspects house types and urban centres. In 1899, Schluter considered the definition of settlement with special reference to location size and growth and their relationship with the environment.[3]

Blache was a French settlement Geographer, who studied human geography in its entirety in detail. Demangeon concentrated his attention on the study of field ownership cultivation, building material, house types and the distribution of towns, rural settlements and human habitations.[4]

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2. Singh, R.L. and Singh, K.N. (Ed.); Readings in Rural Settlement Geography, Varanasi, 1975, P. VII.

3. Mandal, R.B. and Sinha, V.N.P. (Ed.), "Recent Trends and Concepts in Geography," Vol. 3, 1980, Concept Publishing Company, New Delhi: p. 33.

4. Ibid.

In India, the genetic approach has been initiated by Prof. R.L. Singh, known as the founder of Banaras School of Settlement Geography. He has developed his fundamental concept to analyse the sequence of change in the cultural landscape during the initial stage of the school with the case study of the Middle ganga Valley.[5] Analysing the growth and evolution of settlements in chronological order, he has also presented detailed account of the hierarchical classification, territorial controlling system and the layout plan of the villages. In these articles the historical factors are correlated with the socio-economic factors to a considerable level, which have been elaborated in his further writings.[6]

N.D. Bhattacharya,[7] while discussing the role of river in the sitting of human settlements in the Lower Ganga Valley, traced

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5. Singh, R.L., "Evolution of Settlements in the Middle Ganga Valley", National Geographical Journal of India, 1-2 (1955) 69-114.

6. Singh, R.L. & Singh, K. N. "Evolution of the Medieval Towns in the Sarayupar plains of the Middle Ganga Valley - A Case study," National Geographical Journal of India, 9-1 (1963) 1-11, Singh , R.L. "Evolution of clan Territorial Units through land occupance in the Middle Ganga Valley", Ibid 20-1 (1974), Reprinted in R.L. Singh, K.N. Singh and Rana. P.B. Singh (ed.), Readings in Rural Settlement Geography, Varanasi, National Geographical Society of India (1975) 353-366; R.L. Singh and Rana P.B. Singh, "Some Approaches to the Morphogenesis of Indian Village", Ibid, 367-376

7. N.D. Bhattacharya, "Changing Courses of the Padma and Human Settlements," National Geographical Journal of India, Vol. 24, No. 2, pages 62-76.

seven sequence in the river Padma and its effect on the human settlements.

Taking a region of heterogeneous physical conditions, i.e., foot hill zone of Haryana, Singh and Asthana[8] have attempted to analyse the spatial pattern of rural settlement distribution in relation to various physiographic attributes. The size of the villages is mainly determined by the physical and morphometric characteristics like relief, drainage pattern, slope gradient, soil fertility, availability of water etc., on the one hand and cultural characteristics on the other. The sandy soil is the main responsible factor for the small size of village i.e., < 1000 population, as such 85% of the total villages comes under this group. The authors have tested the randomness-level and the hypothetical deviation of spacing. The results reveal that in the plain area settlements are more or less regular leaving aside the piedmont plain and the Yamuna Khadar, while in hilly terrain, the irregularity increases with the abrupt increase in ruggedness. By correlating the density and mean actual distance the rural settlements of the region are classified into four distinct types - compact (mainly in the homogeneous plain), Semi-Compact (mainly in the terrain or broken grounds and low lying lands), scattered (mainly in lowlying, rugged and flooded regions), and hamleted (mainly in rugged and inaccessible hilly terrain).

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8. Singh, Iqbal and Asthana, V.K., Spatial Distribution and Types of Rural Settlements in the Foot Hill Zone of Haryana", in R.L. Singh etc. (Ed.): Geographical Dimensions of Rural Settlements, 1976, Page 99.

Singh, Rotary and Jena[9] have attempted to identify the "Spatial location of Rural settlements in their paper," spatial Analysis of Rule Settlement Patterns in Orissa." In the middle zone of Orissa, due to rugged topography, the density of settlements is very high, giving rise to the development of compact type of villages with irregular spatial arrangement.

Singh, K.N. and Singh, Minati[10] have observed three different types i.e., compact located mostly in the Khadar tracts of the Ganga and Ghaghra; Semi-Compact type generally covering in Bhanghar tract, mainly in Azamgarh and Saidpur tahsil and along the river Mangai, Udanti and choti-Sarju and its tributaries, and hamletes mostly found along road sides especially between Ghosi and Ballia, Phulpur, Sagri, Banasdih and Saidpur tahsils have also some pockets of such villages.

Sharma,[11] in "Settlement Geography of the Indian Desert." presents a regional account of the mutual connections between environment and settlement. He deals with the physical basis of the area and how this affected economic and social development, which in turn influenced the growth of settlement. Thus he tried

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9. Singh, D.K., Routrary, B. and Jena S. "Spatial Analysis of Rural Settlement pattern in Orissa", in R.L. Singh etc. (Ed.) Geographic Dimension of Rural Settlements 1976. pages 124-130.

10. Singh, K.N. and Singh Minati, "Spatial Analysis of Rural Settlements and their Types in Lower Ganga-Ghaghara Doab. National Geographical Journal of India, 27 (3 & 4) 1981 ; 104-114.

11. Sharma, R.C., "Settlement Geography of the Indian Deserts," Kumar Brothers, Hauz-Khas; New Delhi - 16.

to show the effects of a particular environment on the Indian desert settlements, and indicates as well as the other elements of history, economy and culture that go to make up the Rajasthan region.

Population and settlement form significant studies in human-geography. The geographical study of population probably started in 1953, with the appearance of Trewartha's case for population geography.[12]

The study of population dynamics as a specific aspect of population geography is basically concerned with the spatio-temporal variations in different aspects of population. Ali,[13] observed that before the irrigation canals came into existence, the population distribution in the doabs was always concentrated in the northern belt of a doab i.e., the piedmont Zone of the mountains. It is no wonder therefore that in general the capital cities of the ancient janapadas of Punjab were located on strategic sites at the foot of the mountains.

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12. Trewartha, G.T., "A case for Population Geography", Annals of the Association of American Geographers, Vol. 43, p.p. 71-93 in Lal, K.M. Population - Settlements Development and Plannings" Chugh Publication Allahabad-India 1988. page 1.

13. Ali, S.M., "The Geography of the Puranas," People's Publishing House New Delhi (1983) page 145.

Deo,[14] observed the industrial development and urbanisation in Chota-Nagpur brought about manyfold and complex changes in the agricultural economy and land use pattern. A large number of urban settlements came into existence, agriculture has been brought to the level of commercial farming, particular in the villages within the sphere of influence of large-urban centres.

Sinha[15] examined the factors which determine the evolution, distribution types and morphology of the rural settlements and the trends of population and occupational structure of the population which is very much dependent on the intensity of utilisation of natural resources. A correlation of population and settlements with altitudinal zones, relative relief, drainage texture and slope categories has been attempted. There is a close relationship between settlements and topographical features. The density of population is directly related to the character of land, being least in the upper and forested areas of the upper course of river and rising steadily in the fertile plains of lower course. Recently as a result of more employment opportunities in the mining areas of the Bokaro basin and growing agricultural facilities, more people have been attracted to the region.

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14. Deo, Nawal Kishore Nath Shah, "Ranchi, Its Urban Growth-Agricultural Change," Population & Settlement Geography, selected Paaper, 21st International Geographical Congress, 1-8 Dec. New Delhi.

15. Sinha, V.N.P.", Population and Settlement in Bokaro Basin in Bihar, India," in Population and Settlement Geography selected Papers, 21st International Geographical Congress 1-8 Dec. 1970, New Delhi.

Due to this, certain pockets have became patches of changing settlement patterns. The improvements in communicational facilities have exercised marked changes in the distributional pattern of rural settlements in the inaccessible areas."

Awad[16] studies the perspectives of the overall study of Oasis towns where very ancient urban civilisation exist, but which have undergone more or less profound transformations as a result in the first place, of the colonial era and secondly of the discovery of mineral wealth, in particular oil. Awad also examines that exploration of oil gives rise to a new economy and the urbanisation of some of the Oasis towns of Sahara has been remarkably intensified.

Ayyar[17]examined the pace of urbanisation in the upper Narmada Valley. There were only 11 towns in 1872, 13, towns in 1901, which increased to 22 in 1961. The pace of urbanisation in the area has, however, been more rapid since about the end of the last century, due mainly to the great filip provided by the opening of the railways. This has resulted in high agricultural productivity of the valley and the emergence of service and market centres. He examined that in 15 out of the 22 towns other

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16. Awad, Hussain, "The Oasis Towns of the Sahara" in Population and Settlement Geopgraphy, selected Papers, 21st International Geographical Congress 1-8 Dec. 1970 New Delhi.

17. Ayyar, N.P.," The Towns of the Upper Narmada Valley India, in Population and Settlement Geography. Selected Paper, 21st International Geographical Congress, 1-8 Dec. 1970 New Delhi.

services, trade and commerce are among the first three occupations.

Ahmad [18] in social and geographical aspects of human settlements has attempted to study the geography of the villages and towns in the United Provinces. He has divided his work into three parts. First part deals with geographical setting and populations, second part deals with rural settlements, while part three deals with urban settlements. The relation between the distributional pattern of population and the physical and cultural features has been clearly brought out. He has also examined the smallest unit of rural settlement viz., the house and dwellings according to their building materials, size, plan and structure. He has also related house types to geology, relief, soilds, vegetation, rain fall, religious and superstitious ideas and economic factors. Lastly he examined the towns and traces their origin and evolution. Dominance of the historical factors on the growth of the towns of the area has been brought out. He has also examined the distribution of towns and try to show how the existing distribution is related to the historical antecedents of the area as well as to the physical and economical factors. The size and functions of the towns, morphology of towns and their aspects and ground plans has been examined.

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18. Ahmad, E., Social and Geographical Aspects of Human Settlements, Classical Publication, New Delhi, 1979.

Hudson,[19] in "a location theory for rural settlement," attempted to explain the morphological changes that takes place in a rural settlement distribution over time. When density is low, the unsettled areas are common, settlement locations are essentially independent of each other. As density increases through a continued diffusion of settlements, competition for space becomes increasingly important. The pattern changes from a clustered to highly clustered to a highly regular arrangement as weak individuals are forced out and the average size of holding increases. The validity of this theory was tested in actual settlement distributions in Iowa. It was found that regularity of spacing did increase with time, between 1870 and 1960. Agreeing with theoretical expectations based on knowledge of the agricultural economy of the area during this time. Chauhan[20]presents the profile of the rural settlement in upper Yamuna - Khadar regions of India. He found the area given to settlements are very small as compared to other land-uses. But the villages situated far away from the Yamuna bed, provides a bigger area to settlements. Such sites are selected with a view to availing facilities of water for drinking or for irrigation. The density of population

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19. Hudson, J.C., "A Location theory for Rural Settlement,' Annals of the Association of American Geographers, Vol. 59, pp. 365-381, June 1969. Reprinted in R.L. Singh & K.N. Singh (Ed.) "Readings in Rural Settlement Geography, National Geographical Journal of India, Varanasi, 1975.

20. Chauhan, V.S. "Rural Settlements in Upper Yamuna and Khadar Region in India," in Population and Settlement Geography, selected papers 21st International Geographical Congress, 1-8 Dec. 1970, New Delhi.

has been observed between 40 and 90 persons per hectares. The other shape of the settlements mostly depends upon their location as also the alignment of the roads joining them with outer settlements. Two types of settlements may be noted with regard to traffic and circulation of the villages. He also observed the morphological and functional characteristics of the region.

A simulative structural model showing evolution of basic rural territorial and settlement pattern in a small region of eastern Uttar Pradesh, has been presented by Kashi N. Singh[21]his semi-deterministic formulations are based on four sets of valid assumptions. He has schematised the process of spatial diffusion with five time periods. In time period I, the clan centre is established in the occupance territory and grows through generations one through three by natural growth as well as by immigration accretion with increase in population and consequent need for more agricultural land, new villages are established around the clan centre. In time period II (generations for through 6) the clan area is subdivided into 'tappas' and 'tappas' centres are established beyond the core are by the prospective young families of the viable clan centre. In time period III (generations 7 through 9) the existing nuclei in settlements grow into units of different sizes. In time period (IV) (generations 10 through 12)

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21. Singh, Kashi N., "The Territorial Basis of Medieval Town and Village Settlement in Eastern U.P. India," Annals of the Association of American Geographers, 58, June 1968, pp 203-220 Reprinted in R.L. Singh & K.N. Singh (Ed.) Readings in Rural Settlement Geography," National Geographical Journal of India, Varanasi 1975.

new population movements take place within the occupance area and a few 'tappas' are founded by the families of the core-area. In time period V (generations 13 through 15) the growth of population continues, remaining patches and harrow strips of forest lands are taken under settlement and a few new 'tappas' appear in the clan territory. Thus within the above five time periods' through 15 generations or about 350 to 400 years, the entire occupance area of the clan is occupied.

Deshmukh[22] attempted to highlight the relationship between the sizes of settlements and social provisions in the different natural regions of the Buldana district. In the social provisions, he included six services namely public utilities, transport and accessibility, commercial services, professional services, places of assembly and social organisations. He concluded that sizes of settlements are not the only decisive factor but one of the several geographical factors which may influence or determine the standard of social provisions and consequently the basis of service centre.

Sinha[23] studied the application of research models and discussed the origin and growth of Sirsi town. After discussing the topographical structure he studied the functional and occupa-

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22. Deshmukh, V.M., "Correlation of sizes of settlements and social provisions in Buldana district, India", in population & Settlement Geography, selected papers, 1-8 Dec. 21st International Geographical Congress, 1970, New Delhi.

23. Sinha, B.N., "Sirsi: An urban Study in the Application of Research Models", Karnataka University Dharwas - 1970.

tional aspects of urbanisation. He has also studied the infrastructural facilities like transportation and communication network of the city. Lastly he has applied certain quantitative techniques like the functional classification of Sirsi town.

Kulkarni[24] has attempted the urban structure of Nasik city. He has traced the growth and development, its morphology and functional interaction along with infrastructural development.

In the Indian context, two books are of considerable importance for the study of infrastructural facilities in towns. The first is by L.S. Bhat,[25] A Case study of Karnal Area, Haryana-India. The study is based on 23 variables. Depending upon the selected variables correlation matrix and principal component analysis method has been attempted for the ranking of the settlements.

Wanmali,[26] in A Case study of Eastern Maharashtra, has examined the central place concepts and their application, for the planning of social facilities in the towns of Vidarbha and Nagpur Metropolitan Region. Two approach to the study of hierarchy have

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24. Kulkarni K.M. "Urban Structure and Interaction - A Study of Nasik City:, Concept Publishing Company, New Delhi 1981.

25. Bhat L.S., Kundu A., Das B.N., Sharma A.N, Bhat D.R., Sastri C.S. and Mahapatra R.C., "Micro - Level Planning - A Case Study of Karnal Area Haryana - India, K.B. Publications, New Delhi - 1976.

26. Wanmali Sudhir, "Regional Planning of Social Facilities : An Examination of Central Place Concepts and their Applications - A case study of Eastern Maharashtra, National Institute of Community Development, Hyderabad 1970.

been identified here. One involves the assessment of goods and services available in the central places while the other involves the identification of the extent of the complementary region and the degree of dependence of the latter on the central place. The study on Vidharbha takes the former approach, while that on Nagpur Metropolitan Region combines both.

The study of rural settlement distribution in the varanasi district reveals that rural settlements are generally located at favourable and convenient sites, Singh[27] observed that the distribution is guided by the physical environment as well as historical traditions ad their existing socio-economic conditions. In this study hamlets have been considered as a viable unit of settlement analysis. The classification of rural settlement and its types has been carried out on the basis of number of the occupance units in a Mauza (revenue Village territory), while the nature of dispersion is calculated within the limit of the hypothetical spacing as devised by Christaller. It is found that the distributional pattern and functional organisation of settlements are changing in response to historical circumstances, adjustment to the physical factors and institutional changes brought about since independence.

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27. Singh, Ram Bali, "Rural Settlement Tupes and Their Distributions. Examples from Varanasi district India," R.L. Singh and K.N. Singh (Ed.) "Readings in Rural Settlement Geography," Nattional Geographical Society of India, Varanasi, PP 224-236.

The theme that 'the theoretical basis of transportation of density into spacing is provided by an ultimate development of a polygon into a cycle' has been analysed by Mukherjee[28] for the Rajasthan State of India. The results have been compared to the other states of India. The size and rural density have also been taken into consideration. The results reveals that spacing of villages is subject of continuous increase from east to west due to the increasing pressure of physical restraints. This is evident from the Western part of the State which is Marusthali (a desert), where villages have grown in large size but in compact form.

Miller,[29] analysed the factors which have changed the western Llanos of Venezuela from a region with low density of population possessing a primitive economy to a region with an expanding population and a developing commercial economy. The factors influencing the population growth; were control of maleria, economic crisis in the Andes and Potential economic betterment.

Both the histogenesis as well as morphogenetic approaches

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28. Mukerjee, A.B., "Spacing of Rural - Settlements in Rajasthan : A Spatial Analysis", R.L. Singh & K.N. Singh (Ed.) "Readings in Rural Settlement Geopgraphy", National Geographical Society of India, Varanasi (1975) p.p. 252-258.

29. Miller, E. Willard, "Pioneer Settlements in the Western Llanos of Venezuela : Problems & Prospectus", in Population & Settlement Geography Selected Pakers, 21st International Geographical Congress, 1-8 Dec. 1970, New Delhi.

are applied by R.Y. Singh[30] in a case study of village Mahjud to analyse its morphological structure. From the study it can be noted that Mahjud though dominated by Rajputs,since mid - 17th century, experienced the process of settlement dispersion in the village territory, and seven phases can be marked upto the present. The main village has developed in polygonal pattern due to later additions, though rectangular in shape during the first phase. In the east of the village, there is a separate basti or tola (a small settlement unit) inhabited by chamars, separated distinctly by a big pond.

Sinha,[31]observed the historical aspect of the evolution of settlements in the Chota Nagpur. He examined that this region remained the focus of the human occupance even during the pre-historic times and was the home of the pre-Dravidians before the Aryan invasion. The region acted as the meeting ground for different cultures during various historic ages, and the impact has left distinct impression upon the settlements. He observed a close relationship between the evolution of the settlements and the place names there.

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30. Singh, R.Y, "Village Mahjuda : A Study in the Morphogenesis of Rural Settlements," in R.L. Singh & K.N. Singh (Ed.) Readings in Rural Settlements Geography, National Geographical Society of India, Varanasi, 1975, p.p. 436 - 443.

31. Sinha, Vishwa Nath Prasad, "Evolution of Settlements in Chota Nagpur, India," in Population and Settlement Geography Selected Papers, 21st International Geographical Congress, 1-8 Dec. 1970, N. Delhi.

Jauhari[32] in his paper, 'Growth of urban settlements in the Sutlej-Yamuna divide described at a large extent about the urban settlements of Haryana during Pre-Historic and Early-Historic periods'. He attempted to find out the origin of most of the present districts and urban centres of Haryana namely Thaneswar, Kaithal, Rajaund, Safidon, Jind, Sonepat, Rohtak, Palwal, Sirsa and Agroha. The growth of urban-settlements was facilitated by various geographical factors like relief and climate and the domestication of animals and growth of agricultural practices also contributed a lot in this regard. These settlements being along the river banks on their high bluffs, could avail the facilities of river navigation and the use of wheeled carto were further aided to urbanisation.

Jauhari stated that early settlements came into existence during the long Pre-historic and Early - historic period of about three thousand years from the latter half of the third millennium B.C. to the downfall of Harsha's empired in 647 B.C. The most important of these towns like Karnal, Panipat and Sonepat appears to have been sited on the high-bluffs of the Yamuna. Others like Thaneswar and Pehowa lie on the river Saraswati, while the Jind town must have been sited along the banks of the river Chittang or Chutang. The economy of these settlements must have been based on agriculture and pastoral industries. The above mentioned towns

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32. Jauhari, A.S. "Growth of Early Urban Settlements in the Sutlej - Yamuna Divide (Pre Historic and Early - Historic Periods)," National Geographical Society of India, Vol. 8, Part I, March 1962.

found their origin in later Pre-historic or early Vedic period from about 1500 B.C. to about 500 B.C. In Iron-Age from about 500 B.C. to 647 A.D. Agroha town came into being in the south central part and Rohtak in the south-east of Sutlej-Yamuna Divide. Kaithal was a major town of that period. This town is said to have been founded by the hero Yudhisthira. Its Sanskrit name is Kapisthala or the 'abode or Monkeys'[33] Likewise the town of Jind is said to have growth around a temple built by Pandav to 'Jainta Devi' the goddess of victory[34] Rajaund, a village in Kurukshetra, has been mentioned in Mahabharata, and the name is said to have been derived from 'Raja-hand' or 'the Prison of Rajah's[35] Moreover, Panipat and Sonepat are among the five 'pats' demanded by Yudhishtra as a price of peace [36]the town of Safidan, according

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33. Imperial Gazetteer of India, Vol. XIV, 1908, p-288 in A.S. Jauhari, Growth of Early Urban Settlements in the Sutlej - Yamuna Divide (Pre-Historic and Early historic periods, National Geographical Journal of India, Vol. 8, Part I, March 1962, page 15.

34. Ibid, p-177.

35. District Gazetteer, Karnal, Part A, 1918, P-288 in A.S. Jauhari, "Growth of Early Urban Settlements in the Sutlej Yamuna Divide (Pre. Historic and Early-Historic Periods, National Geographical Journal of India, Vol. 8, Part I, 1962.

36. Imperial Gazetteer of India, Provincial Series, Punjab Part I, 1908, pp-301 - 316, In A.S. Jauhari, "Growth of Early Urban Settlements in the Sutlej-Yamuna Divide (Pre-Historic to Early-Historic Periods), National Geographical Journal of India, Vol. 8, Part I, 1962.

to legend, was founded by Janamejaya[37]the son of Raja Parikshit, who was responsible for the destruction of serpents[38]The name of the town Thaneswar is said to have been derived from Sthana (abode) and Ishwara (God). So the author has very successfully made an attempt, to analyse the evolution of the earliest towns of the region and emphasied the influence of the physical and cultureal environment on their evolution.

Jauhari,[39] in his next paper, "urban settlements of the Sutlej - Yamuna divide - C. 647 A.D. to 1947 A.D. (medieval and later historic period settlements) stated that during such a long period of over 1,300 years the Divide had varied contacts with foreign elements and passed through a chequered history, which greatly influenced urban settlements. His study starts with the medieval period of Indian history which begins from the time of the downfall of Harsha's empire in 647 A.D. and ends with the later historical period, when the country was partitioned in 1947 A.d. He has divided the growth of towns into five periods namely

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37. Janamejaya was the great-grandson of Arjuna - the Pandava Brother it was to this king that the Mahabharata was recited by vaisampayna in A.S. Jauhari," Growth of Early Urban - Settlements in the Sutlej - Yamuna Divide (a Pre-Historic to Early Historic Periods) National Geographical Journal of India, Vol. I 1962.

38. Imperial Gazetteer of India, Provincial Series Punjab, Part II, 1908 page 325 Ibid p.p. 15.

39. Jauhari, A.S. "Urban Settlements of the Sutlej-Yamuna Divide - C. 647 A.D. to 1947 A.D. (Medival and Later Historic period Settlements), National Geographical Journal of India, Volume 8, Part 2, June 1962.

(1) C. 647 A.D. to 1192 (2) 1192 A.D. to 1707 (3) Eighteenth Century i.e. from 1707 to the beginning of the British rule in 1803 A.D. (4) Early British period from 1803 to the first complete census of 1881. (5) 1881 to 1948. In first time period Sadhaura, Banur, Samana, Sunam and Sirshind towns came to existence between Saraswati and the Sutlej, while the towns of Hansi, Maham, Gohana, Jhajjar, Rewari and Narnaul lie in between the Yamuna and the desert of Rajasthan. He has also related political and cultural features with the growth of urban centres probably from pre-existing villages. The second time period i.e. from 1192 to 1707 A.D. brought about a great religious & cultural change in the region after the defeat of Hindus and the towns that were founded after 1192 were mostly from the view point of alien rulers which aimed at firstly, the effective control of the empire and secondly, the whole-sale destruction of the Hindu culture and places associated with it. So the towns of Shahabad, Sanaur, Ludhiana, Basi, Sangrur, Phul, Jagraon, and Raikot in order of their age lie in the Sutlej-Saraswati interfluve, while the towns of Bawal, Fatehabad, Hisar, Ferozpur Jhirka, Tohana, Mahindergarh, Beri and Pataudi in order of their age are situated in the southern part of the divide south of the river Ghaggar. In time period III the new settlements were small fortified towns which were the setas of each rising family clan or group. In this western Ghaggar, Upland Plain contains the towns of Dharamkot, Kot Kapura, Bhadaur, Barnala, Dhanoula, Nabha and Patiala. They all extend in a narrow belt from Patiala in the east to Kot - Kapura in the west only the towns of Dharamkot lies quite de-

tached in the north while the towns of Laharu, Farrukhnagar, Ballabgarh and Hodal are situated in the tract lying to the south of Haryana. In the fourth period only a few new towns were founded during the 78 years, i.e. from the time of the coming of British influence in 1803 to the first complete census of 1881. Thus it was mainly a period of expansion and growth for a large number of the existing towns in fifth time period (i.e. 1881-1947) is a period when entirely new towns were not founded, but with the changes that took place in administrative boundaries and with the construction of railways, greater importance and easier accessibility was imparted to villages and other settlements lying along the railways. In this period in the Kurukshetra region, only Gharaunda and Narwana came into existence. Hence the author is very much successful in a historical origin as well as the evolution of these towns with the passage of time.

Jauhary[40] in his next paper "Sutlej - Yamuna Divide : A Study in Post Partition Growth of Small Towns from Pre-existing Rural Settlements" mentions that this post partition period is marked by a rapid growth and expansion of a large number of urban centres. The primary factor which has been instrumental in bringing about this development is the rehabilitation of the displaced persons. This is primarily due to two factors. Firstly, more persons left the divide than came into it after partition. Sec-

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40. Jauhari, A.S. "Sutlej - Yamuna Divide : A Study in Post Partition Growth of Small Towns From Pre-existing Rural Settlements" National Geographical Journal of India, Vol 9 Part II, June 1963.

ondly there was an unequal replacement of population of the urban and rural settlements. This period marks the rise of a number of small towns from pre-existing rural settlements more especially, those along the railway lines. The growth of urban settlements since the time of partition can be considered in two periods. (1) 1947-1951 (2) 1951-1961. During first period, a large number of new towns came into existence which reveal the immediate effect of partition on urbanisation. Although the second period also witnessed the emergence of a few new towns, yet it shows more the stabilising influence on the 1947-51 urban centres, which is quite natural to have with the passage of time. It reveals how far the measures adopted by way of expediency were in accordance with the more fundamental influence exerted by the setting of towns and the environmental potentialities of the region to sustain fresh urban growth. It has been observed that roads and railways have helped in establishment of most of the towns of post partition period which have grown from pre-existing rural centres. The specific reasons for the development of certain old existing villages rather than the others are primarily related to (I) ease of transport (II) better commercial opportunities (III) the growth of non-agricultural population with the settling down of non-cultivating people and (IV) establishment of new industries. Jauhari has observed that railways have been responsible for most of the 'mandi' towns of Sutlej - Yamuna Doab while roads and railways are responsible for trade and commerce functions of Doab. As two-thirds of the towns of Doabs are engaged in this activity. It was partition that brought about a combination of

several functions at individual centres on a larger scale and thus gave them real urban character. The largest of these towns - Yamunanagar has benefited from its old established industries and a favourable situation near the forest resources and transport facilities, both of which are of great advantage to her newly developing industries. This large scale growth of small tocons, however, is significant as it demonstrate the tendency of growing modernisation in this region. These towns have brought closer the people of rural centres and urban areas socially, culturally and economically.

Jauhari,[41] in his next paper "Post-Partition Expansion of Pre-existing Towns in the Sutlej-Yamuna Divide (A Study in the Development of Urban Fringe and Suburbs) has stated that the Sutlej-Yamuna Divide has witnessed vast areal expansion of a fairly large number of old existing towns & cities. This new growth has however,been rapid in the fringe areas where residential, suburbs, civil station sububan area and commercial suburbs have been instituted owing primarily to (1) rehabilitation of displaced persons and (ii) changing political and economic situation since the time of partition. It is the eastern half of the Divide with better water facilities and greater security that has made notable progress, half of the new residential townships are situated in a narrow belt close to the old west bank of the river Yamuna. This zone has the advantage of having some of the trunk

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41. Jauhari, A.S. "Post-Partition Expansion of Pre-existing Towns in the Sutlej-Yamuna Divide. A Study in the Development of Urban Fringe and Saburbs," National Geographical of Inida, Vol. 10, Part 2, 1964.

roads and broad-gauge railway line which connects it with the two major ports of India - viz., Calcutta and Bombay. The extension of irrigation facilities has caused the establishment of new 'mandies'.

Organisation of Material:-

The entire study is divided into five chapters. The first chapter, which is introductory in nature gives the knowledge of the study area and the effects of relief, drainage and climate on the development and distribution of urban settlements. For the clear understanding of the whole text, objectives, data-base and methodology have been given. A brief literature survey has also given at the end of this chapter. In this study, quantitative methods have been used for the analysis of urban characteristics. A few major aspects have been chosen and an attempt has been made to study them in detail.

The second chapter describes and analyses the distribution of spatial characteristics of towns like growth, density and distribution of population of towns. The growth and distribution of towns in space have also been discussed by Nearest Neighbour Analysis and Rank-size Rule method.

The third chapter gives a detailed account of the functional structure of the region. This is a town level study for the periods of 1971 and 1991 and only non-agricultural workers have been taken into account. In the end of this chapter change in functional character has been discussed in detail.

In fourth chapter, the hierarchy of towns has been worked out for 1971 and 1981, and the social, cultural and educational facilities available in the towns have taken into account.

In the end, the chapter fifth deals with the summary of the whole study and certain conclusions has been drawn on the basis of results obtained in various Chapters.

CHAPTER-2

SPATIAL DISTRIBUTION OF TOWNS

2.1 INTRODUCTION :-

Recently, Haryana experienced higher urbanization, which develops an interest to study spatial distribution of towns. Emergence of many new towns during last two decades i.e., 1971-81 and 1981-91 was due to natural growth and increasing infra-structural facilities in countryside, therefore there has been a tendency of faster growth of urban population as compared to the growth of the total population.

Following table shows the change in the percentages of urban population to total population in the Haryana State since 1971.

TABLE 2.1 :-

Increase of population in the Haryana State during 1971-1991

YEARS	TOTAL POP.(in Lakhs)	URBAN POP. (in Lakhs)	1971-1991 PERCENTAGE OF URBAN (Ub.Pop. to Total pop.)
1971	100.37	17.73	17.66
1981	129.23	28.27	21.88
1991	163.18	40.45	24.79

From the above table, we can say that urban population in Haryana has been increasing gradually in the successive decades.

It has shown a 4.22 percent increase during the decade 1971-81, while the increase during the decade 1981-91 is 2.91 percent.

2.2 CENSUS DEFINITION OF " TOWNS " SINCE 1971:-

The present study which aims at analyzing the " Structure of Urban Settlements in Haryana ", during 1971-91 decade, has the 'Urban Center ' or 'Town' as its unit of analysis. The concept of Town should be very much clear before going any further study. The census of India has been defining 'Town' with minor changes over the three decades.

1971[1] :-

In 1971, only those place were termed as towns which fulfilled the following criterion :-

(a) All places with a corporation, Municipality or a Cantonment Board or a Notified Area Committee.

(b) All other places which are having;

(i) A minimum population of 5,000.

(ii) 75 percent of the male working population being engaged in economic pursuits other than agricultural.

(iii) A density of population of at least 386 per square Kilometre.

Standard Urban Area :-

The concept of ' Standard Urban Area ' was to replace the town groups of 1961 census. The concept of standard Urban Area

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1. Census of India, 1971, Series 6, Haryana, Part X A, District census Handbooks, Haryana.

takes into account the contiguous areas made up of other Urban as well as rural administrative Units should have close mutual socio-economic links with the core town having a minimum population size of 50,000 and the probability are that the contiguous area in question got fully urbanized in a period of 2 to 3 decades.

Urban Agglomeration :-

This concept was also started in the 1971 census. It is a matter of common observation that around most of the core or statutory towns, a fairly large and well recognized Railway colonies, University Campuses, Military Camps etc. have come up. Although such out-growths are outside the statutory limit of a corporation or a Municipal or a Cantonment Board, they usually fall within the revenue boundary of the place by which the town itself is known. And each such individual area by itself may not satisfy the minimum population limit to qualify for being created as an Urban area.

1981[2]

The definition which was adopted at the 1971 census has been retained at the 1981 census, with some minor changes:-

(a) All places with a Municipality, Corporation, Cantonment Board or a Notified Area Committee;

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2. Census of India , 1981, Series 6, Haryana, Part X A, Town Directory.

(b) All other places having :-

(i) A minimum population of 5,000;

(ii) At least 75 percent of the male working population engaged in non-agricultural pursuits; and

(iii) A density of population of at least 400, persons per square Kilometere

In the 1971 census the male working in activities, like livestock, forestry, fishing,hunting and plantations, orchards and allied activities were treated as engaged in non-agricultural pursuits and therefore contributed to the 75 percent criterion, whereas in the 1981 census, these activities were treated as par with cultivation and agricultural labour for the purpose of this criterion.

In addition to all the areas, having Municipality or Cantonment Board, four Villages namely (1) Babiyal in Ambala district (2) Samalkha in Karnal district (3) Gurgaon (Rural) and (4) Jharsa in Gurgaon district which satisfy criterion (b) referred to above have been treated as ' Census Towns ' (Non - Municipal) in 1981 census. Panchkula Urban Estate in Ambala district has also been treated as a town. The Faridabad Complex Administration Consists of Faridabad Township and Ballabhgarh towns of 1971 and some surrounding Villages in Faridabad district has been treated as a single Urban Unit. One more very minute change can be seen in 1981 census i.e. in 1971 census density of population of 386 persons per square Km. was taken as a parameter in defining the towns, while in 1981, this density of population is 400 persons per square Km.

Urban Agglomeration :-

The concept of ' Urban Agglomeration ' was adopted for the first time during the 1971 census. This includes a contiguous urban spread constituting a town and its adjoining urban out-growth or two or more physically contiguous towns together with contiguous spread. It also includes such areas which may have sprung upon the periphery of town which may have sprung upon the statutory limits of individual local body.

In 1971 census, no place was recognized to be a continuous urban spread extending beyond the Municipal limits of an urban unit deserving to be treated as an Urban agglomeration, in Haryana. But the following four urban agglomeration have been delineated at the time of 1981 census :-

S.N	Urban Agglomeration	Constituent Towns or Urban Outgrowth.
	1	2
1	Yamunanagar (U.A)	(i) Jagadhri W.Rly Colony (Mc)
		(ii) Yamunanagar (M.C)
		(iii) Jagadhri (M.C)
2.	Hisar (U.A.)	(i) Hisar (M.C.)
		(ii) Haryana Agricultural University Campus and Mini Secretariat.
3.	Ambala (U.A.)	(i) Ambala Cantt (C.B.)
		(ii) Ambala Sadar (M.C.)
4.	Gurgaon (U.A.)	(i) Gurgaon (M.C.)
		(ii) Gurgaon Census Town.

Standard Urban Area :-

This concept was also adopted for the first time in 1971. This is defined as, " the projected growth area of a city or town having a population of 50,000 or more in 1971, as it would be in 1991, taking into account not only the towns and villages which will get merged into it and also the intervening areas which are potentially Urban. This is a long term planning area and is to remain statistical reporting Unit during the three successive censuses 1971, 1981 and 1991 ".

In the case of Haryana, the following eleven Urban areas were delineated. They are (1) Ambala (2) Bahadurgarh (3) Bhiwani (4) Faridabad Complex Administration (5) Gurgaon (6) Hissar (7) Karnal (8) Panipat (9) Rohtak (10) Sonipat (11) Yamunanagar - Jagadhri.

1991[3] **:-**

In 1991, the definition was similar to the one in 1981. Towns were defined which include:

(1) All statutory towns i.e. all places with a local Authority like Municipality, Cantonment Board, Notified Area Committee etc.

(2) All other places, which satisfy the following requirements;

(a) A minimum population of 5,000;

(b) At least 75% of the male working population being engaged in non-agricultural pursuits, and

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3. Census of India, 1991, Series 8, Haryana, Paper 1 of 1991 Supplement, Provisional Population Totals, P.P. 33 - 34.

(c) A density of population of at least 400 persons per square Kilometre.

Urban Agglomeration :-

It is generally seen that some Urban settlements like railway colonies, University Campuses, port areas and military Camps come up outside the notified municipal limits of a town, but adjoining it, Such outgrowth (s) may actually fall in the area of the adjoining revenue estate, but it is not realistic to treat them as rural area on account of their highly developed Urban characteristics, while at the same time each such outgrowth by itself may not satisfy the requirement to qualify itself for treatment as a town. Three more new Urban agglomeration came into existence in 1991 census.

These are :-

1.	Karnal (U.A.)	(i) Karnal (M.C.)
		(ii) Part of Sector 6, Urban Estate (O.G.).
2.	Pundri (U.A.)	(i) Pundri (M.C.)
		(ii) Part of village Fatehpur.
3.	Bahadurgarh (U.A.)	(i) Bahadurgarh (M.C.)
		(ii) Sector 6, H U D A (O.G.).

Standard Urban Area :-

This concept was also used for the first time in 1971 census, which denotes the projected growth area of a town having a

population of 50,000 or more in 1971. This area should have a strong portent of urbanization and be capable of being merged with the core town during the next 2 - 3 decades.

The concept of standard urban area is different from that of the urban agglomeration. The standard urban area is based on the potentialities of development of any urban growth in the next two or three decades while the urban agglomeration depicts the present state of any outgrowth of urban spread adjoining a core town.

2.3 Growth of Towns in Haryana since 1971:-

The number of towns of Haryana has been increasing continuously. Table 2.2 gives a list of towns in the Haryana state in 1971; new towns added during subsequent years; towns declassified and reclassified over the years.

The Table 2.2. shows that in Haryana, there were 65 towns during 1971 census. But in 1981 census, one town of Tosham had been declassified and Faridabad M.C. and Faridabad Township were two separate towns till 1981, in 1981, these two towns merged alongwith the merger of Ballabhagarh and constituted the Faridabad Complex Administration. Thus with the addition of 19 new towns in 1981, the number of towns rose upto 81.

In 1991, the town of Tosham had been reclassified and 15 new towns including Tosham has been added while two towns of Rania and Jharsa has been declassified. Thus the total number of towns in Haryana, in 1991, has gone upto 94 of which 84 are statutory or Municipal towns and 10 are census Towns.

TABLE 2.3.

GROWTH OF TOWNS 1971-1991

S.No.	Name of The Town in 1971	Year	New Towns added in	Towns declassified	Towns reclassified
1.	Kalka				
2.	Naraingarh				
3.	Sadaura				
4.	Ambala M.C.				
5.	Ambala Cantt. (C.B.) (city)				
6.	Chhachhrauli				
7.	Buria				
8.	Jagadhri				
9.	Yamunanagar				
10.	Jagadhri workshop Rly. Colony.				
11.	Pehowa•				
12.	Kaithal				
13.	Pundri				
14.	Shahbad				
15.	Thanesar				
16.	Ladwa				
17.	Radaur				
18.	Nilokheri				
19.	Karnal				
20.	Gharaunda				

S.No.	Name of The Town in 1971	Year	New Towns added in	Towns declassified	Towns reclassified
21.	Panipat				
22.	Narwana				
23.	Uchana				
24.	Jind				
25.	Julana				
26.	Safidon				
27.	Maham				
28.	Gohana				
29.	Ganaur				
30.	Sonepat				
31.	Rohtak (M.C.)(city).				
32.	Beri				
33.	Bahadurgarh				
34.	Jhajjar				
35.	Mandi Dabwali				
36.	Kalanwali				
37.	Sirsa				
38.	Fatehabad				
39.	Jakhalmandi				
40.	Tohana				
41.	Uklanamandi				
42.	Hisar				
43.	Hansi				

S.No.	Name of The Town in 1971	Year	New Towns added in	Towns declassified	Towns reclassified
44.	Bhiwani				
45.	Tosham				
46.	Loharu				
47.	Bawal				
48.	Rewari				
49.	Pataudi				
50.	Haileymandi				
51.	Farrukhnagar				
52.	Gurgaon				
53.	Sohna				
54.	Faridabaad- Township				
55.	Faridabad				
56.	Ballabhagarh				
57.	Palwal				
58.	Hodal				
59.	Nuh				
60.	Ferozepur Jhirka				
61.	Charkhi Dadri				
62.	Kanina				
63.	Mahendergarh				
64.	Ateli				
65.	Narnaul				

S.No.	Name of The Town in 1971	Year	New Towns added in	Towns declassified	Towns reclassified
66.		1981	Ambala Sadar		
67.		1981	Assandh		
68.		1981	Babiyal		
69.		1981	Barwala		
70.		1981	Bawani Khera		
71.		1981	Gurgaon (Rural)		
72.		1981	Hassanpur		
73.		1981	Hathin		
74.		1981	Indri	Tosham	
75.		1981	Jharsa		
76.		1981	Kalanaur		
77.		1981	Kalayat		
78.		1981	Panchkula Urban Estate		
79.		1981	Pinjore(H.M.T.)		
80.		1981	Rania		
81.		1981	Ratia		
82.		1981	Samalkha		
83.		1981	Taoru		
84.		1981	Taraori		
85.		1991	Pinjore(Rural)		
86.		1991	Bilaspur		
87.		1991	Mustafabad		
88.		1991	Farrakhpur		

S.No.	Name of The Town in 1971	Year	New Towns added in	Towns declassified	Towns reclassified
89.		1991	Cheeka		
90.		1991	Uncha Siwana		
91.		1991	Ellenabad		
92.		1991	Tosham		Tosham
93.		1991	Kharkhoda		
94.		1991	Kheri Sampla		
95.		1991	Dundahera		
96.		1991	Dharuhera		
97.		1991	Punahana		
98.		1991	Narnaund		
99.		1991	Siwani		

Source : - Based on

1. Census of India 1971,
   Series 6, Haryana,
   District Census Hand Books,
   Part X-A, Haryana.
2. Census of India 1981,
   Series 6, Haryana,
   Town Directory,
   Part X-A, Haryana.
3. Census of India 1991,
   Series No. 1, Paper 1 of 1992,
   Vol. 1, Final Population Tables, India.

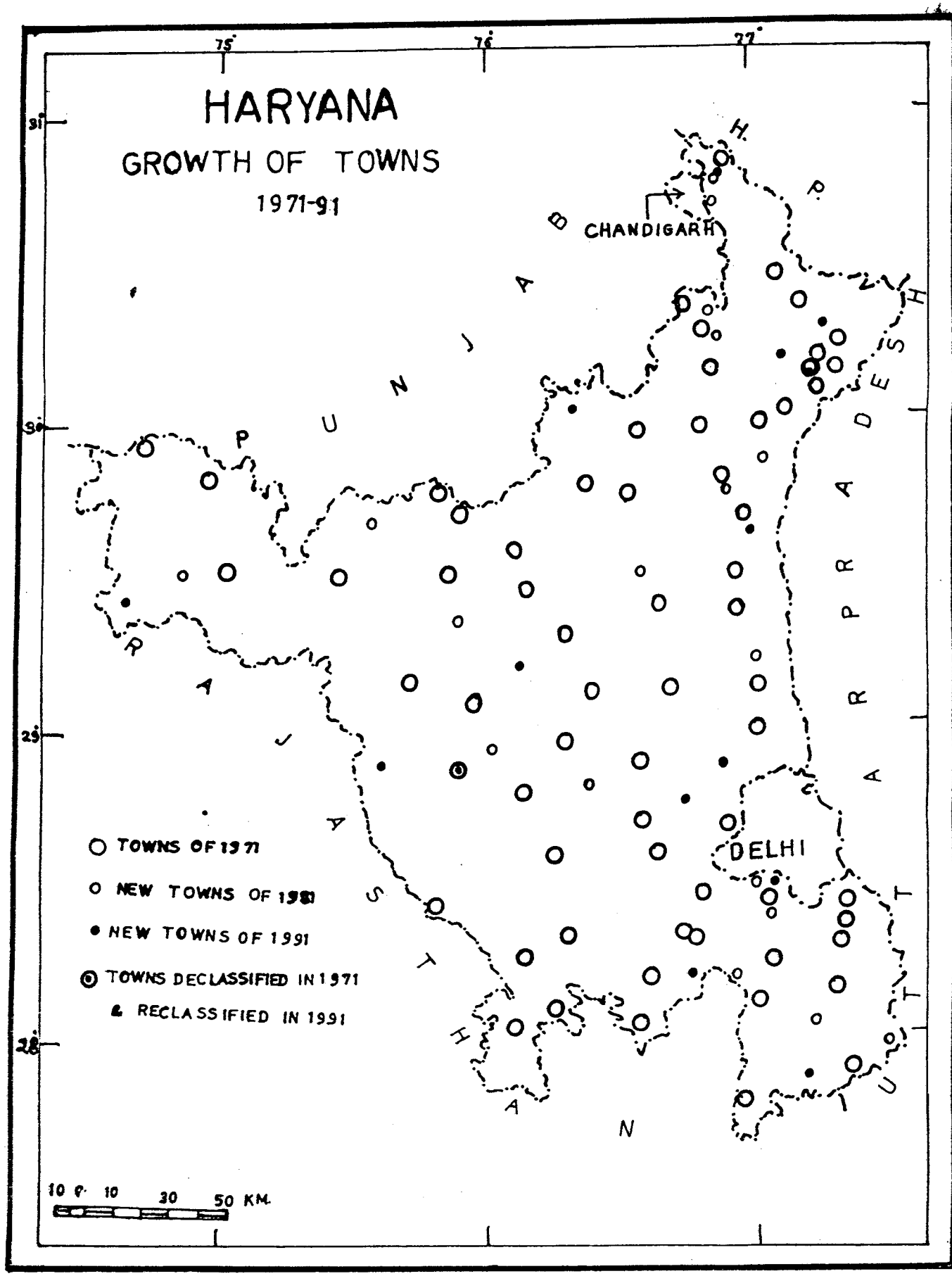
HARYANA
GROWTH OF TOWNS
1971-91
75°
76°
77°
31°
30°
29°
28°
CHANDIGARH
H.P.
PUNJAB
UTTAR PRADESH
RAJASTHAN
DELHI
TOWNS OF 1971
NEW TOWNS OF 1981
NEW TOWNS OF 1991
TOWNS DECLASSIFIED IN 1971
& RECLASSIFIED IN 1991
10 0 10 30 50 KM.

Fig 2·3

2.4 (a) Growth of Urban Population in Haryana since 1971 : A District-wise Analysis :-

As it is clear from the Appendices 2.1 that decennial growth rate of urban population has decreased during the decade 1981-91 in comparision to 1971-81 decade. The decennial growth-rate of Urban population has decreased from 59.47 percent in 1971-81 decade to 43.07 percent in 1981-91 decade. There are thirteen disticts which has shown the same trends, while three districts namely Rewari, Yamunanagar and Ambala has shown increase in growth-rate during 1981-91 in comparision to 1971-81 decade. There were eleven districts which had shown there growth-rate less than that of state as a whole, while five districts namely Faridabad, Sonipat, Panipat,Gurgaon and Sirsa had shown higher growth-rate than that of the state during 1971-81 decade. In 1981-91 decade, there are four districts which have shown higher growth rate than that of state as a whole. They are Faridabad, Rewari, Kaithal and Yamunanagar. Except these for, all others have shown less growth-rate than that of state as a whole. For the mapping purpose, that data of urban population at district level has been taken,as shown in figures. The data has been clubbed into four groups, as given below :

(i) Growth-rate more than 100 %

(ii) Growth-rate between 75 % and 100 %.

(iii) Growth-rate between 50 % and 75 %.

(iv) Growth-rate less than 50 %.

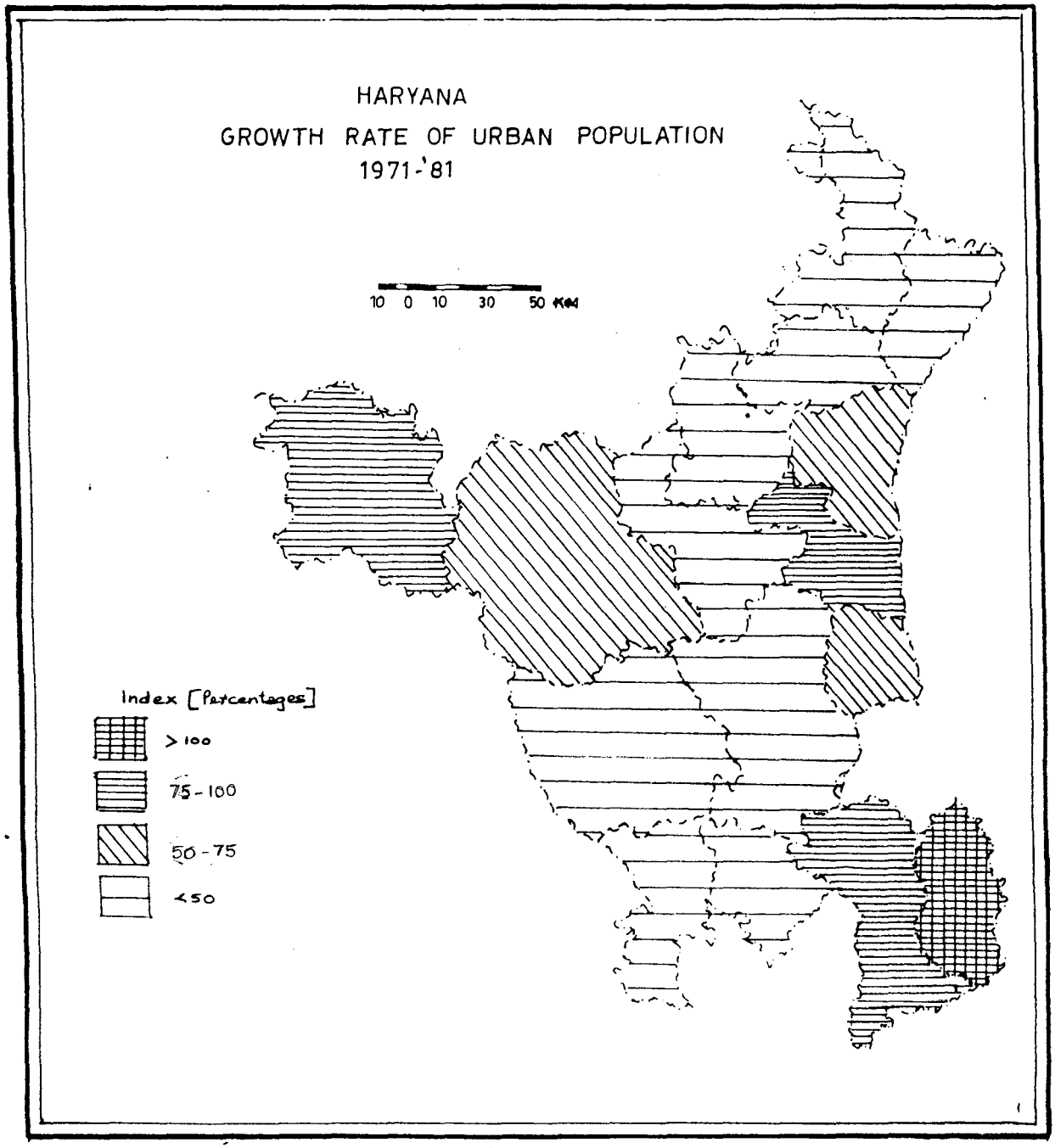
HARYANA
GROWTH RATE OF URBAN POPULATION
1971-'81
10 0 10 30 50 KM
Index [Percentages]
> 100
75 - 100
50 - 75
< 50

Fig 2.4a.

In 1971-81 :- there were nine districts which had shown growth rates less than 50 %, while three districts namely Sonipat, Hisar and Karnal had shown their growth rates between 50 percent and 75 percent. There were three districts viz. Panipat, Gurgaon and Sirsa which came in between 75 percent and 100 percent group, while one district of Faridabad had shown its growth-rate more than 100 percent.

In 1981-91:- There are fourteen districts which has shown their growth-rates less than 50 percent while there are only two districts namely Faridabad and Rewari which has shown their growth-rates between 50 percent and 75 percent. But no district has shown their growth rate more than 75 %.

Faridabad district has shown a remarkable growth-rate in both the decades. It has shown a growth-rate of 135.95 percent in 1971-81 decade and 74.64 percent in 1981-91 decade. This may be due to the pre-dominance of industrial character of the area and the in flux of migrant labour.

2.4 (b) Growth-Rate of Towns :-

As it is clear from the appendices 2.2 that there are sixteen towns which have shown an increase in their growth rate during 1981-91 in comparison to that of 1971-81. Most of these town were smaller towns in 1971-81 decade. But the towns which were bigger towns in 1971-81, they have shown decrease in their growth rates, in 1981-91 decade, for example, Faridabad complex town had shown 169.40 percent growth rate during 1971-81 decade but its growth rate decreased from 169.40 to 85.52 percent in 1981-91 decade.

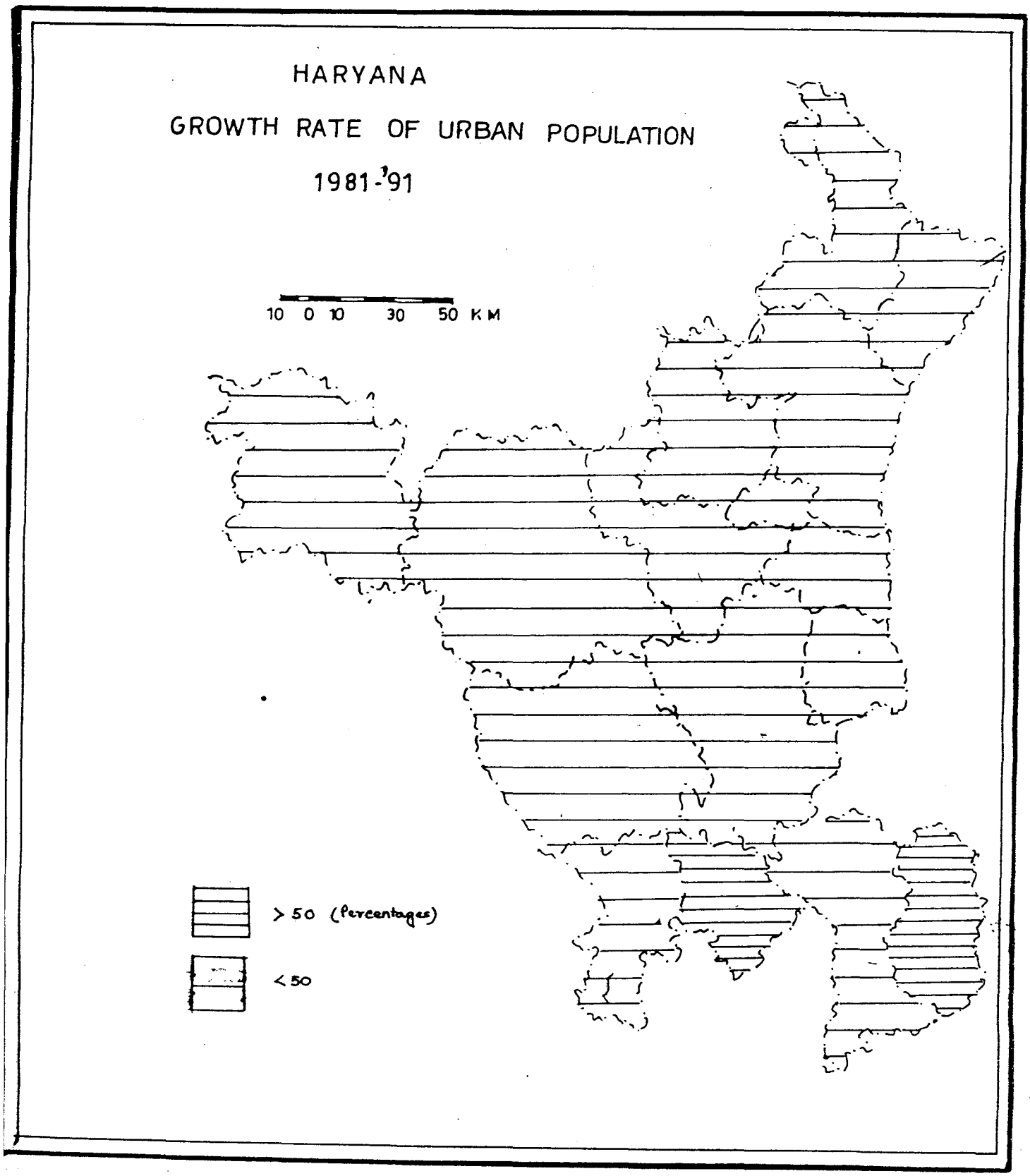
HARYANA
GROWTH RATE OF URBAN POPULATION
1981-'91
10 0 10 30 50 KM
> 50 (Percentages)
< 50

Fig 2.4b.

In 1971-81 decade, Haileymandi town of Gurgaon district had shown the highest growth of 350.27 percent, but it has shown 30.62 percent in 1981-91 decade.

There were only thirteen towns who had shown their growth rate of more than 50 percent in 1971-81, while in 1981-91, they are only eight town. Thus we can say that on the whole there is no remarkable change in the share of the urban population of the towns to the total urban population of Haryana.

2.5 Density of Population in the Towns of Haryana :-

Density of population gives the number of people per unit area. In this study the density of population for the towns of Haryana has been calculated. The area is taken in Kilometre and therefore density is expressed here in terms of the number of people per square kilometer of town.

The density of the towns has been calculated for the years 1971 and 1981. The data for 1991 census on area of towns in Haryana is unpublished. The appendices 2.5 (a) shows the area, population and density of the towns of Haryana for the years of 1971 and 1981 only.

In 1971 census, Faridabad Townships and Faridabad M.C. had been taken as one town. In 1981, Ballabhgarh merged alongwith Faridabad complex administration losing its identity as an individual town. Thus in appendices 2.5 (a) Faridabad Township, Faridabad M.C. and Ballabhgarh M.C. have been taken as one town in 1971 and 1981, to make comparison easy.

It is clear from the appendices 2.5 (a) that the towns which have shown a drastic decrease in their population density are the one which have experienced an increase in their area without a corresponding increase in their population. So the towns show this tendency. The population of these towns has increased steadily but a spurt of the area has lowered their population density. These 18 towns are placed at the beginning of the appendices 2.5 (a). The rest of the towns show a steady increase in their density, a few towns show no change in their area for the two decades 1971 and 1981. They are 22 in number, namely Kaithal, Rewari, Hansi, Palwal, Fatehabad, Ganaur, Mahendergarh, Beri, Pundri, Nilokheri, Haileymandi, Kalanwali, Julana, Pataudi, Radaur, Uchana, Bawal, Loharu, Kanina, Farrukhnagar, Buria and Chhachharauli.

Rest of the towns do show a change in their area but as this change is not sudden and these towns have a corresponding increase in their populations, their density of population of these towns has been rising constantly.

Appendices 2.5(b) and 2.5(c) groups the towns into four categories according to their density. The Appendices feature 1971 and 1981 categorization separately. The data an area of the towns for 1991 is unpublished.

As from Appendices it is clear that there is a dominance of low density towns over the high density towns. Towns having a density below 5,000 lead, followed by towns with density between 5,000 and 10,000. The high density towns are very few.

In 1971, towns with population density of less than 5,000 were forty of the total towns, followed by 5,000-10,000 were thirteen and 10,000-15,000 were three and more than 15,000 were four towns.

In 1981 towns having a population density of les than 5,000 were fortynine in number, followed by 5,000 and 10,000 were 23 and between 10,000 and 15,000, was only one and more than 15,000, were four of the total towns of the Haryana State.

Thus, it is clear that the percentage of low density towns are high and percentage of high density towns are low.

2.6 Density of Urban Population in the tahsils of Haryana :-

Appendices 2.6(a) and 2.6(b) have given the total urban area , total urban population and density of tahsils in Haryana during 1971 and 1981. Data on area of the tahsils in Haryana during 1991 census year is unpublished.

Tahsil level data has been taken for the mapping of density variations during 1971 and 1981 census years, taking the total urban area and total urban population of tahsils into account.

These density figures have been classified into six categories which have been shown in:

Tables- 2.6.1 and 2.6.2 for 1971 and 1981 respectively.

1. Density more than 15,000.
2. Density between 11,000 and 15,000.
3. Density between 8,000 and 11,000.
4. Density between 5,000 and 8,000.
5. Density between 2,000 and 5,000.
6. Density less than 2,000.

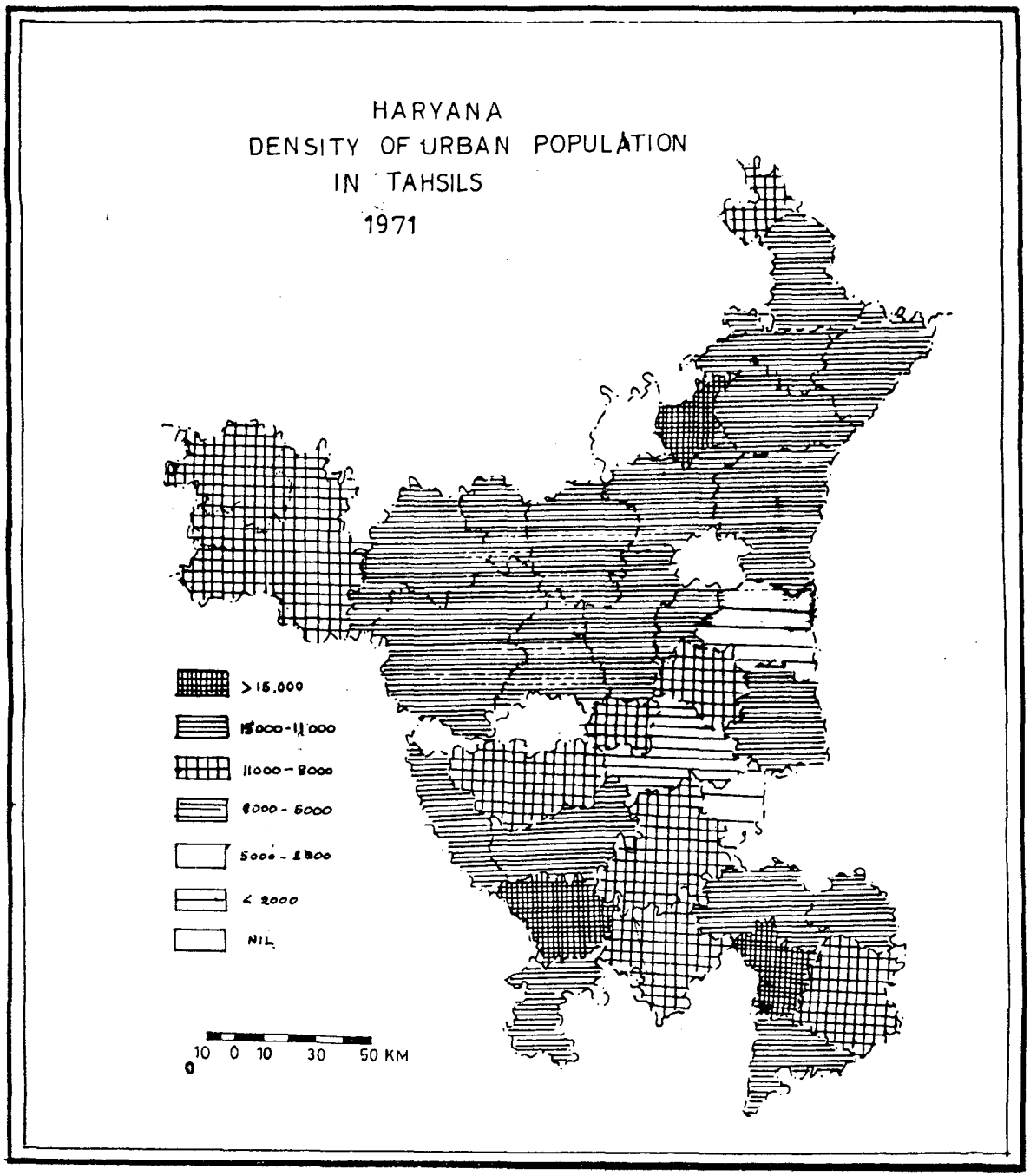
HARYANA
DENSITY OF URBAN POPULATION
IN TAHSILS
1971
> 15,000
15000-11000
11000-8000
8000-5000
5000-2000
< 2000
NIL
10 0 10 30 50 KM

Fig 2·6a.

1. Density Less than 2,000:- In 1971, there ware 5 tahsils, while during 1981, there were 4 tahsils in this category.

2. Density between 2,000 and 5,000:- Majority of the tahsils are in this category, as is evident from tables that there were 18 tahsils during 1971, but during 1981, the number to 22.

3. Density between 5,000 and 8,000 :- There were 9 tahsils in this density category in both the census years.

4 Density between 8,000 and 11,000 :- In 1971, only Rohtak tahsil and in 1981, only Rewari tahsil was in this group.

5. Density between 11,000 and 15,000 :- Panipat tahsil was the only tahsil in 1971, while in 1981, not even a single tahsil was in this category.

6. Density more than 15,000 :- In this category of density, Bahadurgarh and Bawal in 1971 and Nuh and Bawal in 1981.

There were three tahsils namely Guhla, Assandh and Bawani Khera during 1971 and Guhla tahsil during 1981,which have no urban area, mainly because Assandh and Bawani Khera were declared tahsils for the first time in 1981, as we have taken area and population in accordance with the 1981 census to make comparison easy. As far as Guhla is concerned , in 1971, only Pehowa was the urban area which had become a separete Tahsil in 1981, as we have considered Pehowa and Guhla, to separete Tashils here in this study. In 1981 it has no urban area

Table 2.6.1

Classification of Density in the Urban Areas of Tahsils of Haryana 1971.

DENSITY	NUMBER OF TAHSILS	TEHSILS	DISTT.
1	2	3	4
Less than 2000	5		
		1. Naraingarh	Ambala
		2. Safidon	Jind
		3. Nuh	Gurgaon
		4. Mahendergarh	Mahendragarh
		5. Pehowa	Kurukshetra
Between 2000 and 5000		18	
		1. Ambala	Ambala
		2. Jagadhri	Ambala
		3. Kaithal	Kurukshetra
		4. Narwana	Jind
		5. Thanesar	Kurukshetra
		6. Jind	Jind
		7. Sonipat	Sonipat
		8. Ballagarh	Faridabad
		9. Gurgaon	Gurgaon
		10. Ferozepur Jhirka	Gurgaon
		11. Narnaul	Mahendragarh
		12. Dadri	Bhiwani
		13. Loharu	Bhiwani
		14. Fatehabad	Hisar

DENSITY	NUMBER OF TAHSILS	TEHSILS	DISTT.
1	2	3	4
		15. Tohana	Hisar
		16. Hansi	Hisar
		17. Hisar	Hisar
		18. Karnal	Karnal
Density between 5,000 and 8,000	9		
		1. Kalka	Ambala
		2. Gohana	Sonipat
		3. Maham	Rohtak
		4. Jhajjar	Rohtak
		5. Palwal	Faridabad
		6. Rewari	Mahendragarh
		7. Bhiwani	Bhiwani
		8. Dabwali	Sirsa
		9. Sirsa	Sirsa
Between 8,000 and 11,000	1		
		1. Rohtak	Rohtak
Between 11,000 and 15,000	1		
		1. Panipat	Karnal
More than 15,000	2		
		1. Bahadurgarh	Rohtak
		2. Bawal	Mahendragarh

Table 2.6.2

Classification of Density in the Urban Areas of Tehsil of Haryana, 1981

DENSITY	NUMBER OF TEHSILS	NAME OF THE TEHSIL	NAME OF THE DISTRICT
1	2	3	4
Less than 2,000	4.		
		1. Ballabhgarh	Faridabad
		2. Ferozepur Jhirka	Gurgaon
		3. Mahendergarh	Mahendergarh
		4. Bawani Khera	Bhiwani
2,000-5,000	22.		
		1. Narai Agroha	
		2. Ambala	Ambala
		3. Kalka	Ambala
		4. Pehowa	Kurukshetra
		5. Thanesar	Kurukshetra
		6. Assandh	Karnal
		7. Narwana	Jind
		8. Jind	Jind
		9. Safidon	Jind
		10. Gohana	Sonipat
		11. Sonipat	Sonipat
		12. Maham	Rohtak
		13. Jhajjar	Rohtak
		14. Bahadurgarh	Rohtak
		15. Gurgaon	Gurgaon

DENSITY 1	NUMBER OF TEHSILS 2	NAME OF THE TEHSIL 3	NAME OF THE DISTRICT 4
		16. Narnaul	Mahendergarh
		17. Bhiwani	Bhiwani
		18. Loharu	Bhiwani
		19. Fatehabad	Hisar
		20. Hisar	Hisar
		21. Dabwali	Sirsa
		22. Sirsa	Sirsa
5,000-8,000	9		
		1. Jagadhri	Ambala
		2. Kaithal	Kurukshetra
		3. Karnal	Karnal
		4. Panipat	Karnal
		5. Rohtak	Rohtak
		6. Palwal	Faridabad
		7. Dadri	Bhiwani
		8. Hansi	Hisar
		9. Tohana	Hisar
8,000-11,000	1		
		1. Rewari	Mahendragarh
11,000-15,000	0	Nil	Nil
More than 15,000	2		
		1. Nuh	Gurgaon
		2. Bawal	Mahendergarh

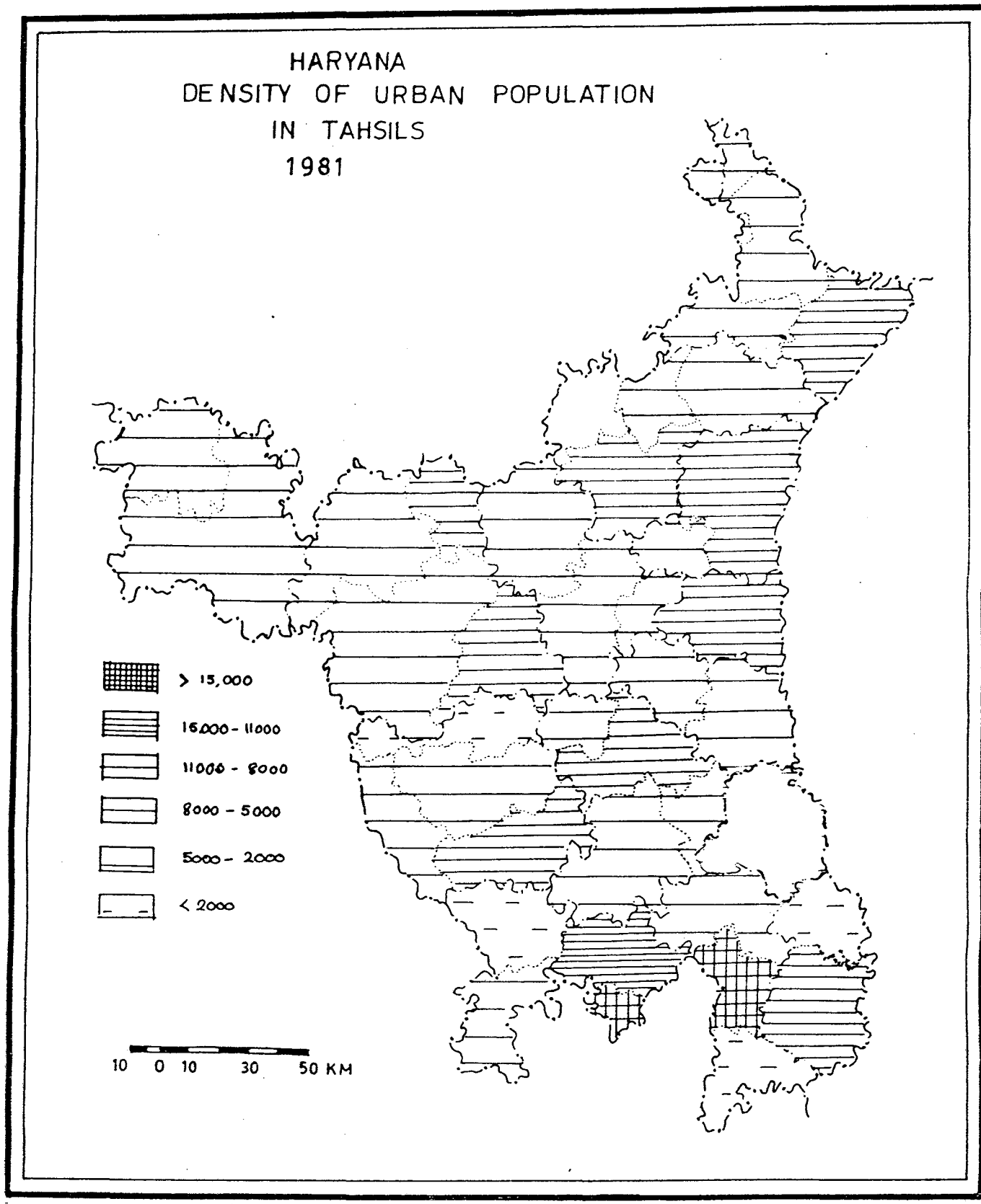
HARYANA
DENSITY OF URBAN POPULATION
IN TAHSILS
1981
> 15,000
15000 - 11000
11000 - 8000
8000 - 5000
5000 - 2000
< 2000
10 0 10 30 50 KM

Fig 2·6b.

A separate tahsil in 1981, as we have also Pehowa and Guhla, two separate tahsils here in this study. In 1981 census, it has no urban area.

As it is clear from the above analysis that high density , less percentage of tahsils and low density, high percentage of Tahsils. The two third of the Tahsils of Haryana have less density in both the census year in both the census years.

2.7 Nearest Neighbour Analysis :-

This technique was introduced in Geography literature by Clark and Evans[4], the Plant Ecologists, who applied the formula to an analysis of the species an analysis of plant communities. Later M.F. Dacey followed this approach and tested it in geographic context. This method has been used to study spatial distribution of settlements in the region, which denotes the ratio of actual mean of the nearest settlement distance to the expected distance. The nearest neighbour technique has been applied to analyse the (a) distribution of settlements,(b) Classwise distribution of settlements and (c) all the settlements.

METHODOLOGY[5] :- First of all the distance between settlements were taken in centimetres. Then these distances were converted

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4. Singh, K.N. and Singh, Minati " Spatial Analysis of Rural Settlements and their Types in Lower Ganga- Ghagghra Doab,"National Geograhical Journal of India, Vol. 27 (3 and 4) 1981 pp.104-114.

5. Saini Poonam, " Urban Structure of the National Capital Region,". An unpublished M.Phil dissertation, Centre for the Study of Regional Development, S.S.S, J.N.U, 1987.

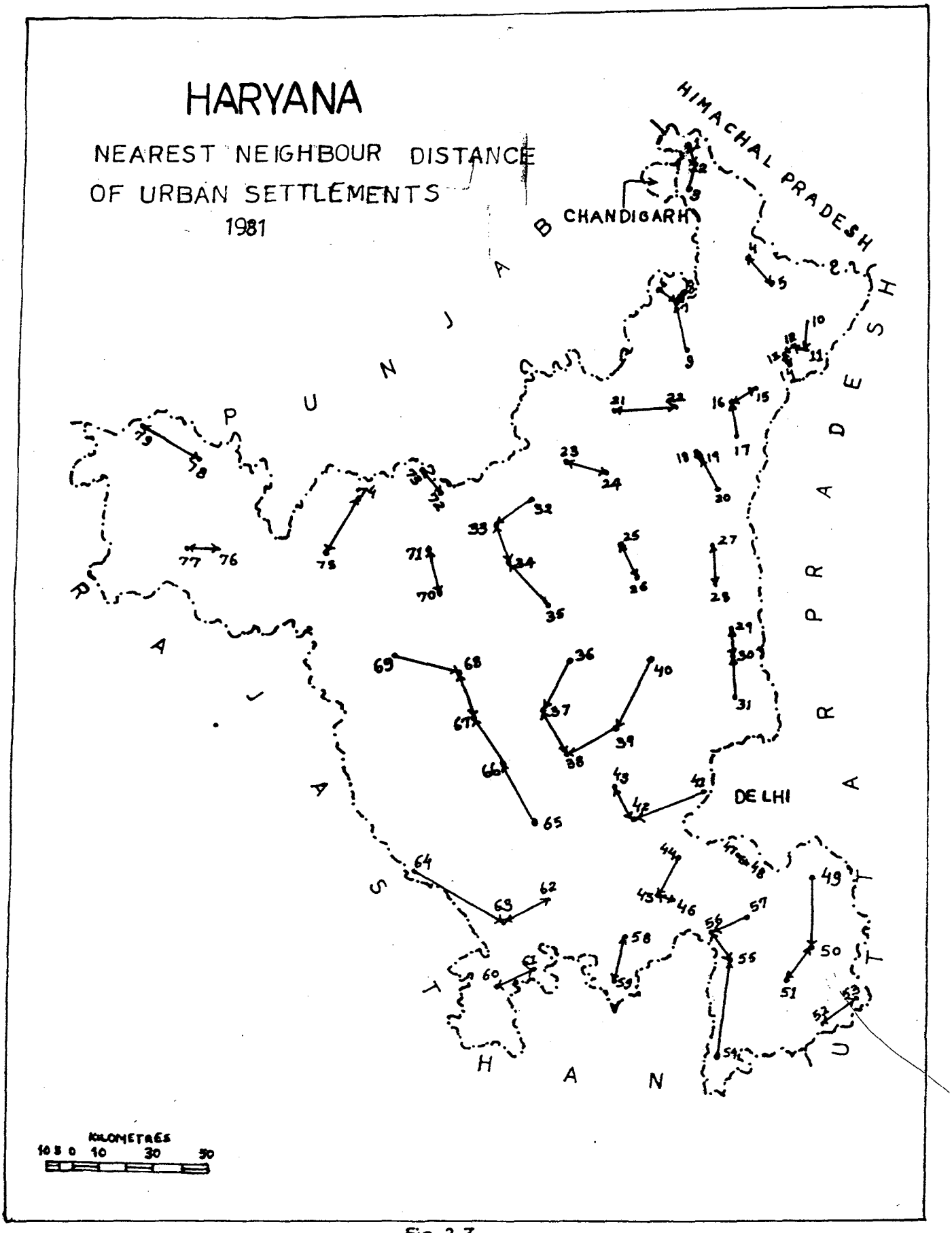
HARYANA
NEAREST NEIGHBOUR DISTANCE
OF URBAN SETTLEMENTS
1981
HIMACHAL PRADESH
CHANDIGARH
PUNJAB
RAJASTHAN
UTTAR PRADESH
DELHI
KILOMETRES
10 5 0 10 30 50

Fig 2.7

into kilometres and all these distances were added and divided by the total number of settlements taken, here it is :

For this following formula has been used

$$R = \frac{\bar{ra}}{\bar{re}}$$

when $\bar{ra}$ = Mean of observed distance in a given area.

and $\bar{re} = \frac{1}{2\sqrt{P}}$ where $P = N/A$

When $\bar{re}$ = is the mean of expected distance in a given area assuming settlements are equally distributed.

P = is density of settlements

N = is number of settlements.

A = is the area of the region.

The ratio of observed mean distance $\bar{re}$ is known as nearest neighbour statistics (R). The R value range from 0.0 (completely clustered), through 1.0 (random) to 2.149 (ideal hexagonal lattice)

Analysis :- The R value worked out for the Haryana region is as follows :-

As $R = \frac{\bar{ra}}{\bar{re}}$ ---- (a)

$$\bar{r}_a = \frac{\text{Sum of actual distance b/w neighbour points in a given area}}{\text{Total Number of settlements.}}$$

When $\bar{r}_a$ =

$$= \frac{1115}{79} = 14.11392405 \qquad \text{----- (b)}$$

$$\bar{r}_e = \frac{1}{2\sqrt{P}} \quad \text{when } P = \frac{N}{A}$$

and $\bar{r}_e$ =

$$\text{So } P = \frac{\text{Number of total Settlements}}{\text{Total area of the region.}}$$

$$\text{i.e. } P = \frac{79}{44212} = 1.7868452 \times 10^{-3}$$

$$\text{Now } \bar{r}_e = \frac{1}{2 \times \sqrt{1.7868452 \times 10^{-3}}}$$

$$\text{or } \bar{r}_e = \frac{1}{2 \times 0.042271091}$$

$$\text{or } \bar{r}_e = 11.82841484 \qquad \text{----- (c)}$$

Putting the values of equations (b) and (c) in the equation (a) then

$$R = \frac{\bar{r}_a}{\bar{r}_e} = \frac{14.11392405}{11.82841484}$$

or $R = 1.19322$

Here the value of R is 1.19322 i.e. the distribution is more towards random and less towards evenness. The R value of Haryana

State is 1.19322 i.e. random. It is based on 1981 data of all the towns of Haryana.

2.8 **Rank-size rule :-**

The rank-size rule is an empirical regularity found in the urban system of many countries of world. This regularity is more evident in many advanced countries and the countries which have an old urban tradition. On the whole this rule has not been much of a success. According to this rule the population of a town is related with its rank in the following form of Pareto's [6] distribution.

$$Pr = KR^{-b}$$

Where Pr is the population of the town whose rank is R. K and b are the constants.

This relationship gets transformed into the following linear form after taking the logarithms of both the sides.

$$Y = a - b\,x$$

Where $Y = \text{Log } Pr$

and $X = \text{Log } R$

$a = \text{Log } K$

or $a = y - b\,x$

$$\text{and } b = \frac{EXY - \frac{X.EY}{n}}{Ex^2 - \frac{(EX)^2}{n}}$$

.. K = Antilog of a

---

6. Mahmood, Aslam, "Statistical Methods in Geographical Studies", Rajesh Publications, New Delhi, 1977, P.P. 77-81.

The original equation from the values of the Constants as found above can be written as in case of 1971.

$$Pr = 489939.R^{-1.057751984}$$

If in the above equation, we put R = 1, 2, 3, 4 and 5 etc., we get the population of cities ranking 1st, 2nd, 3rd, 4th and 5th etc., according to the rank-size rule. The actual population of a city is rarely exactly equal to the estimated population but is close to it, as no city system fits completely into a rank-size rule. The population of three decades of Haryana State viz., 1971, 1981 and 1991 are estimated according to the fitted rank-size relationship given in above equation.

The regularity of the rank-size was observed by Zipf and later on Berry.[7] It has been observed by them that this regularity prevails in many parts of the world. If the population and rank is plotted on a graph, a log or a semi-log graph, we get a curve with a negative slope. On the graph if actual and estimated populations are plotted some towns or cities have both the points so close to one another that they seem to merge into one, though as mentioned earlier, complete equality between the two points is a rarity.

Analysis :-

$$b = \frac{372.426355 - \frac{(90.908)\,(273.774)}{65}}{137.040644 - \frac{(90.908)^2}{65}}$$

$$b = -1.057751984$$

Now $a = y - b\,x$ ---- (b)

$$a = 4.211907692 - (-1.0587751984)\,\frac{(90.908)}{65}$$

$a = 4.211907692 - (-1.0587751984)(1.398584615)$

$a = 4.211907692 + 1.480786703$

$a = 5.692694395$

K = Antilog of a ---- (c)

= Antilog of 5.692694395

---

7. Mahmood Aslam, "Statistical Methods in Geographical studies," Rajesh Publications, New Delhi, 1977, P.P. 77-81.

$K = 489939$

Put the results of a, b, c equations in

Now $Pr = K.R^{-b}$

$Pr = 489939.1^{-1.057751984}$

(when $R = 1$)

In 1971

$$b = \frac{EXY - \frac{EX.EY}{n}}{Ex^2 - \frac{(EX)^2}{n}} \quad \text{----- (d)}$$

$$b = \frac{471.703606 - \frac{(113.153)(330.117)}{77}}{178.283527 - \frac{(113.153)^2}{77}}$$

None $a = y - bx$ ----- (e)

$$\text{or } a = \frac{330.117}{77} - (1.1172014)\frac{(113.153)}{77}$$

or a = 5.92915326

and K = Antilog of 'a' ----- (f)

i.e. K = 849480

Now put the values of equations d, e, and f in the following equation.

$Pr = K.R.^{-b}$

$Pr = 849480.1^{--1.1172014}$

(when R =1.)

In 1991

$$b = \frac{EXY - \frac{EX.EY}{n}}{Ex^2 - \frac{(EX)^2}{n}} \quad \text{----- (g)}$$

$$b = \frac{5.83.697413 - \frac{(138.161)(388.845)}{90}}{226.3396051 - \frac{(138.161)^2}{90}}$$

b = 0.924846907

and a = y - b x ----- (h)

$$\text{or } a = \frac{388.845}{90} - (-0.924846907)\ \frac{138.161}{90}$$

or a = 5.740253039

And K = Antilog or K ----- (i)

i.e. K = 549861

Put equations (g), (h), and (i) into the following equation

$Pr = K.R^{-b}$

$Pr = 549861.1^{-0.924846907}$

(when R = 1)

After getting estimated values, all the towns of Haryana have been subjected to the rank-size rule for the years 1971, 1981 and 1991.

CONCLUSION :-

It has been found that rate of urbanization has declined in 1981-91 decade as compared to 1971-81 decade as it has shown a 4.22 percent increase in 1971-81 decade while it is 2.91 percent in 1981-91 decade.

Many new towns have come up during these three decades. In 1971, there were only 65 towns, with the addition of 19 new towns

these towns have increased 81 in 1981 census. The towns of Tosham had been declassified and Faridabad M.C, Faridabad Township and Ballabhgarh merged into Faridabad Complex Administration. But now in 1991, the town of Tosham has been reclassified and with the addition of 15 new towns, the number of towns has gone upto 94.

Growth-rate of urban population in the districts of Haryana has also declined in 1981-91 decade in comparison to 1971-81 decade. The decadal growth-rate of Urban population has decreased from 59.47 percent in 1971-81 decade to 43.07% in 1981-91 decade. There are thirteen districts following the same trend, while three districts namely Rewari, Yamunanagar and Ambala has shown increase in their growth-rate. Majority of the districts have shown their growth-rate below 50 percent in both the decades. In 1971-81 decade, there are 9 towns while in 1981-91 they are 14 in number, which have shown their growth-rate in this group. Only three districts namely Hissar, Karnal and Sonipat, in 1971-81 decade and two districts in 1981-91 decade have shown their growth-rate between 50 percent and 75 percent. Again three districts namely Mahindergarh, Panipat and Sirsa in 1971-81 have shown their growth-rate between 75 percent and 100 percent, while in 1981-91, there is not even a single district which falls into this group. In 1971-81 decade only Faridabad district has shown its growth-rate more than 100 percent, i.e., 135.94 percent in 1971-81 decade, while there is no district which has shown its growth-rate in this group.

It has been observed that there are only sixteen towns which have shown an increase in their growth-rates in both the decades.

Most of the smaller towns of 1971-81 decade has shown increase in their growth-rate, while bigger towns have shown decrease in their growth-rate e.g., Faridabad Complex Administration town had shown 169.40 percent growth-rate during 1971-81 decade but its growth-rate decreased from 169.40 to 85.52 percent during 1981-91 decade. There are only thirteen towns who had shown their growth-rate more than 50 percent during 1971-81, while in 1981-91, there are only eight towns.

It has been observed that the towns which have shown a drastic fall in their population density are the one which have experienced and increase in their area without a corresponding increase in their population. The population of these towns has increased steadily but a spurt of the area has lowered their population density. There are 22 towns which have not shown any change in their area, for the two decades. Except these all other towns have shown a change in their areas also, but as this change is not sudden therefore these towns have a corresponding increase in their population, the density of population of these towns has been increasing constantly. Overall it can be seen that there is a dominance of low density towns over the high density towns. Therefore it is now clear that the percentage of low density towns are high and vice-versa. The urban population density of tahsils also follows the same pattern as towns.

The nearest neighbour distance technique gives the value of R =1.19 for the urban settlements in 1981 census. The R value shows that the distribution of towns is more towards random.

CHAPTER -3

Functional classification of Towns

3.1 Introduction :-

The functional classification of towns gives us an idea of economic activities adopted by the people in a particular town. In this study, an attempt has been done to present a composite classification based on the predominant function of a town for the period of 1971 and 1991. It is generally agreed that the process of urban growth is highly associated with the direct and indirect impact of non-agricultural activities in the economy. Because of that in this study, only seven non-agricultural Categories, III to IX have been excluded in each case as it was intended to study the inter-se relationships of only the non-agricultural categories.

3.2 Data-Base :-

Since the data for 1981 census is not given in nine industrial categories for town, for present analysis, the data for the census years of 1971 and 1991 has been considered.

3.3 Methodology:-

The `Ternary diagram' has been used by Asok Mitra[1] in the functional classification of Indian towns based on 1961 census data. Briefly speaking, the method makes use of an equilateral triangle whose sides are graduated 0 to 100 percent so that the percentage of three variables industry, trade and transport and service can be represented on the diagram. The method of func-

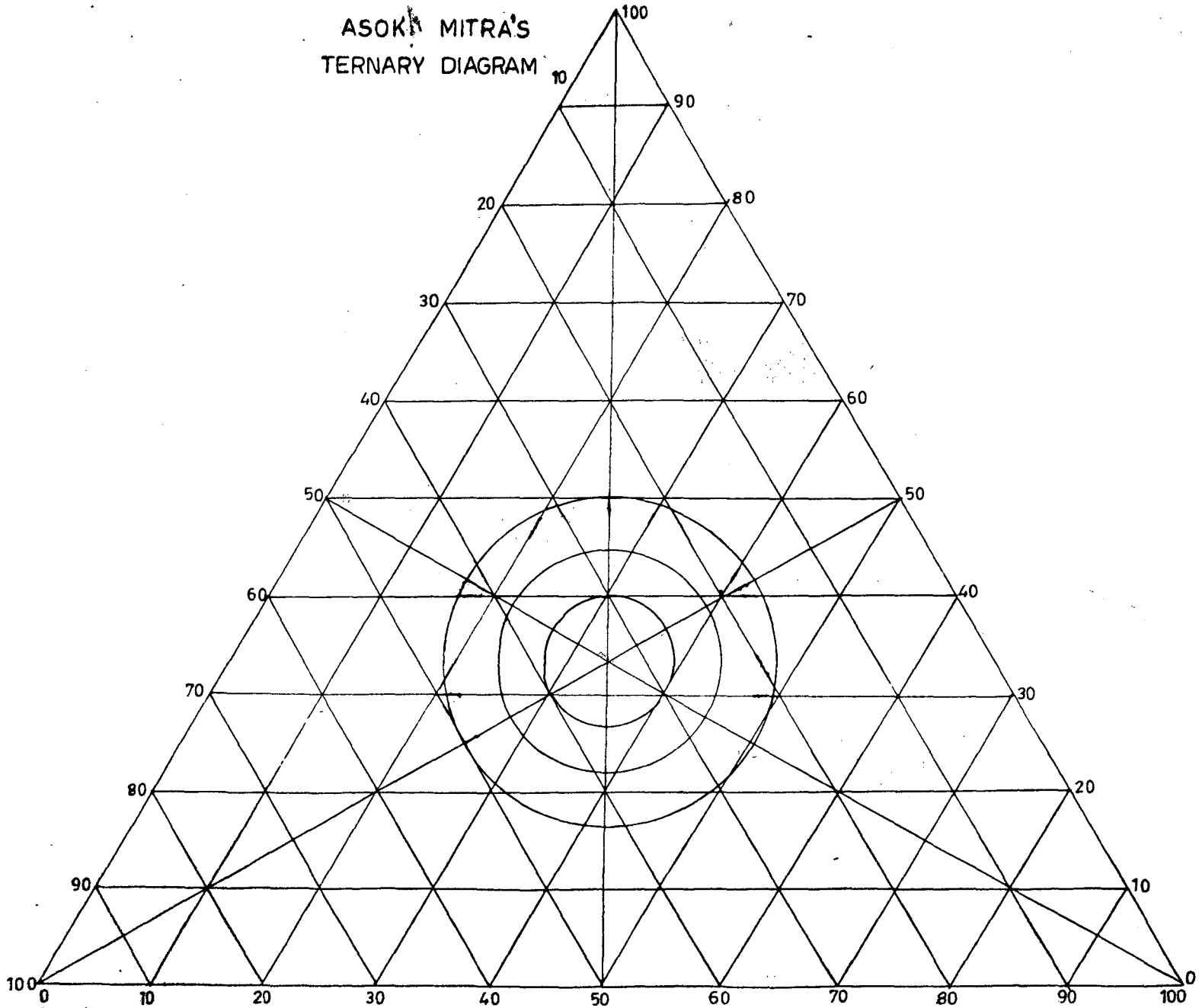
ASOKA MITRA'S
TERNARY DIAGRAM
100
10
90
20
80
30
70
40
60
50
50
60
40
70
30
80
20
90
10
100
0
0
10
20
30
40
50
60
70
80
90
100

Fig 3.1

tional classification of Indian towns was based on the concept of the predominant of a city.

For this classification Asok Mitra, has considered only non-agricultural workers, therefore he has considered seven non-agricultural categories, III to IX, while the agricultural categories I and II are excluded in this study. For each town a percentage distribution was made of all workers into the seven non-agricultural census industrial categories. Besides, these 7 categories were grouped under three rubrics A, B and C, to take the advantage of triangle coordinates. The sum of workers in census industrial categories III to IX was taken as 100. The seven non-agricultural categories are grouped under 3 broad functional types :-

Group of Towns	Census Industrial category.
A. Industry	III, IV, V and VI
B. Trade & Transport	VII and VIII
C. Services	IX only.

These-three broad based functional classification were next attempted as follows.

1. Where the sum of percentages in III, IV, V and VI under group A was greater in value by 20 percent or more than the sum of percentages of VII and VIII in B or the percentage of IX in C, the town was called a Industrial Town.

2. Where the sum of percentages of VII and VIII in B was greater in value by 20 percent or more than the sum of values in A or C, the town was called a Trade and Transport Town.

3. Where the percentage of IX in C was greater in value by 20 percent or more than the sum of percentages of A or in B, the town was called a Service Town.

Towns and Town Groups which fall within the above three categories invariably satisfy what is later described as town with "predominant function accentuated". A further refinement stemmed from this broad three fold classification.

1. Where the percentage of III was observed to be greater than that of IV, V or VI by 10 percent or more, the town was called a Mining or Plantation Town.

2. Where the percentage of IV was observed to be greater than that of III, V or VI by 10 percent or more, the town was called an Artisan Town.

3. Where the percentage of V was observed to be greater than that of III, IV or VI by 10 percent or more than town was called a Manufacturing Town.

4. Where the percentage of VII was observed to be greater than that of VIII by 10 percent or more the town was called a Trading Town.

5. Where the percentage of VIII was observed to be greater than that of VII by 10 percent or more the town was called a Transport Town.

This fivefold classification satisfy those towns which have predominant functions moderately diversified, so there were numerous instances where the percentage difference were by no means clear-cut, and their functions were highly diversified or

accentuated. Then only method was to label a town according to the highest percentage value of any one cateorgy even if that value failed to quality for the predominance tests indicated above.

The need therefore arose of further stratification to distinguish the strong and weak strains of functional classification of Towns. This was accomplished with the help of triangular coordinates. Asok Mitra, divided the triangle into six sub-triangles representing different combinations. These sub-triangles representing different combinations. These sub-triangles were further divided into four parts by three circles with centre at the middle of the triangle and radius equal to 6.2/3, 11.2/3 and 16.2/3. The inference are as follows :-

1. Any town having its position inside the first circle will have its functions highly balanced, that is diversified.

2. Any town having its position inside the second circle will have its functions moderately balanced, that is, diversified.

3. Any town having its position inside the third circle will have its predominant function accentuated.

4. Any town having its position outside any of the three circles will have its predominant function highly accentuated.

3.4 Interpretation of Results :-

It is clear from the figure 3(a) that concentration of the towns of Haryana in 1971, is away from the centre of the trian-

gle. The distribution of towns goes on increasing as one moves away from the centre of the triangle. In first and second circle there are 13 towns in each, while in third circle, there are 19 towns. It can be easily seen from the table 3.1 also that there are 20 towns outside all of the three circles.

The first sub-triangle of the Ternary diagram represents high service, medium trade and transport and a low industrial sector. In this sub-triangle there are 11 towns. The first circle has two towns viz, Bahadurgarh and Hisar representing a highly balanced composition of all the three functions. The second circle of the same triangle contains three towns namely Beri, Buria and Chhachhrauli which has moderately balanced composition of all the three functions. The third circle has five towns. They are Kanina, Karnal, Naraingarh, Rohtak and Thanesar. These towns therefore have service sector accentuated. In this triangle there is one town of Gurgoan which lies outside the three triangles, has service sector highly accentuated.

The second sub-triangle of the Ternary diagram represents low trade and transport, medium industry and high service. In this sub-triangle, there are two towns. The first circle has one town of Tosham representing a highly balanced composition of all the three functions. There is no town in second and third circles respectively. There is one town of Nilokheri, which lies outside the three circles has service sector highly accentuated.

High industry, low trade and transport and medium industry are represented by the third sub-triangle of the Ternary diagram. This sub-triangle has just one town. There is no town lies in all

the three circles. But there is one town lies outside the circles. This town is Faridabad township, which has its industrial function highly accentuated.

There are six towns in fourth sub-triangle of the Ternary diagram. This sub-triangle represents low service, medium trade and transport and high industry. There is no town in the first and second circles. In the third circle, their is one town of Yamunanagar, who has industrial sector accentuated. There are five towns which lie outside all the three circles. They are Ballabhgarh, Bhiwani, Faridabad, Jagadhri and Shahbad. These town have their industrial sector highly accentuated.

Low service, medium industry and high trade and transport are the characterstics features of fifth sub-Triangle of the Ternary diagram. This sub-triangle has 19 towns. The first circle has seven towns viz, Ambala Cantonment, Charkhi Dadri, Ferozepur Jhirka, Ganaur, Gharaunda, Radaur and Sonipat representing a highly balanced composition of all the three functions. The second circle of the same triangle has three towns. They are Farrukhnagar, Hodal and Ladwa. These towns have moderately balanced composition of all the three functions. The third circle of the same triangle has two towns, namely Hansi and Julana who have their trade and transport functions accentuated. There are seven towns outside all the three circles. They are Haileymandi, Kalanwali, Mandi Dabwali, Rewari, Tohana, Uchana and Uklanamandi. These towns have their trade and transport sector highly accentuated.

TABLE 3(A)

DEGREE OF INTENSITY OF FUNCTIONS ACCORDING TO POSITION OF TOWN IN ANY OF THE SIX SUB-TRIANGLES OF TRIANGULAR CO-ORDINATES IN HARYANA 1971.

S.N.	Functional Type Degree of functional diversification or accentuation	Functions highly diversified	Functions moderately diversified	Predominant function accentuated	Predominant function highly accentuated	Total
1	2	3	4	5	6	
1.	**Service Towns**	**3**	**3**	**5**	**2**	**13**
(A)	Low Industry Moderate Trade and Transport	2	3	5	1	11
(B)	Low Trade and Transport Moderate Industry	1	0	0	1	2
2.	**Industrial Towns**	**0**	**0**	**1**	**6**	**7**
(A)	Low Trade & Transport moderate service	0	0	0	1	1
(B)	Low Service Moderate Trade and Transport	0	0	1	5	6
3.	**Trade & Transport Towns**	**10**	**10**	**13**	**12**	**45**
(A)	Low Service Moderate Industry	7	3	2	7	19
(B)	Low Industry	3	7	11	5	26
	Total	**13**	**13**	**19**	**20**	**65**

Source :- Based on
Census of India, 1971, Series 6, Haryana
Part X A, District Census Handbooks
Haryana

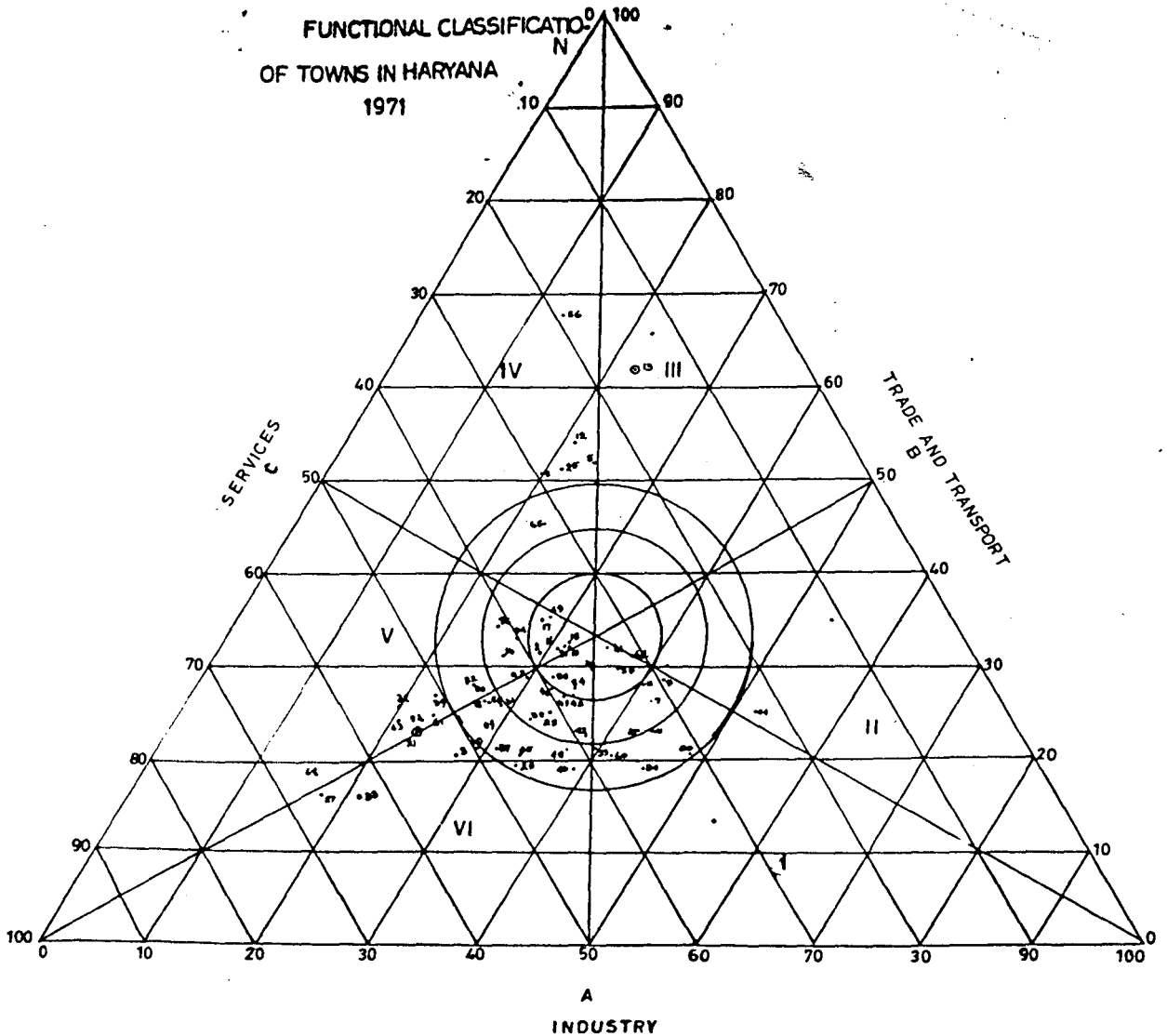
FUNCTIONAL CLASSIFICATION
OF TOWNS IN HARYANA
1971
N
TRADE AND TRANSPORT
B
SERVICES
C
INDUSTRY
A
I
II
III
IV
V
VI
0
10
20
30
40
50
60
70
80
90
100

Fig 2.2

The last sub-triangle i.e., sixth sub-triangle of the Ternary diagram represents a high trade and transport, medium service and low industry. In this sub-triangle, there are 26 towns. The first circle has three towns namely Bawal, Pundri and Sadaura. These towns represents a highly balanced composition of all the three functions. The second circle has seven towns. They are Jhajjar, Maham, Narnaul, Narwana, Palwal, Panipat and Pehowa. These towns have moderately balanced composition of all the three functions. The third circle has eleven towns viz., Ambala M.C. Fatehabad, Jind, Kaithal, Loharu, Mahindergarh, Nuh, Pataudi, Safidon, Sirsa and Sohna. These towns have their trade and transport function accentuated. There are five towns outside the circles. They are Ateli, Gohana, Jagadhri workshop Railway colony, Jakhalmandi and Kalka. These towns have their trade and transport sector highly accentuated. Therefore it is clear from the above analysis that majority of the towns in Haryana state in 1971 were trade and transport towns, which constitute nearby 70 percent of the towns of Haryana state. The service towns constitute 20 percent while the lowest percentage goes to the industrial towns, which comprises more than 10 percent of towns of Haryana.

In 1991, the concentration of towns is in the first, fifth and sixth sub-triangles, of the Ternary diagram. It can be easily seen that more than two third of the total towns of Haryana lie inside the three circle. As it is clear from figure 3(b) that the concentration of towns is close to the centre of the triangle. The distribution of towns thus goes down as one moves away from

the centre. The towns are well dispersed within the area of the circles.

In the first sub-triangle there are twenty towns. The first circle has three towns namely Hathin, Mustafabad and Sonepat, representing a highly balanced composition of all the three functions. The second circle of the same triangle contains nine towns viz., Gurgoan U.A. Haileymandi, Jhajjar, Karnal, Naraingarh, Narnaund, Panchkula Urban Estate, Sadaura and Shahbad. These towns have moderately balanced composition of all the three functions. The third circle contains four towns. They are Bahadurgarh U.A., Chhachhrauli, Nilokheri and Radaur. These towns have their service sector accentuated. There are again four towns outside all of the three circles. These towns are Ambala U.A., Beri, Bilaspur and Thanesar. These towns have their service sector highly accentuated.

There are only four towns in second sub-triangles. The first circle contains just one town of Farrakpur, representing a highly balanced composition of all the three functions. The second circle also contains one town of Bawal representing a moderately balanced composition of all the three functions. There is no town in the third circle. There are two towns Babiyal and Uncha Siwana, which lie outside all the three cricles have their service sector highly accentuated.

In third sub-triangle there are six towns. The first circle of this sub-triangle contains no town. The second circle contains just one town Dundahera representing a moderately balanced composition of all the three functions. The third circle of the same

sub-triangle also contains one town of Buria, which represents its industrial sector accentuated. There are four towns which are outside the three circles. They are Dharuhera, Faridabad Complex Administration, H.M.T. Pinjore and Pinjore Rural. These towns also have their industrial sector highly accentuated.

There are three towns in the fourth sub-triangle. There is no town in the second circle of the same triangle. In the third circle there are two towns namely Kalayat and Panipat which have their industrial sector accentuated. No town lies outside the three circles.

The fifth sub-triangle has nineteen towns. There is one town of Kalka in first circle. This town represents a highly balanced composition of all the three functions. The first circle of this sub-triangle contains just one town, Yamunanagar U.A. having highly balanced composition of the three functions. The second circle contains eight towns namely Fatehabad, Ferozepur Jhirka, Hansi, Palwal, Pundri U.A., Samalkha, Taoru and Tosham. The third circle of the same triangle has six towns. They are Barwala, Julana, Narwana, Sirsa, Taraori, and Tohana. These towns have their trade and transport sector accentuated. There are four towns outside the three circles of the same triangle. They are Cheeka, Ellenabad, Mandi Dabwali and Ratia. These towns have trade and transport sector highly accentuated.

The sixth sub-triangl has thirty eight towns. The first circle has four towns viz, Bhiwani, Hassanpur, Hisar U.A. and Kharkhoda. These towns represents a highly balanced composition of all the three functions. The second circle of the same sub-

TABLE 3(B)

DEGREE OF INTENSITY OF FUNCTIONS ACCORDING TO POSITION OF TOWN IN ANY OF THE SIX SUB-TRIANGLES OF TRIANGULAR CO-ORDINATES IN HARYANA 1991.

S. No	Functional Type Degree of function diversification or accentuation	Functions highly diversified	Functions moderately diversified	Predomi-ant fun accentua-ted	Predominant fun. highly accentuated	Total
1	2	3	4	5	6	
1.	**Service Towns**	**4**	**10**	**4**	**6**	**24**
(A)	Low Industry Moderate Trade and Transport	3	9	4	4	20
(B)	Low Trade and Transport Moderate Industry	1	1	0	2	4
2.	**Industrial Towns**	**1**	**1**	**3**	**4**	**9**
(A)	Low Trade & Transport moderate service	0	1	1	4	6
(B)	Low Service Moderate Trade and Transport	1	0	2	0	3
3.	**Trade & Transport Towns**	**5**	**22**	**14**	**16**	**57**
(A)	Low Service Moderate Industry	1	8	6	4	19
(B)	Low Industry	4	14	8	12	38
	Total	**10**	**33**	**21**	**26**	**90**

Source :- Based on
Census of India, 1991
Data from Computer Floppy.

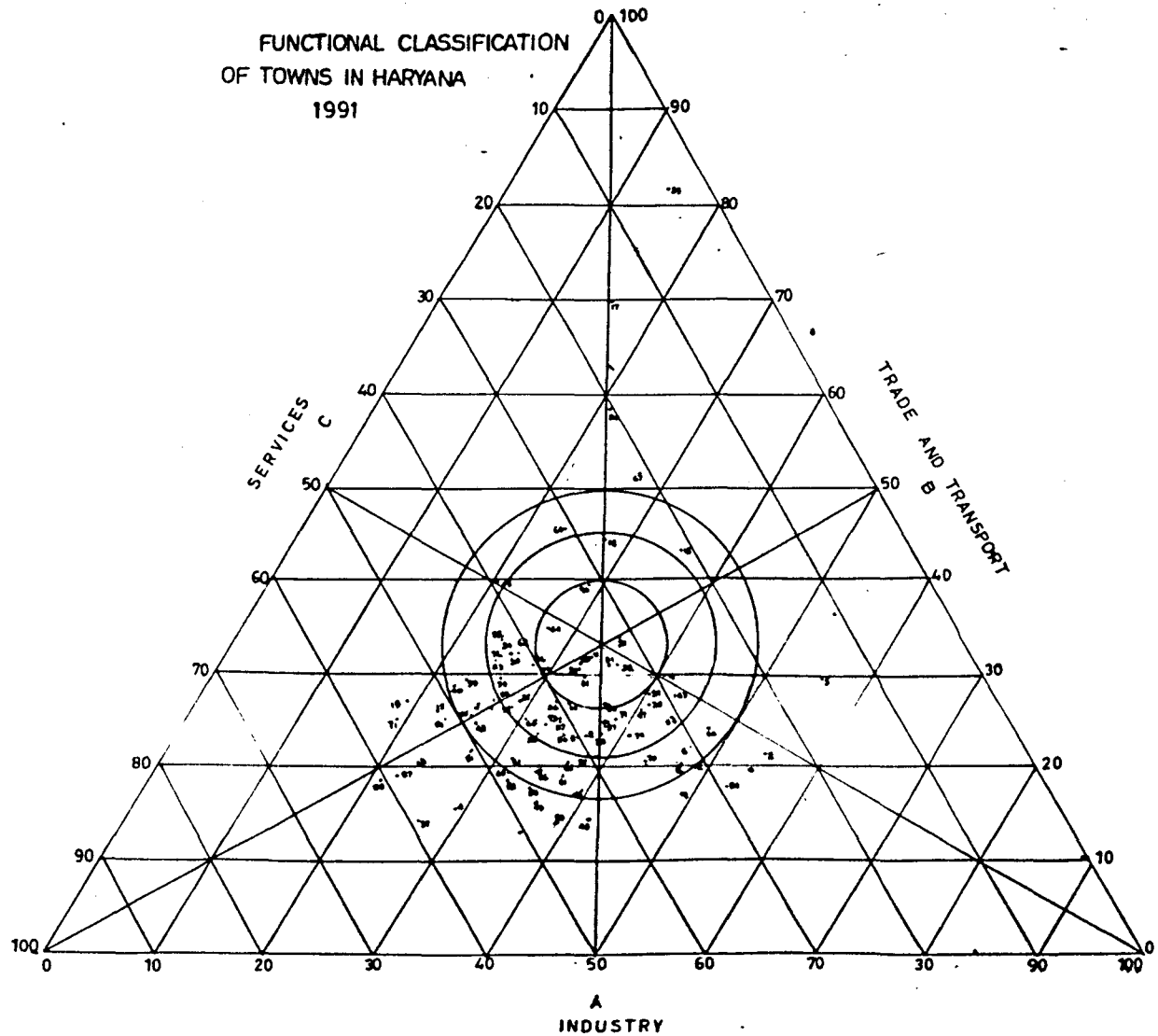
FUNCTIONAL CLASSIFICATION
OF TOWNS IN HARYANA
1991
SERVICES
C
TRADE AND TRANSPORT
B
A
INDUSTRY
0
100
10
90
20
80
30
70
40
60
50
50
60
40
70
30
80
20
90
10
100
0
0
10
20
30
40
50
60
70
30
90
100

Fig 3.3

triangle contains fourteen towns. They are Ambala M.C., Bawani Khera, Charkhi Dadri, Farrukhnagar, Ganaur, Gharaunda, Hodal, Ladwa, Pataudi,Rewari, Rohtak, Safidon, Siwani and sohna.They are having moderately balanced composition of the three functions. The third circle contains eight towns. They are Gohana Indri, Jind, Kaithal, Kalanwali, Kanina, Nuh and Pehowa. These towns have thier trade and transport sector accentuated. There are twelve towns which lie outside all of the three circle. These are Assandh, Ateli, Jakhalmandi, Kalanaur, Kheri Sampla, Loharu, Maham, Mahindergarh, Narnaul, Punahana, Uklanamandi and Uchana. The trade and transport sector of these towns have highly accentuated.

Now it is very much clear from the above analysis that in 1991, trade and transport sector has shown the highest percentage of towns i.e. 63.33 percent. Service sector has shown 26.67 percent of the towns. The lowest percentage has shown by industrial sector. Industrial sector has shown 10 percent of the total towns of the Haryana.

If we compare the percentage of towns of 1971 with that of 1991 census, we can see that in 1971 the highest percentage had shown by Trade and Transport towns, medium percentage by service towns and lowest by industrial towns. Similar pattern has been shown in 1991. But we can observe increase or decrease in their percentage during these three decades. Trade and transport towns have decreased from 69.23 percent in 1971 to 63.33 percent in 1991. Industrial towns also decreased from 10.77 percent in 1971 to 10.00 percent in 1991, but service towns has increased from

20.00 percent in 1971 to 26.67 percent in 1991. Which means that there is a shift towards service towns in Haryana in 1991.

3.5 Change in the Functional character of Towns during 1971-91 :-

To observe the change in functional character of towns in this period, we have to identify as well as classify these towns into two broad categories.

(A) Towns which have undergone change in this period.

(B) The towns which have not undergone any change in this period.

(A) Towns which have undergone change in this period i.e. 1971-1991 :- This category comprises of 82.30 percent of the towns of Haryana, in which the change has been taken place into intra-functional and inter-functional character. On this basis we can divide them into two small categories.

(1) Intra-functional change :- It can further sub-divided into three parts.

(a) Service to Service towns.

(b) Industrial to Industrial towns.

(c) Trade and Transport to Trade and Transport towns.

(2) Inter-functional change :-

(a) Service to Industrial towns.

(b) Service to Trade and Transport towns.

(c) Industrial to Service towns.

(d) Industrial to Trade and Transport towns.

(e) Trade and Transport to Service towns.

(f) Trade and Transport to Industrial towns.

The simple reason behind classification is that for the clear analysis of the change of functional character in 1971-91 period, classification in such a detail was necessary, which will be helpful in understanding the facts properly. Now we will take them one by one.

(1) Intra-functional change :- It means when in any function, change has been taken place within a function. This sub-category comprises of nearly 68.5% of the towns which has undergone change in this period.

(a) Service to service town:- When the functional character of a particular town remains service town in both the decades, but the basic character has changed in this period. As the town of Baha-durgarh was service town in both the decades but in 1971, the functions of this town were highly diversified, while in 1991, its service function has accentuated. Beri town had its functions moderately balanced in 1971, but in 1991, the service function has highly accentuated. In 1971, all the three functions of Chhachhrauli town had moderately balanced while the service function of this town has accentuated in 1991. Gurgaon town in 1971 had shown its service function highly accentuated, while in 1991 it has shown its functions moderately diversified. In 1971 the service function of Karnal had accentuated while in 1991, the functions are moderately diversified. Similarly, the town of Naraingarh in 1971 had shown service function accentuated while the functions are moderately diversified in 1991 census. The service function of the town of Nilokheri was highly accentuated in 1971, while it has accentuated in 1991. The town of Thanesar

in 1971 had shown its service function accentuated, while its service fuction has highly accentuated, in 1991. Babiyal, in 1971, had its service function highly accentuated, while in 1991 also, it has highly accentuated . The basic change between these two decades is that in 1971, the functions of this town were in first sub-triangle of the Ternary diagram which shows that the town is having low industry, medium trade and transport, while in 1991, the functions of this town are in second sub-triangle of the ternary diagram which represents that the town is having low trade and transport and medium industry. Bilaspur town had accentuated its service function in 1971, but in 1991, service function has highly accentuated Hathin had all its functions moderately diversified, in 1971 but the functions have highly balanced in 1991. The town of Mustafabad, in 1971, had accentuated its service function, while in 1991, its functions are highly diversified. And lastly in this sub-category, the town of Narnaund, in 1971, was a village with all its functions highly diversified but in 1991, it became a town with all its functions highly diversified. The percentage of the towns are 13.54 of the total towns of Haryana.

(b) Industrial to Industrial towns :- There are five towns in this sub-category. They are H.M.T. Pinjore, Jagadhri, Kalayat, Yamunanagar and Yamunanagar U.A. In 1971, towns of Yamunanagar, Jagadhri and Jagadhri workshop Railway Colony were enumerated as different towns but in 1991, they have been enumerated separately but in Yamunanagar Urban Agglomeration. But in this study we have taken these towns separately as well as in Yamunanagar U.A. This

has been done in order to analyse and compare them separately as well as jointly.

The first town in this sub-category is H.M.T. Pinjore. This town had its industrial function accentuated in 1971, while in 1991, its industrial function has highly accentuated. Jagadhri town in 1971 had its industrial function highly accentuated, while in 1991, its industrial function has accentuated. In 1971 census, the functions of Kalayat town were moderately balanced but in 1991 census its industrial function has accentuated. The town of Yamunanagar had shown its industrial function accentuated in 1971, while in 1991, its functions are highly diversified. Finally the town of Yamunanagar U.A. (Urban Agglomeration), comprised of Jagdhri, Yamunanagar and Jagadhri workshop Railway Colony, had all its functions moderately diversified in 1971 census and in 1991 census, its functions has highly diversified. This sub-category has 8.3. percent of the total towns.

(c)Trade & Transport to Trade & Transport Towns :- There are 36 towns in this sub-category. This sub-catagory comprised of 37.50 percent of the total towns of Haryana taken for this study. These are Ambala M.C., Charkhi Dadri, Farrukhnagar, Fatehabad, Ferozepur Jhirka, Ganaur, Gharaunda, Gohana, Hansi, Hodal, Jagadhri, Kalanwali, Kalka, Ladwa, Loharu, Maham, Mahindergarh, Narnaul, Narwana, Palwal, Pataudi, Pehowa, Pundri, Rewari, Safidon, Sirsa, Sohna, Tohana Uchana, Uklanamandi, Assandh, Indri, Kheri Sampla, Punahana, Ratia and Siwani. The first town is Ambala M.C. This town in 1971 had shown trade and transport function accentuated, but in 1991, all of its functions are moderately balanced.

Charkhi Dadri had all of its functions highly balanced in 1971, while in 1991, all of its functions are moderately diversified. The town of Farrukhnagar had its functions moderately diversified in 1971, and in 1991 also, its functions are moderately diversified. The basic change in functional character here is that the functions of Farrukhnagar were in triangle number (V) in 1971, while in 1991, its functions are in triangle number (VI) of the Ternary diagram. In 1971, the trade and transport function of Fatehabad town had accentuated, but in 1991, its functions has moderately balanced. The town of Ferozepur Jhirka in 1971, had all of its functions highly balanced while in 1991, all of its functions are moderately balanced. The functions of Ganaur town were in triangle number V of the Ternary diagram in 1971, with all of its functions hihgly balanced, but in 1991, its functions are in triangle number VI of the Ternary diagram and these functions are moderately diversified. Similar change has been observed by Gharaunda town. In 1971, Gohana town had shown its trade and transport function hihgly accentuated, but in 1991, its trade and transport function has accentuated. Hansi town being a trade and transport town in both the decades. i.e., 1971 and 1991. But in 1971 its trade and transport function had accentuated while in 1991, all the three functions of this town has moderately accentuated. In 1971, the functions of Hodal town were moderately diversified and in 1991 also, its functions are moderately diversified. The basic differencse in this is, the town of Hodal in 1971, had shown its functions in fifth sub-triangle of the ternary diagram, while in 1991, it has whown its functions in

sixth sub-triangle of the ternary diagram. In 1971, the town of Jagadhdri workshop Railway Colony had its trade and transport functions hihgly accentuated, while in 1991 also, it has shown its trade and transport function highly accentuated. Now the basic change in this is that this town, in 1971, had its functions in VI sub-triangle of the Ternary diagram, while in 1991, its functions are in Vth sub-triangle. Kalanwali, in 1971, had shown trade and transport function highly accentuated while during 1991 census, its trade and transport function has accentuated. Kalka town had shown its trade and transport function highly accentuated in 1971, but in 1991, its functions are highly diversified. Ladwa, in 1971, all of its functions had moderately diversified and in 1991 also, its functions are moderately diversified. This is because, the functions of Ladwa town in 1971,were in Vth sub-triangle of the ternary diagram, while in 1991, its functions are in VI th sub-triangle of the Ternary diagram. The town of Laharu had shown its trade and transport function accentuated in 1971, while in 1991, its trade and transport function has highly accentuated. The town of Maham, in 1971, had all of its functions moderately diversified, but in 1991, its trade and transport function has highly accentuated. The trade and transport function of the Mahindergarh, in 1971, had accentuated, while in 1991, its trade and transport function has highly accentuated. The functions of Narnaul town had moderately diversified in 1971 but its trade and transport function has highly accentuated in 1991. The functions of Narwana town, in 1971, were moderately diversified but in 1991 its trade and transport function

has accentuated. In 1971, functions of Palwal town were moderately diversified but during 1991 also, all functions are moderately diversified . This is why the functions of the town of Palwal, in 1971, were in VI th sub-triangle of the Ternary diagram, while in 1991, it is in V th sub-triangle of the Ternary diagram. The trade and transport function of Pataudi town was accentuated in 1971, while in 1991, its functions moderately diversified. Pehowa, in 1971, had shown all of its functions moderately diversified, while in 1991, its trade and transport function has accentuated. All of the functions of Pundri town in 1971, were highly balanced, but in 1991, its functions are moderately diversified. The trade and transport function of Rewari town had highly accentuated during 1971, but in 1991, all of its functions have moderately diversified. The trade and transport function of Safidon town, in 1971, had accentuated while in 1991 census, its functions has moderately diversified. The functions of Sirsa town were in VI th sub-triangle of the Ternary diagram, in which its trade and transport function had accentuated, while in 1991, all of its functions are in V th sub-triangle of the Ternary diagram in which also, its trade and transport function has accentuated. The trade and transport function of Sohna town, in 1971, had accentuated, while in 1991, its functions are moderately balanced. In 1971, the trade and transport function of Tohana town, had highly accentuated, but in 1991, its trade and transport function has accentuated. The trade and transport function of Uchana town had highly accentuated in 1971, while in 1991 also, its trade and transport function has highly accentuated. This is

because, the functions of Uchana town in 1971 were in V th sub-triangle while in 1991 census, its functions are in VI th sub-triangle of the Ternary diagram. The functional character of the Uklanamandi is also same as that of Uchana town. The town of Assandh, in 1971 was a village, with all of its functions moderately diversified, but in 1991, this town has its trade and transport function highly accentuated. Indri, in 1971 was also a trade and transport village with all its functions moderately balanced, while in 1991, this town's trade and transport function has accentuated. Kheri Sampla was also a village in 1971. The functions of Punahana village had accentuated in 1971, but in 1991, the trade and transport function of Kheri Sampla town has highly accentuated. The functions of village, in 1971, had moderately balanced, but in 1991, the trade and transport function of Punahana town has highly accentuated. Town of Ratia, in 1971 was a village having all of its functions moderately balanced while in 1991, its trade and transport function is highly accentuated. Siwani town was a village, in 1971 census, its trade and transport function had accentuated, but in 1991 census, its functions are moderately diversified.

(2) Inter-functional change :- When a particular town changes its functional character from one period to another period. In this study, we have taken six such sub-Categories, which are as :-

(a) Service to Industrial towns.

(b) Service to Trade and Transport towns.

(c) Industrial towns to Service towns.

(d) Industrial towns to Trade and Transport towns.

(e) Trade and transport towns to service towns.

(f) Trade and Transport towns to Industrial towns.

In the above classification, the former functional character of each sub-category represents the functional character of 1971 census while the latter that of 1991 census. Now we will analyse them one by one.

(a) Service towns to Industrial towns :- There are only three towns which has changed their functional character from service to industrial. These towns are Buria, Dharuhera and Dundahera. The functions of Buria town in 1971, were moderately diversified but during 1991, its industrial function has accentuated. Dharuhera town in 1971, was a village, with all its functions highly diversified, but in 1991, it has shown its industrial function highly accentuated. The town of Dundahera was also a village in 1971 with all its functions moderately diversified, but in 1991, it has become an industrial town with all its functions moderately diversified.

(b) Service to trade and transport towns :- There are just seven towns which has changed their functional character as a service town to trade and transport towns. These towns are Hisar, Kanina, Rohtak, Tosham, Barwala, Kalanaur and Taraori. The first town of this sub-category is Hisar, whose functions in 1971, were highly balanced while in 1991, its functions are highly balanced. The functional character this town in 1971 was service while it is trade and transport in 1991 census. Second town is Kanina, whose service function had accentuated in 1971, but is 1981 ? its trade and transport function has accentuated. Third town is Rohtak. The

Table - 3·3

Change in the functions of the towns of Haryana, 1971-1991

Name of the Town	Functions highly diversified	Functions moderately diversified	Predominent function accentuated	Predominent function highly accentuated	Functions highly diversified	Functions moderately diversified	Predominent function accentuated	Predominent function highly accentuated	Change
Ambala M.C.			Trade & Transport			Trade & Transport			
Ambala Cantt. (CBI City)	Trade & Transport			U.A.				Service	
Atell				Trade & Transport				Trade & Transport	No Chang
Bahadurgarh	Service						Service		
Ballabhgarh				Industrial				Industrial	
Bawal	Trade & Transport					Service			
Beri		Service						Service	
Bhiwani				Industrial	Trade & Transport				
Burla		Service					Industrial		
Charkha Dadri	Trade & Transport					Trade & Transport			
Chhachhrauli		Service					Service		
Faridabad				Industrial				Industrial	No change
Faidabad Township				Industrial				Industrial	No change
Farukanagar		Trade & Transport				Trade & Transport			
Fatehabad			Trade & Transport			Trade & Trasport			
Ferozepur Jhirka	Trade & Transport					Trade & Transport			
Ganaur	Trade & Transport					Trade & Transport			
Gharaunda	Trade & Transport					Trade & Transport			
Gohana				Trade & Transport			Trade & Transport		
Gurgaon				Service	U.A.	Service			
Haileymandi				Trade & Transport		Service			
Hansi				Trade & Transport			Trade & Transport		

Name of the Town	Functions highly diversified	Functions moderately diversified	Predominent function accentuated	Predominent function highly accentuated		Functions highly diversified	Functions moderately diversified	Predominent function accentuated	Predominent function highly accentuated	Change
Hisar	Service				U.A.	Trade & Transport				
Hodal		Trade & Transport					Trade & Transport			
Jagadhari				Industrial				Industrial		
Jagadhari W.R.C.				Trade & Transport					Trade & Transport	No change
Jakhalmandi				Trade & Transport					Trade & Transport	"
Jhajjar		Trade & Transport					Service			
Jind			Trade & Transport					Trade & Transport		No change
Julana			Trade & Transport					Trade & Transport		"
Kaithal			Trade & Transport					Trade & Transport		"
Kalanwali				Trade & Transport				Trade & Transport		
Kalka				Trade & Transport			Trade & Transport			
Kanina			Service					Trade & Transport		
Karnal			Service				Service			
Ladwa		Trade & Transport					Trade & Transport			
Loharu			Trade & Transport						Trade & Transport	
Maham		Trade & Transport							Trade & Transport	
Mandi Daburoli				Trade & Transport					Trade & Transport	No change
Mahindergarh			Trade & Transport						Trade & Transport	
Naraingarh			Service				Service			
Narnaul		Trade & Transport							Trade & Transport	
Narwana		Trade & Transport							Trade & Transport	
Nilokheri				Service					Service	No change
Nuh			Trade & Transport						Trade & Transport	

Name of the Town	Functions highly diversified	Functions moderately diversified	Predominent function accentuated	Predominent function highly accentuated	Functions highly diversified	Functions moderately diversified	Predominent function accentuated	Predominent function highly accentuated	Change
Palwal		Trade & Transport					Trade & Transport		
Panipat		Trade & Transport						Industrial	
Pataudi			Trade & Transport				Trade & Transport		No change
Pehowa		Trade & Transport						Trade & Transport	
Pundri	Trade & Transport			U.A.		Trade & Transport			
Radaur	Trade & Transport						Service		
Rewari				Trade & Transport		Trade & Transport			
Rohtak			Service			Trade & Transport			
Sadaura	Trade & Transport					Service			
Safidon			Trade & Transport			Trade & Transport			
Shahbad				Industrial		Service			
Sirsa			Trade & Transport				Trade & Transport		No change
Sohna			Trade & Transport			Trade & Transport			
Sonipat	Trade & Transport				Service				
Thanesar			Service					Service	
Tohana				Trade & Transport			Trade & Transport		
Tosham	Service						Trade & Transport		
Uchana				Trade & Transport				Trade & Transport	No change
Uklanamandi				Trade & Transport				Trade & Transport	"
Yamunanagar			Industrial			Industrial			
Assandh		Trade & Transport						Trade & Transport	
Babiyal				Service				Service	No change
Barwala	Service						Trade & Transport		

Name of the Town	Functions highly diversified	Functions moderately diversified	Predominent function accentuated	Predominent function highly accentuated	Functions highly diversified	Functions moderately diversified	Predominent function accentuated	Predominent function highly accentuated	Change
Bawani Khera	Industry					Trade & Transport			
Bilaspur			Service					Service	
Cheeka			Industry					Trade & Transport	
Dharukhera	Service							Industrial	
Dundahera		Service				Industrial			
Ellenabad				Trade & Transport				Trade & Transpor	No-change
Faridabad C.A.				Industrial				Industrial	No-change
Farrakpur				Trade & Transport	Service				
Hassanpur		Nil			Trade & Transport				
Hathin		Service			Service				
H.M.T. Pinjore			Industry					Industrial	
Indri		Trade & Transport					Trade & Transport		
Kalanaur	Service							Trade & Transport	
Kalayat		Industry					Industrial		
Kharakhoda	Industry				Trade & Transport				
Kheri Simpla			Trade & Transport					Trade & Transport	
Mustafabad			Service		Service				
Narnaul	Service					Service			
Panchkula U.E.	Nil					Service			
Pinjore (Rural)				Industrial				Industrial	No-change
Punahana		Trade & Transport						Trade & Transport	
Ratia		Trade & Transport						Trade & Transport	
Samalakha		Trade & Transport				Trade & Transport			No-change

Name of the Town	Functions highly diversified	Functions moderately diversified	Predominent function accentuated	Predominent function highly accentuated	Functions highly diversified	Functions moderately diversified	Predominent function accentuated	Predominent function highly accentuated	Change
Taoru		Industry				Trade & Transport			
Taraori		Service				Trade & Transport			
Uchal Siwana				Service				Service	No-change
Siwani			Trade & Transport			Trade & Transport			
Yamunanagar		Industrial			Industrial				

Source :- Based on

1 Census of India, 1971
Series 6, Haryana
District Census Handbooks,
Part XA, Village & Town Directory
Part XB Village & Townwise Primary
Census Abstract.

2. Census of India, 1991
Series 8, Haryana
Computer Floppy.

service function of Rohatak town had accentuated in 1971, but in 1991, all of its functions has moderately diversified. The fourth town is Tosham, whose functions are highly diversified in 1971, while in 1991, its trade and transport function has accentuated. The function of the fifth town is this sub-category Barwala had highly diversified in 1971, while in 1991, its trade and transport function has accentuated. The sixth town, Kalanaur in 1971, had its function highly diversified but in 1991, its trade and transport function has highly accentuated. The last town in this sub-category is Taraori. Taraori town, in 1971, had its functions moderately diversified while in 1991,its function has moderately diversified.

(c) Industrial town to Service towns :- There is only town of Shahbad who had changed from industrial town in 1971 to service in 1991. The industrial function of Shahbad district in 1971, was highly accentuated while in 1991, its functions has moderately balanced.

(d) Industrial towns to Trade and Transport towns :- There are five such towns, who has changed their functional character from industrial in 1971 to trade and transport in 1991. These towns are Bhiwani, Bawani Khera,Cheeka, Kharkhoda, and Taoru. The industrial function of Bhiwani town, in 1971, had highly accentuated, on the contrary in 1991, its functions are highly balanced. The town of Bawani Khera, had its functions highly balanced. The town of Cheeka, was a village in 1971 census, had its industrial function accentuated, but in 1991, its trade and transport has

highly accentuated. The town of Kharkhoda was also a village in 1971 census, with all its functions highly diversified while in 1991, all the functions of this town are highly diversified. But the town of Kharkhoda in 1971 was an industrial while in 1991, it has become trade and transport town. The town of Taoru was also a village in 1971, with its functions moderately balanced, but in 1991, its functions are moderately balanced.

(e) Trade and transport towns to service towns :- There are eight towns in this sub-category. These are Ambala Cantt. (city)(C.B.), Bawal, Haileymandi, Jhajjar, Radaur, Sadaura, Sonepat and Farrakhpur. The functions of Ambala Cantt.(C.B.)(city), in 1971 were highly balanced but in 1991 census, it has changed its status from Ambala Cantt.(city)(C.B.) of 1971 to Ambala U.A., which comprises of Ambala Sadar and Ambala Cantonment, as well as functional character also. The functions of Ambala Cantt.(city)(C.B.) were highly diversified in 1971, while in 1991, its service function has highly accentuated. The functions of Bawal town were highly balanced in 1971 census, but in 1991, its functions have moderately diversified. The town of Haileymandi in 1971, had its trade and transport function highly accentuated, while in 1991, its functions are moderately diversified. The functions of Jhajjar town were moderately diversified, in 1971, while in 1991, its function has moderately diversified. Radaur town had shown its functions highly diversified during 1971 census, while in 1991, its service function has accentuated . The functions of Sadaura town were highly diversified during 1971 census, while its funcions are moderately diver-

sified in 1991 census. The functions of Sonepat town in 1971 census, were highly balanced, but in 1991, it has become a service town and its functions are also highly balanced. The last town in this sub-category is Farrakhpur. This town of Farrakhpur had its trade and transport function highly accentuated, in 1971, while in 1991 census, its functions are highly balanced.

(f) Trade and Transport towns to Industrial towns :- There is just one town of Panipat, who has changed from trade and transport towns in 1971 to industrial towns in 1991. The functions of Panipat town in 1971, were moderately diversified while in 1991, its industrial function has accentuated.

(g) Towns which have not undergone any change in this period i.e. 1971-91 :- There are fifteen towns, who have not undergone any change in both the census periods. They are Ateli, Jabhalmandi, Jind, Julana, Kaithal, Mandi Dabwali, Nuh, Ellenabad, Faridabad Complex Administration, Pinjore (Rural), Samalkha, Ucha Siwana, Ballabhgarh, Faridabad and Faridabad township. In the present study, we have taken Ballabhgarh, Faridabad and Faridabad township separately in1971, but for 1991 census, we have estimated their functional character. But in 1991 census, we have taken all these three towns in Faridabad Complex Administration and function character of this town for the census of 1971, it has been calculated by taking the figures of these three towns. Now we will discuss them one by one. The town of Ateli had its trade and transport function highly accentuated while in 1991 census also its trade and transport function has highly accentuated. The functions of this town of Ateli are in VI th sub-triangle of the

ternary diagram for both the census period. The functions of the town of Jind are in VI th sub-triangle in both the censuses. In 1971, the trade and transport function of Jind town had accentuated while in 1991 also this trade and transport function has accentuated . The functions of Julana town are in V th sub-triangle in 1971 and 1991 census. The trade and transport function of Julana town has accentuated in 1971 as well as 1991 census. The trade and transport function of Kaithal town has accentuated in 1971 as well as in 1991 census. The functions of this town lies in VI th sub-triangl. The town of Mandi Dabwali had its trade and transport function highly accentuated in 1971 census as well as in 1991 census and the functions are in V th sub-triangle. The town of Nuh, in 1971, had its trade and transport function accentuated while in 1991 also, its trade and transport function has accentuated and the functions lies in VI th sub-triangle. The trade and transport function of Ellenabad town had highly accentuated during 1971 census, while in 1991 also, this function has highly accentuated and its functions in both the census periods lie in V th sub-triangle. The functional character of the town of Faridabad Complex Administration has calculated for the census of 1971 by taking the figures of Ballabhgarh, Faridabad and Faridabad township and it has shown its industrial function highly accentuated while in 1991 also its industrial function has accentuated and the functions are in III rd sub-triangle. The town of Pinjore (Rural) was a village in 1971 census having its industrial function highly accentuated and in 1991 also its industrial function has highly accentuated and

the functions for both the censuses lie in III rd sub-triangle. The town of Samalkha had all its functions moderately balanced in 1971 and also in 1991 census. The functions lie in V th sub-triangle. The service function of Ucha Siwana had highly accentuated in 1971 and 1991 census and the functions of both the census period lie in IInd sub-triangle. The towns of Ballabhgarh, in 1971, had its industrial function highly accentuated but in 1991, it has estimated its industrial function has highly accentuated and its functions are in IV th sub-triangle in both the census period. Similar is the case with the town of Faridabad. But Faridabad township had its industrial function highly accentuated and all its functions are in III rd sub-triangle for both the census period.

The town of Hassanpur in Faridabad district is exceptional which had shown no functional character in 1971 census and at that time it was a village, but in 1991 census, it is a trade and transport town with all its functions highly diversified.

The town of Panchkula Urban Estate came into existence in 1981 census. So in 1971, the data for this town is not available, but in 1991 it has shown its service function moderately diversified .

From the above analysis, it can be said that there are only 15(fifteen) towns out of total 96 towns, which have not undergone any change in 1971 and 1991, while all others have changed. It means that the towns of Haryana are rapidly developing with the same functional character. The highest number of towns, who have undergone any change is in trade and transport towns to trade and

transport towns while the lowest number went to the towns, who have changed from industrial towns to service towns i.e., only are town of Panipat.

3.6 Conclusion :- The towns of Haryana, in 1971 are situated away from the centre of the Ternary diagram i.e. equilateral triangle. In first circle of this diagram, there are thirteen towns, which represents a highly balanced composition of all the three fuctions. There are thirteen towns in the second circle also. These towns have their compositions moderately balanced. The third circle has nineteen towns. These towns have their prominent function accentuated. While there are twenty towns outside the circles. Their prominent function is highly accentuated.

The first sub-triangle of the Ternary diagram represents high service, moderate trade and transport and low industrial sector. It has eleven towns. There are two, three, five and two towns in first second, third circles and outside the circles respectively. The second sub-triangle has two towns. This sub-triangle signifies high service, moderate industry and low trade and transport. There is one town in the first circle, while second and third circles have no towns. There is one town outside the circles.

High industry, moderate service and low trade and transport are the characteristic features of the third sub-triangle. It has just one town. There is no town in all the three circles. There is one town outside the circles. The fourth sub-triangle had high industry, moderate trade and transport and low service. It has six towns. There is no town in first and second circles. There is

one town in the third circle, while five towns lie outside the circles.

The fifth sub-triangle signifies high trade and transport, moderate industry and low service. It has nineteen towns. The first, second and third circles has seven, three and two towns respectively. And seven towns are outside the circles. Low industry, moderate service and high trade and transport are the features of sixth sub-triangle. It has twenty six towns. There are three towns in first, seven towns in second and eleven towns in the third circle. There are five towns outside the circles also.

In 1971, majority of the towns of Haryana are trade and transport towns which constitutes nearly 70 percent of the total towns of Haryana state. Service towns which constitutes 20 percent while the industrial towns of Haryana constitutes just 10.66 percent of the total towns of Haryana state.

In 1991, the concentration of towns is close to the centre of the triangle. The distribution of towns goes down as one moves away from the centre of the triangle i.e. ternary diagram. The towns are well dispersed within the circles.

There are twenty towns in the first sub-triangle. There are three towns in first, nine towns in second and four towns in third circle, while there are four towns outside all of the three circles. The second sub-triangle has four towns. There is one each in first and second circle. There is no town in the third circle, while there are two towns outside the circles.

There are six towns in the third sub-triangle. There is no town in first circle. There is one town in second circle while

one each in third circle and outside the circles. The fourth sub-triangle has three towns. There is one town in first circle while there is no town in second circle. There are two towns in third circle and outside the circles there is no town.

The fifth sub-triangle of the Ternary diagram has nineteen towns. There is one town in first circle, while there are eight towns in second circle and six towns in third circle. There are four towns outside all of three circles. The last sub-triangle or the sixth sub-triangle has thirtyeight towns. Ther are four towns in first, fourteen in second and eight towns in third circle. But there are twelve towns outside the three circles.

In 1991 also, majority of the towns are trade and transport, which constitutes 63.33. percent, followed by service sector which constitutes 26.67 percent the lowest percentage has shown by industrial towns which constitutes just 10.00 percent of the total towns of the Haryana state.

Therefore we can say that there is no remarkable change in the percentages of all the three sectors during a period of three decades. Although number of towns has increased gradually in each sector, during this period. Trade and transport and industrial towns has shown a decline in their percentage. While service town has shown an increase in percentage by about seven percent in this period.

To observe the change during 1971 and 1991 census, towns have been classified into two broad categories, (A) Towns which have undergone change and (B) Towns which have not undergone any change during 1971 and 1991. First category has been further sub-

divided into two sub-categories; (1) Intra-functional change (2) Inter-functional change. Intra-functional change has three parts; (a) Service to service (b) Industrial to industrial (c) Trade & transport to trade & transport towns while inter-functional has six parts; (a) Service to industrial (b) Service to trade and transport (c) Industrial to service (d) Industrial to trade and transport towns (e) Trade and transport to service (f) Trade and transport to industrial towns.

About 82.3 percent of the total towns of Haryana comprised of 68.5 percent Intra-functional and 13.8 percent of the Inter-functional towns, which have undergone change in this period.

There are 15.6 percent of towns which have not undergone any change in this period.

There are thirteen towns which have changed their function character from service to service, five from industrial to industrial and thirtysix from trade and transport to trade and transport in 1971 and 1991.

While there are three towns which has undergone change from towns to industrial, seven from service to trade and transport, one from industrial to service, five from industrial to trade and transport, eight from trade and transport to industrial towns in this period.

There are fifteen towns, which have not undergone any change in this period, while one town of Hassanpur, who had shown no functional character in 1971, but in 1991, it has shown trade and tansport character.

Therefore we can say that majority of the towns have undergone minor or major change while there are 15.63 percent of the total towns of Haryana, which have not undergone any change. It indicates that the towns of Haryana are developing their prominant functionas. Which is not true ?. If we strictly follow Inter-functional change then the percentage of towns which have not undergone any change will be 73.96, which indicates that the towns of Haryana are rapidly changing their functions.

CHAPTER 4

HIERARCHY OF URBAN SETTLEMENTS

4.1 Introduction :-

The present chapter is an attempt to analyse the availability of infrastructural facilities in the towns of Haryana. The hierarchy of these towns have been worked out on the basis of availability of social, cultural and educational facilities.

On the basis of infrastructural facilities, few studies have been done in India. The two important ones in the field are the one by Sudhir Wanmali[1] - A case study of Eastern Maharastra and the other by L.S. Bhat[2] - A case study of Karnal Area, Haryana - India. The present chapter which attempts to analyse the availability of infrastructural facilities in the towns of Haryana, is based on the study by Sudhir Wanmali, because the variables used in this chapter are quite similar to that of Wanmali, while the variables considered by L.S. Bhat are totally different.

4.2 Data-Base :-

For the analysis of available infrastructural facilities in the towns of Haryana State, the data for 1971 and 1981 have been

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1. Wanmali S., "Regional Planning of Social Facilities: An Examination of Central Place Concepts and their Application - A case study of Eastern Maharashtra," National Institute of Community Development, Hyderabad, 1970.

2. Bhat L.S., Kundu A., Das B.N., Sharma A.N., Bhat D.R., Sastri C.S. and Mahapatra R.C., "Micro-Level Planning - A case study of Karnal Area, Haryana-India, K.B. Publications, New Delhi, 1976.

taken into consideration. The data for 1991 census was not available. Data for census year 1971 has been collected from the statements IV, V and VI of Village and Town Directory of District Census Handbooks. And the data for 1981 has been collected from the statements IV, V and VI of Town Directory of Haryana.

4.3 Methodology :-

The present text has been divided into two parts, the first part is an analysis of the total infrastructural facilities present in the towns of Haryana in 1971 and 1981, while the second part is related with the study of hierarchy of Urban settlements in Haryana. For this, numerical values have been given to all variables on the basis of their relative importance. For example if there is one primary school in a town, it will get, say, 1 point. The next higher level, secondary school is awarded a value of 1 plus 1 and the third 1 plus 1 plus 1 and so on : So the lowest order of a particular function is assigned a numerical value of one which goes on increasing according to the importance of the function. Equal numerical values have been assigned to equally important functions Table 4.1 gives the functions, their code No. and weightages.

Table 4.1 Major Functions, Their Sub-Functions, Codes and weightages in the towns of Haryana.

Sl. No.	Functions	Code	Weightages
1.	**Road Length**		
	Pucca Road	PR	upto 5 km. = 1
	Kuchcha Road	KR	upto 10 km. = 1
2.	**System of Sewerage**		
	Open Surface Drains	OSD	1
	Box Surface Drains	BSD	1
	Kuchcha Drains	KD	1
	Pit System	Pt.	2
	Sewer	S	3
3.	**Number of Latrines**		
	Water Borne Service		3
	Others		1
4.	**Methods of Carriage of Night Soil**		
	Head Load	HL	1
	Baskets	B	2
	Hand Cart	HC	3
	Wheel Barrow	W.B.	3
	Sceptic Tank	S T	4
	Sewerage	S	5
5.	**Protected Water Supply**		
	Wells	W	1
	Tanks	TK	2
	Tube Wells	TW	3
	Hand Pumps	HP	4
	Taps	T	5

6.	Fire Fighting Service	1	
7.	**Electrification (No. of Connections)**		
	Domestic		3
	Commercial		4
	Industrial		5
	Road Lighting Points		2
	Others		1
8.	**Medical Facilities**		
	Health Centre	HC	1
	Dispensary	D	2
	Nursing Home	NH	3
	Hospital	H	4
	Specialised Hospitals (including T.B.C. and F.C.)	TBC & FC	5
9.	**Educational Facilities**		
	Primary School		1
	Middle School		2
	Higher Secondary		3
	Arts College	A	4
	Science College	S	4
	Commerce College	C	4
	College of Education	CE	4
	Arts and Science College	AS	5
	Science and Commerce "	SC	5
	Arts and Commerce College	AC	5
	Medical College		7
	Engineering College		7
	Polytechnic		3
	Vocational Institute		2
	Others		1
10.	**Cultural Facilities**		
	Cinema		1
	Stadia		2
	Auditaria		3
	Public Library	PL	4
	Reading Room	RR	4
11.	**Banking Facilities**		
	No. of Bank Branches		1

4.4 Analysing of Infrastructural Facilities of the Towns in Haryana in 1971 and 1981:

It is analysed from the data available on the infrastructural facilities of the towns in Haryana State that there was an overall increase in the infrastructural facilities in 1981 as compared to 1971. The pucca road had increased from 671.84 Kilometers (in 1971) to 8701.32 Kilometers (in 1981), while the Kuchcha road had increased from 48.20 Kilometers (in 1971) to 958.40 Kilometers (in 1981).

The system of sewerage was very obsolete in 1971, as out of 65 towns, 62 towns of Haryana had open surface drains, 5 with box surface drains and sewers. In 1981 also, out of 77 towns of Haryana, 67 towns had open surface drains, 24 towns had open surface drains as well as sewers and 10 towns had sewers only. The town of Rama had both open surface drains and box surface drains while Naraingarh town had pit system only. In 1971, the number of water borne latrines were 716, service were 201 and others were 357. There were 23 towns which had no latrines. In 1981, the number of latrines increased remarkably. The number of water borne latrines increased to 40627, service to 223076 and others to 48893. Kanina, Pataudi and Samalbha towns had no latrines in 1981.

Again the methods of disposal of night soil was very much traditional. As out of 65 towns, in 1971, 28 towns had head load 35 towns had wheel barrows, and one town of Jagadhri workshop Railway Colony had sceptic tanks and sewers as the methods of carriage of night soil. In 1981, there was some improvements in the methods, as out of 77 towns, 13 towns had head load, 14 towns

had baskets, 50 towns had wheel barrows, six towns had sceptic tanks had wheel barrows, six towns had sceptic tanks and 13 towns had sewers only.

The supply of drinking water was also different in the towns of Haryana, as wells supplied water to 11 towns and handpumps to 3 towns in 1971. But in 1981, the number of towns getting its supply of water from wells increased to 56. In 15 towns, water was supplied from tanks, in 58 towns from tubewells, and in 56 towns from taps. In 1971, there was no town which had its water supply from tanks while in 1981, no town had its water supply from.

The fire fighting equipments were present in 9 towns in 1971 and in 22 towns in 1981.

The number of domestic connections of electricity were 176219 in 1971 and 358050 in 1981. The number of domestic connections had doubled in one decade. The number of the industrial connection had increased more than three times from 9815 in 1971 to 29792 in 1981. while the number of commercial connections had increased nearly two times from 53511 in 1971 to 96246 in 1981. Road lighting points had also increased nearly two times as these were 27720 in 1971 and 48307 in 1981. The five time increase had been shown by the number of other connections as these were 4812 in 1971 and 22583 in 1981.

34 health centres, 3 nursing homes, 43 dispensaries, 69 hospitals and 8 specialised hospitals (including 6 T.B.C., 1 each for F.C. and M.C.W.) provided the medical facilities in 1971. But in 1981, in number of health centres deceased to 23, dispensaries

increased to 80, hospitals increased to 71 and there was a remarkable progress in the specialised hospitals (including T.B.C. and F.C.) which shows an increase from 8 in 1971 to 74 in 1981. In 1981, there were 13 T.B. Clinics and 61 family planning centres.

The educational facilities present in the towns of Haryana in 1971 are briefly as follows. There were 359 primary schools, 67 middle schools, 206 higher secondary schools and 69 colleges were for higher education. Among these colleges, there were 20 for Arts, 6 for college of Education, 21 for Arts and Science, one for Arts and Commerce and 21 for Arts, Science and Commerce Colleges, The number of primary, middle and higher secondary in 1981 were 692, 415 and 170 respectively. There were 28 Arts, 20 Arts and Commerce, and 38 Arts, Science and Commerce Colleges. The number of Colleges has increased from 69 in 1971 to 95 in 1981. There was 1 Medical College in Rohtak town in 1971. Two more medical colleges were added to the former one. In 1981, two Medical Colleges were in Rohtak and one in Thanesar. There were two Engineering Colleges one at Thanesar and another at Bhiwani, in both 1971 and 1981. The number of vocational institute were 21 in 1971, and these increased to 97 in 1981. There were 14 polytechnics in 1971, but in 1981, these were only 8 in number, other educational facilities (including Adult Education Centres) had also increased from 93 in 1971 and 271 in 1981. The later being three times the former.

The Cinema halls had increased from 59 (in 1971) to 96 (in 1981), stadias from 6 (in 1971) to 11 (in 1981) auditorias from 28 (in 1971) to 44 (in 1981) and public libraries including

reading rooms had also increased from 156 (in 1971) to 203 (in 1981).

In the end, the number of bank branches were 195 in 971 and these increased to 482 in 1981.

4.5 Hierarchy of Settlements:-

Hierarchy is the stepwise differentiation, which depends upon the size and the kinds of services offered by a town. While population size is the most important in providing services and facilities, there are several instances where the settlements are large enough in terms of population and yet functionally their ranks are low. As in 1971. There were 34 towns, whose functional ranks were higher than population ranks. On the contrary 30 towns had their functional ranks lower than population ranks. While only one town of Rohtak had equal functional and population ranks. But in 1981, out of 80 towns, 37 towns had their functional ranks higher than population ranks. On the contrary, there were 38 towns who had their functional ranks lower than population ranks. There are only 5 towns who had their functional and population ranks equal in 1981. This is because the services and facilities provided mostly by the government are often subject to political pressure while small scale industry and commercial activities prefer location on economic consideration. Thus there is a strong need for the formulation of a spatial development strategy which would integrate the social and economic aspects of development.

On the basis of 52 variables selected an attempt has been made to study the hierarchy of the towns of Haryana in 1971 and

1981. The hierarchy of the towns of Haryana have been worked out by assigning weightages for every unit of facilities available and then totalled for all the amenities to arrive at the total score for each town in 1971 and 1981. The towns have been arranged according to their descending order of total score.

On the basis of the table and hierarchy diagram, four levels of hierarchy have been determined, which are as follows.

1. Score above 100.
2. Score between 75 and 100.
3. Score between 50 and 75.
4. Score below 50.

In 1971, as is depicted from the table Rohtak stands out as first ranking settlement. The centrality score for Rohtak was 101 while the next town Ambala M.C. had only a total score 70.60. The gap between the first and the second ranking town was wide. Rohtak being a class I town with a population of 1,24,755 had more infrastructural facilities than Ambala M.C. in 1971. The next level of hierarchy which had total score between 75 and 100 and occupying the second level of hierarchy were 4 in 1971. The third level of hierarchy, which had total score between 50 and 75 had 16 towns while the rest 44 towns in 1971 had the total score below 50. Hailey mandi which a total score of 11.40 was at the bottom of the hierarchical order in 1971 and the rank of town was 65.

Table 4.2

Hierarchy of Urban Settlements in Haryana 1971-81

1971			1981		
Sl. No.	Name of the Town	Total Score	Sl. No.	Name of the Town	Total Score
1.	Rohtak	101.00	1.	Faridabad Complex Administration	158.50
2.	Ambala M.C.	79.60	2.	Yamunanagar	108.64
3.	Hisar	76.80	3.	Rohtak	107.80
4.	Karnal	75.84	4.	Gurgaon U.A.	107.29
5.	Sonipat	75.00	5.	Yamunanagar	100.00
6.	Bhiwani	73.20	6.	Karnal	98.36
7.	Faridabad Township	73.20	7.	Bhiwani	97.80
8.	Gurgaon	69.60	8.	Thanesar	96.45
9.	Ambala Cantt. (City) (C.B.)	66.82	9.	Hisar U.A.	94.40
10.	Narual	63.00	10.	Panipat	90.10
11.	Yamunanagar	60.80	11.	Ambala M.C.	86.20
12.	Rewari	55.00	12.	Sirsa	85.22
13.	Sirsa	55.60	13.	Jind	81.09
14.	Charkhi Dadri	54.75	14.	Ambala U.A.	77.50
15.	Thanesar	54.40	15.	Kaithal	76.00
16.	Panipat	54.00	16.	Narnaul	74.70
17.	Hansi	53.40	17.	Rewari	73.99
18.	Mahindergarh	52.13	18.	Fatehabad	73.45
19.	Kaithal	51.42	19.	Tohana	73.25
20.	Jhajjar	51.20	20.	Hansi	73.20
21.	Jind	50.84	21.	Jagadhri	72.24
22.	Narwana	49.00	22.	Charkhi Dadri	70.90
23.	Bahadurgarh	48.80	23.	Mahindergarh	68.50
24.	Palwal	47.75	24.	Bahadurgarh	66.98
25.	Jagadhri	47.79	25.	Jhajjar	66.90
26.	Mandi Dabwali	45.56	26.	Narwana	66.60
27.	Ballabhgarh	45.50	27.	Palwal	65.58
28.	Kalka	45.10	28.	Haileymandi	64.40
29.	Beri	44.80	29.	Mandi Dabhwali	62.26
30.	Shahbad	44.70	30.	Shahbad	62.14
31.	Nuh	44.50	31.	Sonipat	62.00
32.	Tohana	44.40	32.	Kalka	61.25
33.	Jagadhri Workshop Railway Colony	41.40	33.	Sohna	60.10
34.	Gohana	41.37	34.	Radaur	59.70
35.	Maham	41.32	35.	Nuh	59.60
36.	Sadaura	38.40	36.	Sadaura	59.60
37.	Radaur	38.30	37.	Gohana	58.68
38.	Hodal	38.30	38.	Ladwa	58.00
39.	Nilokheri	37.00	39.	Safidon	55.20
40.	Uklanamandi	36.60	40.	Panchkula Urban Estate	55.00
41.	Chhachhrauli	35.88	41.	Beri	54.70

42.	Uchana	35.64	42.	Nilokheri	53.35
43.	Sohna	35.60	43.	Gharaunda	52.90
44.	Fatehabad	35.30	44.	Hodal	51.80
45.	Julana	34.00	45.	Jakhalmandi	51.43
46.	Ladwa	32.52	46.	Loharu	51.20
47.	Pundri	32.50	47.	Ferozepur Jhirka	50.57
48.	Jabhalmandi	32.43	48.	Pehowa	50.10
49.	Kalanwali	32.29	49.	Pataudi	49.40
50.	Kanina	31.70	50.	Pinjore	49.40
51.	Pataudi	30.60	51.	Kanina	48.65
52.	Pehowa	30.14	52.	Julana	48.55
53.	Tosham	29.30	53.	Bawal	48.50
54.	Buria	29.25	54.	Ganaur	48.25
55.	Loharu	29.20	55.	Barwala	48.00
56.	Safidon	29.20	56.	Uklanamandi	47.89
57.	Bawal	28.50	57.	Naraingarh	47.54
58.	Naraingarh	28.00	58.	Samalkha	46.64
59.	Farrubhnagar	27.30	59.	Uchana	44.15
60.	Ferozepur Jhirka	27.18	60.	Rania	43.20
61.	Gharaunda	26.60	61.	Ateli	42.80
62.	Ganaur	25.65	62.	Kalanwali	42.10
63.	Ateli	25.50	63.	Kalayat	41.70
64.	Faridabad	23.90	64.	Farrukhnagar	41.50
65.	haileymandi	11.40	65.	Maham	41.50
			66.	Chhachhrauli	41.05
			67.	Bawani Khera	40.80
			68.	Ratia	40.80
			69.	Jagadhri Workshop Railway Colony	40.40
			70.	Taoru	40.30
			71.	Taraori	40.20
			72.	Buria	39.20.
			73.	Hassanpur	38.80
			74.	Pundri	37.90
			75.	Assandh	37.50
			76.	Kalanaur	36.65
			77.	Indri	36.65
			78.	Hathin	32.60
			79.	Jharsa	30.80
			80.	Babiyal	19.80

Source:- Based on:

1. Census of India, 1971
   Series 6, Haryana
   District Census Handbooks,
   Part X A, Village and
   Town Director and
   Part XB, Village and
   Townwise Primary Census

2. Census of India, 1981
   Series 6, Haryana
   Part XA.
   Town Directory.

In 1981, there were 5 towns whose score is above 100. Faridabad Complex Administration was the first ranking settlement with a centrality score of 158.50. While the next settlement, Yamunanagar Urban Agglomeration (U.A.) had its centrality Score 108.64. This wide gap was not only found in case of centrality score but in population also. The population of Faridabad Complex Administration (330864) was twice as that of Yamunanagar U.A. (160424). Both Faridabad Complex Administration and Yamunanagar U.A. had Class I towns and their prominent function, was industry. The location of Faridabad Complex Administration is more suitable than Yamunanagar Urban Agglomeration. The town of Faridabad Complex Administration is connected in all directions to important towns and sea ports of India. i.e. Bombay, Calcutta etc., firstly by the National Highways, and secondly by broad gauge railway lines. It is also enjoying the advantage of being one of the satellite towns of Delhi, the National Capital of India. On the contrary the location of Yamunanagar is not so favorable.

The second level of hierarchy which had centrality score between 75 and 100, had increased from 4 in 1971 to 10 in 1981. The towns of third level of hierarchy. which had the score between 50 and 75, had increased from 16 in 1971 to 33 in 1981. This is because in 1966 Haryana became a separate state and the heed for development of towns was felt, which lead to deliberate planning of towns. Ultimate the infrastructural facilities had increased in 1981 in compression to 1971. Which is the result that in 1981, lower number of towns were in the fourth level of hierarchy than in 1971.

In first level of hierarchy the town of Rohtak, in second level of hierarchy, the towns of Ambala M.C., Hisar and Karnal, in third level of hierarchy, the towns of Narnaul, Rewari, charlehi Dadri, Mahindergarh, Nuh, Hansi and Jagadhri and in fourth level of hierarchy, the towns of Jagadhri workshop Railway Colony, Maham, Uklanamandi, Chhachhrauli, Uchana, Julana, Pundri, Kalawali, Kanina, Pataudi, Buria, Bawal, Naraingarh, Farrubhnagar, Ganaur and Ateli had retained their position in 1981 also. Though there was an increase in the total score of towns.

4.6 Conclusion :-

It has been observed from the analysis of results that manifold development had taken place in infrastructural activities of towns in Haryana State. The Pucca and Kuchcha road had increased from 671.84 kilometers in 1971 to 8701.32 kilometers in 1981 and from 48.20 kilometers in 1971 to 958.40 kilometers in 1981 respectively.

The system of sewerage was very obsolete. Most of the towns had open surface drain in 1971 and 1981. Only a few towns had sewers and box surface drains. There was a remarkable change in the number of latrines. The number of water borne latrines increased from 716 (in 1971) to 40627, service latrines from 201 to 2230 and others from 357 to 48893. The method of disposal of night soil was almost traditional as in 1971 only one town and in 1981, thirteen towns had sewers.

There was great improvement in the supply of drinking water the number of electrical connections had also increased in 1981

as compared to 1971. The number of towns having the fire fighting had also increased.

There was an overall development in medical facilities. The number of hospitals increased from 69 to 71, dispensaries from 43 to 80 and specialised hospitals (T.B.C., F.C. - New) from 8 to 74 in 1981 in comparison to 1971. But the number of primary health centre decreased from 34 to 23 in 1981 as compared to 1971.

The number of educational facilities increased in 1981 than that of 1971. The number of primary schools increased from 359 to 692, middle school increased from 67 to 415, Higher Secondary decreased from 206 to 170 and degree colleges increased from 69 to 95 in 1981 in comparison to 1971. There was one medical college at Rohtak in 1971, but in 1981, two more medical colleges added to the former one. In 1981, two medical colleges were in Rohtak and one in Kurukshetra. There were two Engineering Colleges one at Thanesar and another at Bhiwani, in both 1971 and 1981. The vocational institutes increased from 21 (in 1971) to 97 (in 1981).

The number of cinemas increased from 59 to 96, Stadia increased from 6 to 11, Auditorias increased from 28 to 44 and public library and reading rooms from 156 to 203 in 1981 as compared to 1971. Lastly the number of bank branches also increased from 195 (in 1971) to 482 (in 1981).

The town of Rohtak was the highest with a total score of 101.00 in 1971 And Faridabad Complex Administration with a total score of 158.50 was the highest in 1981. The town of Haileymandi with a total score of 11.40 in 1971 had gone up to 64.40 in 1981.

This means that the total score calculated had gone up in 1981 as compared to 1971.

Thirty-five towns of 1971 have ascended the scale of hierarchy during the decade; Gurgaon U.A., Faridabad Complex Administration and Yamunanagar U.A. have ascended from third level in 1971 to first level in 1981. Faridabad Complex Administration formed as a result of the combination of Faridabad Township of second level of hierarchy, Ballabhgarh and Faridabad of third level of hierarchical in 1971. As far as town of Yamunanagar is concerned it is composed of Yamunanagar of third level of hierarchy, Jagadhri and Jagadhri Workshop Railway Colony of fourth level of hierarchy of 1971.

The towns of Bhiwani - Ambala Cantonment (City) (C.B.), Sirsa, Thanesar, Panipat, Kaithal and Jind had gone up from third to second level of hierarchy in 1981.

There were twentyfive towns, which had gone up from fourth to third level of hierarchy. They were Narwana, Bahadurgarh, Palwal, Jagadhri, Mandi Dabwali, Kalka, Beri, Shahbad, Nuh tohana, gohana, Sadaiera, Radaur, Hodal, Nolokheri, Sohna, Fatehbad, Ladwa, Jabhalmandi, Pehowa, Lohauri, Safidon, Ferozepur Jhirka, Gharaunda and Haileymandi.

There is only one town of Sonipat which has descended from second to third level of hierarchy in 1981 as this town has a total score of 75.00 in 1971 and 62 in 1981.

Out of 65 towns in 1971, twenty six have retained their respective levels of hierarchy in 1981. These towns are Rohtak of first level, Karnal, Hisar and Ambala M.C. of second level, Naraingarh, Rewari, Charkhi Dadri, Mahindergarh, Hansi and Jhaj-

jar of third level and Jagadhri workshop Railway colony, Maham, Uklanamandi, Chhachharauli, Uchana, Julana, Pundri, Kalanwali, Kanina, Patudi Buria, Bawal, Naraingarh, Farrubhgarh, Ganaur and Ateli of fourth level of hierarchy.

From the above analysis it can be concluded that the public amenities and infrastructural facilities in the town of Haryana definitely increased. Increase in total score and the improvement in the position of towns in the hierarchical levels of 1971 and 1981 given evidence to our conclusions.

CHAPTER 5

CONCLUSIONS

Haryana is an agriculture dominant area and two third of its total population is engaged in agriculture, which do not like to diversity their activities as the returns from agriculture are fairly good due to the favourable soil and climatic conditions. The spatial location of NCR is very favourable. It is spread out over the fertile plains. The plain surface helps to build up a well spread out infrastructural development. The towns of the Haryana are well connected by roads and railways network.

Routes both roads and railroads have greatly helped in fixing the sites of the townships. Half of the townships are situated alongside the towns which are on the Grand Trunk road. They are from South to North Hodal, Palwal, Faridabad Complex Administration, Sonipat, Panipat, Karnal and Ambala, Although this road, as noted before has always been a very important highway since very early times, yet in the post partition period it has risen to even greater importance and extensive urban developments have been taking place along it. The broad-gauge railway from point beyond Delhi to Ambala which runs parallel to this road is another major advantage due to which the region has gained considerable.

The ease of transport, better commercial opportunities, the growth of non-agricultural population with the settling down of non cultivating people and establishment of new industries, have led to the development of old existing villages to towns. The great majority of these towns lie along the railway lines. And

these new towns helped in further expansion of old existing towns that happened to be along with them. In several of the newly developed towns 'mandies' have been established close to the railway stations. The condition of the towns which are side tracked by railway and highway are suffering from handicaps and the development is rather slow. However a factor which should not be neglected is that inspite of the theoretical advantages of the situation or settlements, their practical utility becomes evident with the establishment and growth of commercial and economics activities in them.

The rate of Urbanisation has declined in 1981-91 decade as compared to 1971-81 decade, as it has shown a 4.22 percent increase in 1971-81, while it is 2.91 percent in 1981-91.

In 1971, therefore only 65 towns with the addition of 19 new towns, the number had increased to 81 in 1981. Tosham town had been declassified and Faridabad M.C., Faridabad Township and Ballabhgarh merged into Faridabad complex Administration. But in 1991, the town of Tosham has been reclassified and with the addition of 15 new towns, the number of towns has gone upto 94.

The decadal growth rate of Urban population has decreased from 59.47 percent in 1971-81 decade to 43.07% in 1981-91 decade Most of the smaller towns of 1971-81 decade has shown an increases in their growth-rate. While bigger towns have shown decrease in their growth rate.

The towns which have shown a drastic fall in their population density are the on which have experienced an increase in their area, without a corresponding increase in their population.

The population of these towns has increased steadily but a spurt of the area has lowered their population density. While other towns have also shown change in their areas but as this change is not sudden therefore these towns have a corresponding increase in their population, the density of population of these towns has been increasing constantly. The dominance of low density towns over the high density towns have been observed, So the percentage of low density towns are high and vice-versa.

The Nearest Neighbour Distance Techniques gives the value of R = 1.19 for the urban settlements during 1981 census. The R Value shows that the distribution of towns is more towards random.

The towns of Haryana, in 1971 are situated away from the centre of the Ternary diagram i.e. equilateral triangle. On the contrary, in 1991 census, the concentration of towns is close to the centre of the Ternary diagram. The distribution of towns goes down as one moves away from the centre.

Majority of the towns of Haryana are trade and transport towns which has decreased from 70 percent in 1971 to 63.33 percent in 1991 service towns has increased from 20 percent in 1971 to 26.67 percent in 1991. While the industrial towns has decreased from 10.66 percent in 1971 to 10 percent in 1991.

No remarkable change has been observed during the period of three decades. However the number of towns has shown a decline in their percentage. While service town has shown an increase in percentage by about seven percent in this period.

Majority of the towns have undergone minor or major change while there are 15.63 percent of the total towns of Haryana, which have not undergone any change. It indicates that the towns of Haryana are not rapidly shifting their functional character If we strictly follow inter - functional change then the percentage of towns which have not undergone any change will be 73.96, which indicates that the towns of Haryana are making considerable progress in their prominent functional group.

The hierarchy of these towns have been worked out on the basis of availability of social, cultural and educational facilities. Manifold development had been taken place in 1981, as compared to 1971. The increase in pucca and Kuchcha road was remarkable but the system of sewerage had not shown any considerable improvement in 1971 and 1981. There was a great improvement in supply of drinking water as well as number of electrical connections. In both the census years domestic connections are leading the others. The educational, medical and recreational facilities had also shown remarkable progress in 1981 to that of 1971.

In 1971, the town of Rohtak and in 1981 the town of Faridabad complex Administration had the highest score. The town of Haileymandi in 1971 was the lowest settlement with a total score of 11.40 had gone up to 64.40 in 1981. This means that the total score calculated had gone up in 1981 instead of 1971.

There are 35 towns out of 65 in 1971, who had ascended the scale of hierarchy in 1981, while the Sonipat is the only town

who had descended the scale of hierarchy in 1981. Towns have been divided into four levels of hierarchy. First level of hierarchy is above 100, second level between 75 and 100, third level between 50 and 75 and fourth level of hierarchy below 50. Seven towns of 1971 had gone up from third to second level of hierarchy in 1981. Twnety five towns of fourth level in 1971 had gone up to third level in 1987. In 1981, 26 towns out of 65 (of 1971) had retained their respective levels of hierarchy in 1981. It is clear from the analysis that the public amenities and the infrastructural facilities in the towns of Haryana had definitely increased during the period.

Hence we can conclude that there is a overall growth in these towns in respect of number of towns, population and public amenities during the period. However rate of Urbanisation and growth rate of population has thus decreased during the period. There is a decrease in industrial and trade and transport towns, but the service towns have increased considerably. Changes in functional character of towns is very less which indicates the towns of Haryana are making progress in their prominent function.

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Appendices 2.1

District-Wise proportion of urban Population to Total Population and Decennial Growth-Rate 1971-1991.

STATE/DISTRICT		Percentage share of the Urban Population to Total Population			Decennial Growth-Rate of Urban Population	
S.No.		1971	1981	1991	1971-81	1981-91
	HARYANA	18.17	21.88	24.79	59.47	43.07
(1)	Faridabad	28.49	40.82	48.66	135.95	74.64
(2)	Rewari	13.38	14.26	15.26	17.69	60.40
(3)	Kaithal	10.81	14.64	14.74	49.44	48.59
(4)	Yamunanagar	35.56	35.87	33.82	35.93	44.88
(5)	Kurukshetra	13.57	18.63	24.25	47.44	43.04
(6)	Ambala	21.35	31.74	35.85	33.27	41.22
(7)	Sonipat	20.48	17.96	23.78	73.68	40.68
(8)	Jind	13.24	12.78	17.27	39.88	39.64
(9)	Panipat	24.26	27.10	27.16	87.16	37.18
(10)	Gurgaon	8.81	19.91	20.51	83.10	36.85
(11)	Hisar	33.71	19.29	21.18	60.48	34.66
(12)	Karnal	20.17	25.40	27.60	57.68	33.77
(13)	Bhiwani	16.86	16.02	17.49	42.82	33.25
(14)	Sirsa	6.12	20.44	21.16	89.48	32.08
(15)	Rohtak	14.17	19.83	21.63	38.31	31.72
(16)	Mahendergarh	8.00	12.16	12.70	29.05	27.99

Appendices 2.2

Percentage of Urban population to total Urban Population and Growth Rate of Towns During 1971-81 and 1981-91.

Name of the Town	Percentage of the Urban Population to Total Population			Growth Rate	
S.No.	1971	1981	1991	1971-81	1981-91
1.Faridabad Complex Administration	4.84	11.70	15.17	169.40	85.52
2.Yamunanagar U.A.	6.49	5.67	5.43	39.47	36.91
3.Rohtak	7.04	5.90	5.34	33.68	29.43
4.Panipat	4.96	4.88	4.72	56.77	38.49
5.Hisar U.A.	5.04	4.86	4.47	53.59	31.60
6.Karnal U.A.	5.23	4.67	4.35	42.38	33.32
7.Sonipat	3.52	3.87	3.53	75.29	30.74
8.Ambala U.A.	5.78	4.29	3.45	18.25	15.19
9.Gurgaon U.A.	3.22	3.57	3.33	76.51	33.47
10.Bhiwani	4.12	3.58	3.00	38.57	19.92
11.Ambala M.C.	4.72	3.70	2.96	25.03	14.32
12.Sirsa	2.75	3.15	2.78	82.49	26.36
13.Jind	2.15	2.01	2.11	48.71	50.33
14.Thanesar	1.67	1.73	2.01	65.97	65.69
15.Rewari	0.78	1.82	1.86	17.49	46.03
16.Kaithal	2.55	2.06	1.76	29.17	21.77
17.Panchkula	-	0.40	1.74	-	525.80

Name of the Town	Percentage of the Urban Population to Total Population			Growth Rate	
S.No.	1971	1981	1991	1971-81	1981-91
18.Hansi	2.32	1.78	1.47	22.52	18.41
19.Palwal	2.04	1.67	1.46	30.72	24.93
20.Bahadurgarh (U.A.)	1.46	1.33	1.41	35.23	52.57
21.Narnaul	1.80	1.47	1.28	30.01	25.19
22.Fatehabad	1.28	1.17	1.12	46.04	37.67
23.Narwana	1.20	1.03	0.95	37.16	31.76
24.Mandi Dabwali	1.18	1.03	0.89	38.96	24.51
25.Tohana	0.95	0.90	0.85	51.81	34.24
26.Gohana	0.94	0.93	0.80	56.31	23.98
27.Charkhi Dadri	1.10	1.00	0.80	40.19	18.06
28.Shahbad	1.21	0.93	0.78	22.36	19.55
29.Jhajjar	1.07	0.86	0.68	27.97	14.13
30.Kalka	1.00	0.76	0.67	20. 60	26.49
31.Hodal	0.80	0.66	0.46	32.49	36.74
32.Barwala	-	0.62	0.61	-	40.95
33.Ellenabad	-	-	0.55	-	-
34.Pehowa	0.64	0.61	0.54	52.02	27.18
35.Gharaunda	0.74	0.61	0.52	32.86	22.04
36.Cheeka	-	-	0.52	-	-
37.Ganaur	0.47	0.58	0.52	96.32	26.90
38.Safidon	0.68	0.53	0.50	25.86	32.68
39.Kalanwali	0.37	0.34	0.49	47.65	105.85
40.Mahendergarh	0.65	0.51	0.48	26.03	35.33

Name of the Town	Percentage of the Urban Population to Total Population			Growth Rate	
S.No.	1971	1981	1991	1971-81	1981-91
41.Ladwa	0.60	0.53	0.48	41.75	28.59
42.Samalkha	-	0.48	0.45	-	34.95
43.Ratia	-	0.46	0.44	-	34.98
44.Assandh	-	0.47	0.41	-	25.81
45.Sohna	0.49	0.45	0.40	44.35	29.01
46.Taraori	-	0.45	0.39	-	23.43
47.Pundri U.A.	0.51	0.42	0.38	29.61	31.59
48.Maham	0.59	0.42	0.37	11.20	27.41
49.Kalanaur	-	0.44	0.36	-	17.33
50.Beri	0.70	0.48	0.36	9.35	7.55
51.Bawani Khera	-	0.41	0.35	-	22.81
52.Nilokheri	0.53	0.39	0.34	18.39	25.53
53.Naraingarh	0.40	0.33	0.34	36.19	47.53
54.Haileymandi	0.13	0.36	0.33	350.27	30.62
55.Kharkhoda	-	-	0.32	-	-
56.Kalayat	-	0.39	0.32	-	17.35
57.Babiyal	-	0.26	0.31	-	73.51
58.Taoru	-	0.24	0.31	-	81.34
59.Ferozepur Jhirka	0.45	0.33	0.31	18.06	32.01
60.Narnaund	-	-	0.30	-	-
61.Sadaura	0.51	0.36	0.29	12.93	16.71
62.Julana	0.39	0.33	0.28	34.89	22.78
63.Pataudi	0.34	0.30	0.28	39.32	33.66

Name of the Town	Percentage of the Urban Population to Total Population			Growth Rate	
S.No.	1971	1981	1991	1971-81	1981-91
64.Indri	-	0.29	0.27	-	33.88
65.Siwani	-	-	0.27	-	-
66.Dharuhera	-	-	0.27	-	-
67.Radaur	0.37	0.29	0.25	23.95	25.39
68.Uchana	0.36	0.29	0.25	27.84	25.56
69.Loharu	0.31	0.26	0.22	29.90	24.62
70.Bawal	0.37	0.27	0.22	18.85	16.15
71.Panahana	-	-	0.21	-	-
72.Uklanamandi	0.34	0.25	0.21	17.96	21.89
73.Kanina	0.33	0.25	0.21	21.38	20.56
74.Tosham	0.28	-	0.21	-	-
75.Farrukhnagar	0.31	0.23	0.20	16.04	26.37
76.Pinjore(Rural)	-	-	0.20	-	-
77.Hathin	-	0.23	0.19	-	19.99
78.Buria	0.26	0.22	0.19	34.73	25.41
79.Kheri Sampla	-	-	0.19	-	-
80.Nuh	0.27	0.21	0.19	26.68	25.00
81.Chhachhrauli	0.30	0.22	0.18	14.08	19.38
82.Mustafabad	-	-	0.18	-	-
83.Hassanpur	-	0.18	0.18	-	39.56
84.Bilaspur	-	-	0.18	-	-
85.Dundahera	-	-	0.17	-	-
86.Farakhpur	-	-	0.14	-	-

Name of the Town	Percentage of the Urban Population to Total Population			Growth Rate	
S.No.	1971	1981	1991	1971-81	1981-91
87.H.M.T. Pinjore	-	-	0.14	-	4.26
88.Jakhalmandi	0.22	0.16	0.13	17.61	14.28
89.Uncha Siwana	-	-	0.12	-	-
90.Ateli	0.11	0.11	0.11	54.52	48.91

Source :- Based on

1. Census of India, 1971,
   Series 6, Haryana,
   Part X-A, District Census Hank Books.
2. Census of India, 1981
   Series 6, Haryana
   Part X-A, Town Directory.
3. Census of India 1991,
   Series No. 1, Part 1, of 1992,
   Vol. 1, Final Population Tables, India.

Appendices 2.5 (a)

Area Population & Density of Towns of Haryana During 1971 AND 1981

S.no.	Name of The Town	Area	Total Population	Density	Area	Total Population	Density
1.	Faridabad complex Admn.	25.75	122817	4770	178.24	330864	1856
2.	Rohtak	11.66	124755	10699	22.03	166767	7570
3.	Panipat	7.77	87981	11323	20.82	137927	6625
4.	Hisar U.A.	31.34	89437	2854	41.38	137369	3320
(a).	Hisar M.C.	31.34	89437	2854	37.38	131309	3513
(b)	H.A.U. Campus & mini sectt.	-	-	-	4.00	6060	1515
5.	Ambala M.C.	8.70	83633	9613	16.94	104565	6173
6.	Bhiwani	9.0	73086	8058	29.74	101277	3405
7.	Sirsa	5.18	48808	9422	19.33	89068	4608
8.	Narnaul	6.48	31875	4919	9.67	41441	4286
9.	Bahadurgarh	1.30	25812	19885	9.00	37488	4165
10.	Mandi Dabwali	2.98	20921	7020	7.11	29071	4089
11.	Gohana	2.59	16754	6469	6.57	26188	3986
12.	Kalka	2.90	17711	6214	17.20	38344	2229
13.	Ladwa	0.65	10666	16409	2.00	15119	7560
14.	Maham	1.53	10541	6890	3.49	11722	3359
15.	Ferozepur Jhirka	3.49	7962	2328	8.86	9400	1061
16.	Uklanamandi	0.78	5981	7668	1.86	7055	3793

S.no.	Name of The Town	Area	Total Population	Density	Area	Total Population	Density
17.	Jakhalmandi	0.13	3919	30146	0.67	4609	6879
18.	Ateli	0.65	1937	2980	1.67	2993	1814
19.	Yamunanagar U.A.	43.05	115020	2735	27.60	160424	5812
	(a)Yamunanagar M.C.	23.31	72594	3114	15.88	109304	6883
	(b) Jagadhri	10.83	35094	3240	10.83	43102	3980
	(c)Jagaadhri workshop Railway Colony.	8.91	7332	823	0.89	8018	9009
20.	Karnal	18.57	92784	4996	22.10	132107	5978
21.	Sonipat	21.37	62393	2920	21.37	109369	5118
22.	Ambala U.A.	36.26	102493	2827	37.51	121203	3231
	(a)Ambala Sadar	36.26	102493	2827	31.18	40462	1298
	(b)Ambala Cantt.	-	-	-	6.33	80741	12755
23.	Gurgaon U.A.	15.33	57151	3728	24.13	100877	4181
	(a)Gurgaon M.C.	15.33	57151	3728	15.33	89115	5813
	(b)Gurgaon (Rural)	-	-	-	8.80	11762	1337
24.	Kaithal	7.90	45199	4606	7.90	58385	7391
25.	Jind	10.36	38161	3683	15.30	56748	3709
26.	Rewari	6.06	43885	7242	6.06	51562	8509
27.	Hansi	9.07	41108	4532	9.07	50365	5553
28.	Thansar	16.58	29555	1783	20.00	49052	2453
29.	Palwal	5.52	36207	6559	5.52	47328	8574
30.	Fatehabad	10.36	22630	2184	10.36	33049	3190
31.	Narwana	5.18	21319	4116	6.00	29242	4874
32.	Charkhi Dadri	4.51	19484	4320	5.42	27315	5040

S.no.	Name of The Town	Area	Total Population	Density	Area	Total Population	Density
33.	Shahbad	7.77	21500	2767	3.84	26308	6851
34.	Tohana	4.53	16789	3706	4.70	25487	5423
35.	Jhajjar	5.18	18947	3658	6.00	24247	4041
36.	Hodal	2.59	14144	5461	2.25	18740	8329
37.	Gharaunda	1.55	13045	8416	2.00	17332	8666
38.	Pehowa	7.77	11366	1463	4.57	153167	3781
39.	Rania	-	-	-	2.93	16714	5704
40.	Ganaur	9.06	8399	927	9.06	16489	1820
41.	Safidon	6.48	12010	1853	6.50	15116	7560
42.	Mahindergarh	9.07	11496	1296	9.07	14488	1597
43.	Beri	2.59	12336	4763	2.59	13490	5208
44.	Sohna	3.24	8775	2708	3.70	12667	3424
45.	Pundri	3.89	9107	2341	3.89	11804	3034
46.	Nilokheri	4.69	9357	1995	4.69	11078	2363
47.	Haileymandi	2.59	2252	869	2.59	10140	3915
48.	Sadaura	11.66	8971	769	2.70	10131	3752
49.	Kalanwali	2.59	6531	2552	2.59	9643	3723
50.	Naraingarh	5.18	6880	1328	1.35	9370	6941
51.	Julana	1.22	6890	5648	1.22	9294	7618
52.	Pataudi	3.89	6045	1554	3.89	8422	2165
53.	Radaur	2.59	6539	2525	2.59	8105	3129
54.	Uchana	0.57	6329	11104	0.57	8091	14195
55.	Bawal	0.36	6529	18136	0.36	7760	21556
56.	Loharu	2.59	5579	2154	2.59	7247	2798

S.no.	Name of The Town	Area	Total Population	Density	Area	Total Population	Density
57.	Kanina	2.36	5875	2489	2.36	7131	3022
58.	Farrukhnagar	2.91	5487	1886	2.91	6367	2188
59.	Buria	1.94	4645	2394	1.94	6258	3226
60.	Chhachhrauli	1.29	5382	4172	1.29	6140	4760
61.	Nuh	5.67	4380	834	0.30	5992	19973
62.	Barwala	-	-	-	1.50	17648	11765
63.	Samalakha	-	-	-	6.09	13532	2222
64.	Assandh	-	-	-	3.95	13209	3344
65.	Ratia	-	-	-	4.00	13265	3266
66.	Taraori	-	-	-	3.69	12803	3470
67.	Kalanaur	-	-		5.70	12380	2172
68.	Bawani Khera	-	-	-	6.00	11530	1922
69.	Panchkula Urban Estate	-	-	-	10.37	11239	1084
70.	Kalayat	-	-	-	6.50	10965	1687
71.	Jharsa	-	-	-	9.99	8412	842
72.	Indri	-	-	-	0.95	8304	8741
73.	Babiyal	-	-	-	2.11	7342	3322
74.	Taoru	-	-	-	0.35	6912	19740
75.	Hathin	-	-	-	1.99	6553	3293
76.	Pinjore	-	-	-	3.44	5746	1670
77.	Hassanpur	-	-	-	0.93	5109	5494

Source:- Based on

1. Census of India,1971, Series 6,Haryana, Part X-A, District Census Handbooks, Haryana
2. Census of India,1981, Series 6,Haryana, Part X-A, Town Directory, Haryana.

Appendices 2.5 (b)

Towns Classified According to Population Density-1971

Density	No.of Towns	Name of Towns
Less than 5000	40	(1) Faridabad Complex Administration. (2) Yamunanagar U.A. (3) Hisar U.A. (4) Karnal (5) Sonipat (6) Ambala U.A. (7) Gurgaon U.A. (8) Kaithal (9) Jind (10) Hansi (11) Thanesar (12) Narnaul (13) Fatehabad (14) Narwana (15) Charkhi Dadri (16) Shahbad (17) Tohana (18) Jhajjar (19) Pehowa (20) Ganaur (21) Safidon (22) Mahendergarh (23) Beri (24) Sohna (25) Pundri (26) Nilokheri (27) Haileymandi (28) Sadaura (29) Kalan wali (30) Ferozepur Jhirka (31) Narain garh (32) Pataudi (33) Radaur (34) Loharu (35) Kanina (36) Farrukhnagar (37) Buria (38) Chhachhrauli (39) Nuh (40) Ateli.
5,000-10,000	13	(1) Ambala M.C. (2) Bhiwani (3) Sirsa (4) Rewari (5) Palwal (6) Mandi Dabwali (7) Gohana (8) Kalka (9) Hodal (10) Gharaunda (11) Maham (12) Julana (13) Uklan-namandi

Density	No.of Towns	Name of Towns
10,000-15,000	3	(1) Rohtak
		(2) Panipat
		(3) Uchana
More than 15,000	4	(1) Bahadurgarh
		(2) Ladwa
		(3) Jakhalmandi
		(4) Bawal.

Source :- Based on

1. Census of India, 1971,
   Series 6, Part X-A,
   District Census Handbooks, Haryana.

Appendices 2.5 (c)

Towns Classified According to Population Density-1981

Density	No.of Towns	Name of Towns
Less than 5,000	49	(1) Faridabad Complex Administration (2) Hisar U.A. (3) Ambala U.A. (4)Bhiwani(5)Gurgaon U.A.(6) Sirsa (7)Jind (8) Thanesar (9)Narnaul (10) Bahadurgarh (11) Fatehabad (12) Narwana (13) Mandi Dabwali (14)Gohana(15)Jajjar(16)Kalka(17) Pehowa(18)Ganaur(19)Safidon(20) Mahendergarh(21)Samalkha(22)Assandh(23 Ratia (24) Taraori (25) Sohna (26) Kalanaur (27) Pundri (28) Maham (29) Bawani Khera (30) Panchkula Urban Estate (31) Nilokheri (32) Kalayat (33)Haileymandi (34) Sadaura (35) Kalanwali (36) Pataudi (37) Ferozepur Jhirka (38) Jharsa (39) Radaur (40) Babiyal (41) Loharu (42) Kanina (43) Buria (44) Uklanamandi (45) Haithin (46)Farrukhnagar (47) Chhachhrauli (48) Pinjore (49) Ateli.

Density	No.of Towns	Name of Towns
5,000-10,000	23	(1) Yamunanagar U.A.(2) Rohtak (3) Panipat (4) Karnal (5) Sonipat (6) Ambala M.C. (7) Kaithal (8) Rewari (9)Hansi (10) Palwal (11) Charkhi Dadri (12) Shahbad (13) Tohana (14) Hodal (15) Gharaunda (16) Rania (17) Ladwa (18) Beri (19) Narain-garh (20) Julana (21) Indri (22) Hassanpur (23) Jakhalmandi.
10,000-15,000	1	(1) Uchana
More than 15,000	4	(1)Barwala(2)Bawal(3)Taoru(4) Nuh.

Appendics : 2.6 (a)

Total Urban Area, Total Urban Population, and Density of Tahsils in Haryana, 1971

	Distt	Tahsil	Total Urban Area in Sq. Kms.	Total Urban Population	Density (Urban Pop. per Sq. Kms.
	1	2	3	4	5
1.	Ambala	Kalka	2.85	17711	6214
		Naraingarh	16.84	15851	941
		Ambala	44.96	186126	4140
		Jagadhri	46.28	125047	2702
2.	Kurukshetra	Pehowa	7.77	11366	1463
		Guhla	-	-	-
		Kaithal	11.79	54306	4606
		Thanesar	27.59	68260	2474
3.	Karnal	Karnal	24.81	115186	4643
		Assandh	-	-	-
		Panipat	7.77	87981	11323
4.	Jind	Narwana	5.75	27648	4808
		Jind	11.58	45051	3890
		Safidon	6.48	12010	1853
5.	Sonipat	Gohana	2.59	16754	6469
		Sonipat	30.43	70792	2326
6.	Rohtak	Maham	1.53	10541	6890
		Rohtak	11.66	124755	10699
		Jhajjar	7.80	57095	7320
		Bahadwagarh	1.30	25812	19855
7.	Faridabad	Ballabhgarh	25.75	122817	4770
		Palwal	8.11	50351	6209
8.	Gurgaon	Gurgaon	27.98	79710	2849
		Nuh	5.67	4730	834
		Ferozepur Jhirka	3.42	7962	2328
9.	Mahendergarh	Bawal	0.36	6529	18136
		Rewari	6.06	43885	7242
		Mahendergarh	11.43	17371	1520
		Naruaul	7.13	33812	4742
10.	Bhiwani	Bawani Khera	-	-	-
		Bhiwani	11.66	78125	6700
		Dadri	4.51	19484	4320
		Loharu	2.59	5579	2154
11.	Hisar	Fatehabad	10.36	22630	2184
		Tohana	4.66	20708	4444
		Hansi	9.07	41108	4532
		Hisar	32.12	95418	2971
12.	Sirsa	Dabwali	2.98	20921	7020
		Sirsa	7.79	55339	7104

Source :- Based on
Census of India, 1971
Part X-A, District Census Handbooks, Haryana.

Appendics : 2.6 (b)

Total Urban Area, Total Urban Population, and Density of Tahsils in Haryana, 1981

	Distt	Tahsil	Total Urban Area in KM^2	Total Population	Density urba Population p Per KM^2
	1	2	3	4	5
1.	Ambala	Kalka	17.2	38344	2229
		Naraingarh	4.05	19501	4815
		Ambala	56.66	233110	4114
		Jagadhri	30.83	172822	5606
2.	Kurukshetra	Pehowa	4.57	17279	3781
		Guhla	-	-	-
		Kaithal	11.79	70189	5953
		Thanesar	28.43	98584	3468
3.	Karnal	Karnal	33.40	181624	5433
		Assandh	3.95	13209	3344
		Panipat	26.91	151459	5628
4.	Jind	Narwana	13.07	48298	3695
		Jind	16.52	66042	3998
		Safidon	6.48	15116	2333
5.	Sonipat	Gohana	6.57	26188	3986
		Sonipat	30.43	125858	4136
6.	Rohtak	Maham	3.49	11722	3359
		Rohtak	27.73	179147	6460
		Jhajjar	8.59	37737	4393
		Bahadurgarh	9.00	37488	4165
7.	Faridabad	Ballabhgarh	178.24	330864	1856
		Palwal	10.69	77730	7271
8.	Gurgaon	Gurgaon	47.21	146885	3111
		Nuh	0.65	12904	19852
		Ferozepur Jhirka	8.86	9400	1061
9.	Mahendergarh	Bawal	0.36	7760	21556
		Rewari	6.06	51562	8509
		Mahendergarh	11.43	21619	1891
		Naruaul	11.32	44434	3925
10.	Bhiwani	Bawani Khera	6.00	11530	1922
		Bhiwani	29.74	101277	3405
		Dadri	5.42	27315	5040
		Loharu	2.59	7247	2798
11.	Hisar	Fatehabad	14.36	46114	3211
		Tohana	5.37	30096	5604
		Hansi	9.07	50365	5553
		Hisar	44.74	162072	3623
12.	Sirsa	Dabwali	7.11	29071	4089
		Sirsa	24.85	115425	4645

Source :- Based on
Census of India, 1981,
Part X-A, Town Directory,
Haryana.

Appendices 2.7

Nearest Neighbour Distance of Towns in Haryana State, 1981

Name of The Town		Code No.	Distance in Cms.	Kms.
	1	2	3	4
1.	Kalka-Pinjore	1-2	0.8	8
2.	Pinjore-Kalka	2-1	0.8	8
3.	Panchkula-Pinjore	3-2	1.1	11
4.	Naraingarh-Sadaura	4-5	1.4	14
5.	Sadaura-Naraingarh	5-4	1.4	14
6.	Ambala M.C.-Ambala U.A.	6-7	0.3	3
7.	Ambala U.A.-Babiyal	7-8	0.2	2
8.	Babiyal-Ambala U.A.	8-7	0.2	2
9.	Shahbad-Ambala U.A.	9-7	0.2	2
10.	Chhachhrauli-Buria	10-11	1.6	16
11.	Buria-Jagadhri	11.12	0.8	8
12.	Jagadhri-Jagadhri W.Rly.C.	12-13	0.4	4
13.	Jagadhri W.Rly.C.-Yamunanagar	13-14	0.3	3
14.	Yamunanagar-Jagadhri W.Rly.C.	14-13	0.3	3
15.	Radaur-Ladwa	15-16	1.0	10
16.	Ladwa-Radaur	16-15	1.0	10
17.	Indri-Ladwa	17-16	1.3	13
18.	Nilokheri-Taraori	18.19	0.1	1
19.	Tarori-Nilkokheri	19.18	0.1	1
20.	Karnal-Taraori	20-19	1.3	13
21.	Pehowa-Thanesar	21-22	2.3	23
22.	Thanesar-Pehowa	22-21	2.3	23
23.	Kaithal-Pundri	23-24	1.6	16
24.	Pundri-Kaithal	24-23	1.6	16
25.	Assandh-Safidon	25-26	1.3	13
26.	Safidon-Assandh	26-25	1.3	13
27.	Gharaunda-Panipat	27-28	1.5	15
28.	Panipat-Gharaunda	28-27	1.5	15
29.	Samalkha-Ganaur	29-30	1.0	10
30.	Gananur-Samalkha	30-29	1.0	10
31.	Sonipat-Ganaur	31-30	1.4	14
32.	Kalayat-Narwana	32-33	1.6	16
33.	Narwana-Uchana	33-34	1.5	15
34.	Uchana-Narwana	34-33	1.5	15
35.	Jind-Uchana	35-34	2.1	21
36.	Julana-Maham	36-37	2.0	20
37.	Maham-Kalanaur	37-38	1.8	18
38.	Kalanaur-Maham	38-37	1.8	18
39.	Rohtak-Kalanaur	39-38	1.9	19
40.	Gohana-Rohtak	40-39	2.9	29
41.	Bahadurgarh-Jhajjar	41-42	2.7	27
42.	Thajjar-Beri	42-43	1.2	12
43.	Beri-Jhajjar	43-42	1.2	12
44.	Farrubhangar-Haileymandi	44-45	1.3	13
45.	Haileymandi-Pataudi	45-46	0.2	2
46.	Pataudi-Haileymandi	46-45	0.2	2

Name of The Town		Code No.	Distance in Cms.	Kms.
	1	2	3	4
47.	Gurgaon-Jharsa	47-48	0.2	2
48.	Jharsa-Gurgaon	48-47	0.2	2
49.	Faridabad-Palwal	49-50	2.0	20
50.	Palwal-Hathin	50-51	1.4	14
51.	Hathin-Palwal	51-50	1.4	14
52.	Hodal-Hassanpur	52-53	1.5	15
53.	Hassanpur-Hodal	53-52	1.5	15
54.	Ferozepur Jhirka-Nuh	54-55	3.6	36
55.	Nuh-Taoru	55-56	1.2	12
56.	Taoru-Nuh	56-55	1.2	12
57.	Sohna-Taoru	57-56	1.9	19
58.	Rewari-Bawal	58-59	1.4	14
59.	Bawal-Rewari	59-58	1.4	14
60.	Narnaul-Ateli	60-61	1.5	15
61.	Ateli-Narnaul	61-60	1.5	15
62.	Kanina-Mahindergarh	62-63	1.5	15
63.	Mahindergarh-Kanina	63-62	1.5	15
64.	Loharu - Mahindergarh	64-63	3.9	39
65.	Charkhi Dadri-Bhiwani	65-66	2.5	25
66.	Bhiwani-Bawani Khera	66-67	1.9	19
67.	Bawani Khera-Hansi	67-68	1.7	17
68.	Hansi-Bawani Khera	68-67	1.7	17
69.	Hisar-Hansi	69-68	2.5	25
70.	Barwala-Uklanamandi	70-71	1.6	16
71.	Uklanamandi-Barwala	71-70	1.6	16
72.	Tohana-Jakhalmandi	72-73	1.1	11
73.	Jakhalmandi-Tohana	73-72	1.1	11
74.	Ratia-Fatehabad	74-75	2.1	21
75.	Fatehabad-Ratia	75-74	2.1	21
76.	Sirsa-Rania	76-77	1.3	13
77.	Rania-Sirsa	77-76	1.3	13
78.	Kalanwali-Mandi Dabwali	78-79	2.5	25
79.	Mandi Dabwali-Kalanwali	79-78	2.5	25
	Total	**N= 79**		**1115 KMS**

Source:- Based on
Census of India, 1981
Town Directory, Part X-A,
Haryana.

Appendices 2.8(a)

Logarithms of Population with their Ranks of the Towns in Haryana 1971

Name of the Town/City/U.A.	Rank R	Population Pr	Log (R) = X	X^2	Log Pr = Y	Y^2	XY
Total	65	90.908	137.0406	273.774	1165.809374	372.426355	
Rohtak	1	124755	0	0	5.096	25.969216	0
Ambala Cantt.	2	102493	0.301	0.090601	5.011	25.110121	1.508311
Karnal	3	92784	0.477	0.227529	4.967	24.671089	2.369259
Hisar	4	89437	0.602	0.362404	4.952	24.522304	2.981104
Panipat	5	87981	0.699	0.488601	4.944	24.443136	3.455856
Faridabad Township	6	85762	0.778	0.605284	4.933	24.334489	3.837874
Ambala	7	83633	0.845	0.714025	4.922	24.226084	4.159090
Bhiwani	8	73086	0.903	0.815409	4.864	23.658496	4.392192
Yamunanagar	9	72594	0.954	0.910116	4.861	23.629321	4.637394
Sonepat	10	62393	1.000	1.000000	4.795	22.992025	4.795000
Gurgaon	11	57151	1.041	1.083681	4.757	22.629049	4.952037
Sirsa	12	48808	1.079	1.164241	4.688	21.977344	5.058352
Kaithal	13	45199	1.114	1.240996	4.655	21.669025	5.18567
Rewari	14	43885	1.146	1.313316	4.642	21.548164	5.319732
Hansi	15	41108	1.176	1.382976	4.614	21.288996	5.426064
Jind	16	38161	1.204	1.449616	4.582	20.994724	5.516728
Palwal	17	36207	1.230	1.512900	4.559	20.784481	5.60757
Jagadhri	18	35094	1.255	1.575025	4.545	20.657025	5.703975
Narnaul	19	31875	1.279	1.635841	4.503	20.277009	5.759337
Thanesar	20	29555	1.301	1.692601	4.471	19.989841	5.816771
Bahadurgarh	21	25812	1.322	1.747684	4.412	19.465744	5.832664
Fatehabad	22	22630	1.342	1.800964	4.355	18.966025	5.844410

Name of the Town/City/U.A.	Rank R	Population Pr	Log (R) = X	X^2	Log Pr = Y	Y^2	XY
Shahbad	23	21500	1.362	1.855044	4.332	18.766224	5.900184
Narwana	24	21319	1.380	1.904400	4.329	18.740241	5.974020
Mandi Dabwali	25	20921	1.398	1.954404	4.321	18.671041	6.040758
Faridabad	26	19644	1.415	2.002225	4.293	18.429849	6.074595
Charkhi Dadri	27	19484	1.431	2.047761	4.290	18.404100	6.138990
Jhajjar	28	18947	1.447	2.093809	4.278	18.301284	6.190266
Kalka	29	17711	1.462	2.137444	4.248	18.045504	6.210576
Ballabhgarh	30	17411	1.477	2.181529	4.241	17.986081	6.263957
Tohana	31	16789	1.491	2.223081	4.225	17.850625	6.299475
Gohana	32	16754	1.505	2.265025	4.224	17.842176	6.357120
Hodal	33	14144	1.519	2.307361	4.151	17.230801	6.305369
Gharaunda	34	13045	1.531	2.343961	4.115	16.933225	6.300065
Beri	35	12336	1.544	2.383936	4.091	16.736281	6.316504
Safidon	36	12010	1.556	2.421136	4.08	16.646400	6.348480
Mahendragarh	37	11496	1.568	2.458624	4.061	16.491721	6.367648
Pehowa	38	11366	1.58	2.496400	4.056	16.451136	6.40848
Ladwa	39	10666	1.591	2.531281	4.028	16.224784	6.408548
Maham	40	10541	1.602	2.566404	4.023	16.184529	6.444846
Nilokheri	41	9357	1.613	2.601769	3.971	15.768841	6.405223
Pundri	42	9107	1.623	2.634129	3.959	15.673681	6.425457
Sadaura	43	8971	1.633	2.666689	3.953	15.626209	6.455249
Sohna	44	8775	1.643	2.699449	3.943	15.547249	6.478349
Ganour	45	8399	1.653	2.732409	3.924	15.397776	6.486372
Ferozepur Jhirka	46	7962	1.663	2.765569	3.901	15.217801	6.487363

Name of the Town/City/U.A.	Rank R	Population Pr	Log (R) = X	X^2	Log Pr = Y	Y^2	XY
Jagadhri	47	7332	1.672	2.795584	3.865	14.938225	6.462280
Julana	48	6890	1.681	2.825761	3.838	14.730244	6.451678
Naraingarh	49	6880	1.690	2.856100	3.838	14.730244	6.48622
Radaur	50	6539	1.699	2.886601	3.816	14.561856	6.483384
Kalanwali	51	6531	1.708	2.917264	3.815	14.554225	6.516020
Bawal	52	6529	1.716	2.944656	3.815	14.554225	6.546540
Uchana	53	6329	1.724	2.972176	3.801	14.447601	6.552924
Pataudi	54	6045	1.732	2.999824	3.781	14.295961	6.548692
Uklanamandi	55	5981	1.740	3.027600	3.777	14.265729	6.571980
Kanina	56	5875	1.748	3.055504	3.769	14.205361	6.588212
Loharu	57	5579	1.756	3.083536	3.747	14.040009	6.579732
Farukhanagar	58	5487	1.763	3.108169	3.739	13.980121	6.591857
Chhachrauli	59	5382	1.771	3.136441	3.731	13.920361	6.607601
Tosham	60	5039	1.778	3.161284	3.702	13.704804	6.582156
Nuh	61	4730	1.785	3.186225	3.675	13.505625	6.559875
Buria	62	4645	1.792	3.211264	3.667	13.446889	6.571264
Jakhalmandi	63	3919	1.799	3.236401	3.593	12.909649	6.463807
Haileymandi	64	2252	1.806	3.261636	3.353	11.242609	6.055518
Ateli	65	1937	1.813	3.286969	3.287	10.804369	5.959331

Source :- Based on
Census of India, 1971
District Census Handbooks,
Part X-A, Haryana.

Appendices 2.8 (b)

Logarithms of Population with their Ranks of the Towns of the Towns in Haryana, 1981

Name of the Town/ City/U.A.	Rank R	Population Pr.	Log (R) = X	X^2	Log (Pr) = Y	Y^2	XY
Total	77		113.153	178.283527	330.117	1431.166021	471.703606
Faridabad Complex Admn.	1	330864	0	0	5.520	30.4704	0
Rohtak	2	166767	0.301	0.090601	5.222	27.269284	1.571822
Yamunagar U.A.	3	160424	0.477	0.227529	5.205	27.092025	2.482785
Panipat	4	137927	0.602	0.362404	5.140	26.419600	3.094280
Hisar (U.A.)	5	137369	0.699	0.488601	5.138	26.399044	3.591462
Karnal	6	132107	0.778	0.605284	5.121	26.224641	3.984138
Ambala U.A.	7	121203	0.845	0.714025	5.084	25.847056	4.295980
Sonipat	8	109369	0.903	0.815409	5.039	25.391521	4.550217
Ambala M.C.	9	104565	0.954	0.910116	5.019	25.190361	4.788126
Bhiwani	10	101277	1.000	1.000000	5.006	25.060036	5.006000
Gurgaon U.A.	11	100877	1.041	1.083681	5.004	25.040016	5.209164
Sirsa	12	89068	1.079	1.164241	4.950	24.502500	5.341050
Kaithal	13	58385	1.114	1.240996	4.766	22.714756	5.309324
Jind	14	56748	1.146	1.313316	4.754	22.600516	5.448084
Rewari	15	51562	1.176	1.382976	4.712	22.202944	5.541312
Hansi	16	50365	1.204	1.449616	4.702	22.108804	5.661208
Thanesar	17	49052	1.230	1.512900	4.691	22.005481	5.769930
Palwal	18	47328	1.255	1.575025	4.675	21.855625	5.867125
Narnaul	19	41441	1.279	1.635841	4.617	21.316689	5.905143
Bahadurgarh	20	37488	1.301	1.693601	4.574	20.921476	5.950774
Fatehabad	21	33049	1.322	1.747684	4.519	20.421361	5.974118

Name of the Town/ City/U.A.	Rank R	Population Pr.	Log (R) = X	X^2	Log (Pr) = Y	Y^2	XY
Narwana	22	29242	1.342	1.800964	4.466	19.945156	5.993372
Mandi-Dabwali	23	29071	1.362	1.855044	4.463	19.918369	6.078606
Charkhi-Dadri	24	27315	1.380	1.904400	4.436	19.678096	6.121680
Shahbad	25	26308	1.398	1.954404	4.420	19.536400	6.179160
Gohana	26	26188	1.415	2.002225	4.418	19.518724	6.251470
Tohana	27	25487	1.431	2.047761	4.406	19.412836	6.304986
Jhajjar	28	24247	1.447	2.093809	4.385	19.228225	6.345095
Kalka	29	21359	1.462	2.137444	4.330	18.748900	6.330460
Hodal	30	18740	1.477	2.181529	4.273	18.258529	6.311221
Barwala	31	17648	1.491	2.223081	4.247	18.037009	6.332277
Gharaunda	32	17332	1.505	2.265025	4.239	17.969121	6.379695
Pohawa	33	17279	1.519	2.307361	4.237	17.952169	6.436003
Rania	34	16714	1.531	2.343961	4.223	17.833729	6.465413
Ganaur	35	16489	1.544	2.383946	4.217	17.783089	6.511048
Ladwa	36	15119	1.556	2.421136	4.180	17.472400	6.504080
Safidon	37	15116	1.568	2.458624	4.179	17.464041	6.552672
Mahendergarh	38	14488	1.580	2.496400	4.161	17.313921	6.574380
Beri	39	13490	1.591	2.531281	4.130	17.056900	6.570830
Samalkha	40	13532	1.602	2.566404	4.131	17.065161	6.617862
Assandh	41	13209	1.613	2.601769	4.121	17.982641	6.647173
Ratia	42	13065	1.623	2.634129	4.116	16.941456	6.680268
Taraori	43	12803	1.633	2.666689	4.107	16.867449	6.706731
Sohna	44	12667	1.643	2.699449	4.103	16.834609	6.741229
Kalanaur	45	12380	1.653	2.732409	4.093	16.752649	6.765729
Pundri	46	11804	1.663	2.765569	4.072	16.581184	6.771736
Maham	47	11722	1.672	2.795584	4.069	16.556761	6.803368

Name of the Town/ City/U.A.	Rank R	Population Pr.	Log (R) = X	X^2	Log (Pr) = Y	Y^2	XY
Bawani khera	48	11530	1.681	2.825761	4.062	16.499844	6.828222
Punchkula Urban Estate	49	11239	1.690	2.856100	4.051	16.410601	6.846190
Nilokheri	50	11078	1.699	2.886601	4.044	16.353936	6.870756
Kalayat	51	10965	1.708	2.917264	4.040	16.321600	6.900320
Haileymandi	52	10140	1.716	2.944656	4.006	16.048036	6.874296
Sadaura	53	10131	1.724	2.972176	4.006	16.048036	6.906344
Kalanwali	54	9643	1.732	2.999824	3.984	15.872256	6.900288
Ferozepur Jhirka	55	9400	1.740	3.027600	3.973	15.784729	6.913020
Naraingarh	56	9370	1.748	3.055504	3.971	15.768841	6.941308
Julana	57	9294	1.756	3.083536	3.968	15.745024	6.967808
Pataudi	58	8422	1.763	3.108169	3.925	15.405625	6.919775
Jharsa	59	8412	1.771	3.136441	3.925	15.405625	6.951175
Indri	60	8304	1.778	3.161284	3.919	15.358561	6.967982
Radaur	61	8105	1.785	3.186225	3.909	15.280281	6.977565
Uchana	62	8091	1.792	3.211264	3.908	15.272464	7.003136
Bawal	63	7760	1.799	3.236401	3.890	15.132100	6.998110
Babiyal	64	7342	1.806	3.261636	3.866	14.945956	6.981996
Loharu	65	7247	1.813	3.286969	3.860	14.899600	6.998180
Kanina	66	7131	1.820	3.312400	3.853	14.845609	7.012460
Uklanamandi	67	7055	1.826	3.334276	3.848	14.807104	7.026448
Taoru	68	6912	1.833	3.359889	3.840	14.745600	7.038720
Hathin	69	6553	1.839	3.381921	3.816	14.561856	7.017624
Farrukhnagar	70	6367	1.845	3.404025	3.804	14.470416	7.018380
Buria	71	6258	1.851	3.426201	3.796	14.409616	7.026396
Chhachhrauli	72	6140	1.857	3.448449	3.788	14.348944	7.034316
Nuh	73	5992	1.863	3.470769	3.778	14.273284	7.038414

Name of the Town/ City/U.A.	Rank R	Population Pr.	Log (R) = X	X^2	Log (Pr) = Y	Y^2	XY
Pinjore	74	5746	1.869	3.493161	3.759	14.130081	7.025571
Hassanpur	75	5109	1.875	3.515625	3.708	13.749264	6.952500
Jakhalmandi	76	4609	1.881	3.538161	3.664	13.424896	6.891984
Ateli	77	2993	1.886	3.556996	3.476	12.082576	6.555736

Source :- Based on
Census of India, 1981,
town Directory, Part X-A,
Haryana.

Appendices 2.8 (C)

Logarithms of Population with their Ranks of the Towns in Haryana 1991

Name of the Town/ City/U.A	Rank R	Population Pr.	Log (R) = X	X^2	Log (Pr) = Y	Y^2	XY
Total Haryana	90		138.161	226.396051	388.845	1716.774109	583.697413
Faridabad Complex Administrations	1	613828	0	0	5.788	33.500944	0
Yamunanagar	2	219642	0.301	0.090601	5.342	28.536964	1.607942
Rohtak	3	215844	0.477	0.227529	5.334	28.451556	2.544318
Panipat	4	191010	0.602	0.362404	5.281	27.888961	3.179162
Hisar	5	180744	0.700	0.490000	5.257	27.636049	3.679900
Karnal	6	176120	0.778	0.605284	5.246	27.520516	4.081388
Sonipat	7	142992	0.845	0.714025	5.155	26.574025	4.355975
Ambala U.A.	8	139615	0.903	0.815409	5.145	26.471025	4.645935
Gurgaon	9	134639	0.954	0.9110116	5.129	26.306641	4.893066
Bhiwani	10	121449	1.000	1.000000	5.084	25.847056	5.084000
Ambala M.C.	11	119535	1.041	1.083681	5.077	25.775929	5.285157
Sirsa	12	112542	1.079	1.164241	5.051	25.512601	5.450029
Jind	13	85307	1.114	1.240996	4.931	24.314761	5.493134
Thanesar	14	81275	1.146	1.313316	4.910	24.108100	5.626860
Rewari	15	75294	1.176	1.382976	4.877	23.785129	5.735352
Kaithal	16	71096	1.204	1.449616	4.852	23.541904	5.841808
Panchkula Urban Estate	17	70334	1.230	1.512900	4.847	23.493409	5.961810
Hansi	18	59638	1.255	1.575025	4.776	22.810176	5.993880
Palwal	19	59127	1.279	1.635841	4.772	22.771984	6.103388
Bahadurgarh	20	57195	1.301	1.692601	4.757	22.629049	6.188857

Name of the Town/City /U.A.	Rank R	Population Pr.	Log (R) = X	X^2	Log (Pr) = Y	Y^2	XY
Narnaul	21	51880	1.322	1.747684	4.715	22.231225	6.233230
Fatehabad	22	45500	1.342	1.800964	4.658	21.696964	6.251036
Narwana	23	38530	1.362	1.855044	4.586	21.031396	6.246132
Mandi Dabuwali	24	36197	1.380	1.904400	4.559	20.784481	6.291420
Tohana	25	34215	1.398	1.954404	4.534	20.557156	6.338532
Gohana	26	32467	1.415	2.002225	4.512	20.358144	6.384420
Charkhi Dadri	27	32247	1.431	2.047761	4.508	20.322064	6.450948
Shahbad	28	31451	1.447	2.093809	4.498	20.232004	6.508606
Jhajjar	29	27674	1.462	2.137444	4.442	19.731364	6.494204
Kalka	30	27018	1.477	2.181529	4.432	19.642624	6.546064
Hodal	31	25626	1.491	2.223081	4.409	19.439281	6.573819
Barwala	32	24875	1.505	2.265025	4.396	19.324816	6.615980
Ellenabad	33	22256	1.519	2.307361	4.347	18.896409	6.603093
Pehowa	34	21975	1.531	2.343961	4.342	18.852964	6.647602
Gharaunda	35	21152	1.544	2.383936	4.325	18.705625	6.677800
Cheeka	36	21090	1.556	2.421136	4.324	18.696976	6.728144
Ganaur	37	20925	1.568	2.458624	4.321	18.671041	6.775328
Safidon	38	20056	1.580	2.496400	4.302	18.507204	6.797160
Kalanwali	39	19850	1.591	2.531281	4.298	18.472804	6.838118
Mahendergarh	40	19606	1.602	2.566404	4.292	18.421264	6.875784
Ladwa	41	19441	1.613	2.601769	4.289	18.395521	6.918157
Samalkha	42	18262	1.623	2.634129	4.262	18.164644	6.917226
Ratia	43	17635	1.633	2.666689	4.246	18.028516	6.933718
Assandh	44	16618	1.643	2.699449	4.221	17.816841	6.935103
Sohna	45	16342	1.653	2.732409	4.213	17.749369	6.964083
Taraori	46	15803	1.663	2.765569	4.199	17.631601	6.982937

Name of the Town/City /U.A.	Rank R	Population Pr.	Log (R) = X	X^2	Log (Pr) = Y	Y^2	XY
Pundri	47	15533	1.672	2.795584	4.191	17.564481	7.007352
Maham	48	14935	1.681	2.825761	4.174	17.422276	7.016494
Kalanaur	49	14525	1.690	2.856100	4.162	17.322244	7.033780
Beri	50	14509	1.699	2.886601	4.162	17.322244	7.071238
Bhawani Khera	51	14160	1.708	2.917264	4.151	17.230801	7.089908
Nilokheri	52	13906	1.716	2.944656	4.143	17.164449	7.109388
Naraingarh	53	13824	1.724	2.972176	4.141	17.147881	7.139084
Haileymandi	54	13245	1.732	2.999824	4.122	16.990884	7.139304
Kharkhoda	55	13145	1.740	3.027600	4.119	16.966161	7.167060
Kalayat	56	12867	1.748	3.055504	4.109	16.883881	7.182532
Babiyal	57	12739	1.756	3.083536	4.105	16.851025	7.208380
Taoru	58	12534	1.763	3.108169	4.098	16.793604	7.224774
Ferozepur Jhirka	59	12409	1.771	3.136441	4.094	16.760836	7.250474
Naranaul	60	12183	1.778	3.161284	4.086	16.695396	7.264908
Sadaura	61	11824	1.785	3.186225	4.073	16.589329	7.270305
Julana	62	11411	1.792	3.211264	4.057	16.459249	7.270144
Pataudi	63	11257	1.799	3.236401	4.051	16.410601	7.287749
Indri	64	11117	1.806	3.261636	4.046	16.370116	7.307076
Siwani	65	11114	1.813	3.286969	4.046	16.370116	7.335398
Dharuhera	66	10848	1.820	3.312400	4.035	16.281225	7.343700
Radaur	67	10163	1.826	3.334276	4.007	16.056049	7.316782
Uchana	68	10159	1.833	3.359889	4.007	16.056049	7.344831
Loharu	69	9031	1.839	3.381921	3.956	15.649936	7.275084
Bawal	70	9013	1.845	3.404025	3.955	15.642025	7.296976
Punahana	71	8663	1.851	3.426201	3.938	15.507844	7.289238

Name of the Town/City /U.A.	Rank R	Population Pr.	Log (R) = X	X^2	Log (Pr) = Y	Y^2	XY
Uklanamandi	72	8599	1.857	3.448490	3.934	15.476356	7.305438
Kanina	73	8597	1.863	3.470769	3.934	15.476356	7.329042
Tosham	74	8369	1.869	3.493161	3.923	15.389929	7.332087
Farrukhnagar	75	8046	1.875	3.515625	3.906	15.256836	7.323750
Pinjore (Rural)	76	8004	1.881	3.538161	3.903	15.233409	7.341543
Hathin	77	7863	1.886	3.556996	3.896	15.178816	7.347856
Buria	78	7848	1.892	3.579640	3.895	15.171025	7.369340
Kheri Sampla	79	7838	1.898	3.602404	3.894	15.163236	7.390812
Nuh	80	7490	1.903	3.621409	3.874	15.007876	7.372222
Chhachhrauli	81	7330	1.908	3.640464	3.865	14.938225	7.374420
Mustafabad	82	7302	1.914	3.663396	3.863	14.922769	7.393782
Hassanpur	83	7130	1.919	3.682561	3.853	14.845609	7.393907
Bilaspur	84	7121	1.924	3.701776	3.852	14.837904	7.411248
Dundahera	85	6910	1.929	3.721041	3.839	14.737921	7.405431
Farakhpur	86	5578	1.934	3.740356	3.747	14.040009	7.246698
H.M.T. Pinjore	87	5501	1.940	3.763600	3.740	13.987600	7.255600
Jakhalmandi	88	5267	1.944	3.779136	3.722	13.853284	7.235568
Uncha-Siwana	89	4859	1.949	3.798601	3.687	13.593969	7.185963
Ateli	90	4457	1.954	3.818116	3.649	13.315201	7.130146

Source :- Based on
Census of India, 1991
Series 1, Paper 1 of 1992,
Vol. 1, Final Population Tables,
India.

Appendices 2.8.1.

Rank-Size Distribution of Towns of Haryana, 1971

1	2	3	4
Name of The Town	**Rank**	**Actual Pop.**	**Estimated Po**
Rohtak	1	124755	489939
Ambala Cantt.	2	102493	235357
Karnal	3	92783	153273
Hisar	4	89437	113061
Panipat	5	87981	89290
Faridabad	6	85762	73629
Township Ambala	7	83633	62552
Bhiwani	8	73086	54312
Yamunanagar	9	72594	47950
Sonepat	10	62393	42893
Gurgaon	11	57151	38780
Sirsa	12	48808	35370
Kaithal	13	45199	32499
Rewari	14	43885	30049
Hansi	15	41108	27934
Jind	16	38161	26090
Palwal	17	36207	24470
Jagadhri	18	35094	23034
Narnaul	19	31875	21754
Thanesar	20	29555	20605
Bahadurgarh	21	25812	19569
Fatehabad	22	22630	18629

1	2	3	4
Name of The Town	Rank	Actual Pop.	Estimated Po
Shahbad	23	21500	17773
Narwana	24	21319	16991
Mandi Dabwali	25	20921	16273
Faridabad	26	19644	15612
Charkhi Dadri	27	19484	15001
Jhajjar	28	18947	14435
Kalka	29	17711	13909
Ballabhgarh	30	17411	13419
Tohana	31	16789	12961
Gohana	32	16754	12533
Hodal	33	14144	12132
Gharaunda	34	13045	11755
Beri	35	12336	11400
Safidon	36	12010	11065
Mahendergarh	37	11496	10749
Pehowa	38	11366	10450
Ladwa	39	10666	10166
Maham	40	10541	9898
Nilokhari	41	9357	9643
Pundari	42	9107	9400
Sadaura	43	8971	9169
Sohna	44	8775	8949
Ganaur	45	8399	8739
Ferozepur Jhirka	46	7962	8538

1	2	3	4
Name of The Town	Rank	Actual Pop.	Estimated Po
Jagadhari Workshop Rly. Col.	47	7332	8346
Julana	48	6890	8162
Naraingarh	49	6880	7986
Radaur	50	6539	7817
Kalanwali	51	6531	7655
Bawal	52	6529	7500
Uchana	53	6329	7350
Pataudi	54	6045	7206
Uklanamandi	55	5981	7068
Kanina	56	5875	6934
Loharu	57	5579	6806
Farruknagar	58	5487	6681
Chhachhrauli	59	5382	6562
Tosham	60	5039	6446
Nuh	61	4730	6334
Buria	62	4645	6226
Jakhalmandi	63	3919	6122
Haileymandi	64	2252	6021
Ateli	65	1937	5923

Source :- Based on
Census of India, 1971
Part X-A, District Census Handbooks,
Haryana.

Appendices 2.8.2

Rank-Size Distribution of Towns or Haryana, 1981.

1	2	3	4
Name of The Town	Rank	Actual Pop.	Estimated Po
Faridabad Comp. Admn.	1	330864	849480
Rohtak	2	166767	391599
Yamunanagar U.A.	3	160424	248950
Panipat	4	137927	180522
Hisar U.A.	5	137369	140690
Karnal	6	132017	114763
Ambala U.A.	7	121203	96607
Sonipat	8	109369	83218
Ambala M.C.	9	104565	72958
Bhiwani	10	101277	64856
Gurgaon U.A.	11	100877	58305
Sirsa	12	89068	52904
Kaithal	13	58385	48379
Jind	14	56748	44535
Riwari	15	51562	41231
Hansi	16	50365	38363
Thanesar	17	49052	35850
Palwal	18	47328	33633
Narnaul	19	41441	31661
Bahadurgarh	20	37488	29898
Fatehabad	21	33049	28312

1	2	3	4
Name of The Town	Rank	Actual Pop.	Estimated Po
Narwana	22	29242	26878
Mandi Dabwali	23	29071	25576
Charkhi Dadri	24	27315	24388
Shahbad	25	26308	23301
Gohana	26	26188	22302
Tohana	27	25487	21381
Jhajjar	28	24247	20530
Kalka	29	21359	19741
Hodal	30	18740	19007
Barwala	31	17648	18323
Gharaunda	32	17332	17685
Pehowa	33	17279	17087
Rania	34	16714	16527
Ganaur	35	16489	16000
Ladwa	36	15119	15504
Safidan	37	15116	15037
Mahendergarh	38	14488	14595
Beri	39	13490	14178
Samalakha	40	13532	13783
Assandh	41	13209	13408
Ratia	42	13065	13051
Taraori	43	12803	12713
Sohna	44	12667	12390
Kalanaur	45	12380	12083
Pundri	46	11804	11790

1	2	3	4
Name of The Town	**Rank**	**Actual Pop.**	**Estimated Po**
Maham	47	11722	11510
Bawani Khera	48	11530	11243
Panchkula Urban Estate	49	11239	10987
Nilokheri	50	11078	10741
Kalayat	51	10965	10506
Haileymandi	52	10140	10281
Sadaura	53	10131	10064
Kalanwali	54	9643	9856
Ferozwpur Jhirka	55	9400	9656
Naraingarh	56	9370	9464
Julana	57	9294	9279
Pataudi	58	8422	9100
Jharsa	59	8412	8928
Indri	60	8304	8762
Radaur	61	8105	8602
Uchana	62	8091	8447
Bawal	63	7760	8297
Babiyal	64	7342	8152
Loharu	65	7247	8012
Kanina	66	7131	7877
Uklanamandi	67	7055	7746
Taoru	68	6912	7619
Hathin	69	6553	7495
Farrukhnagar	70	6367	7376
Buria	71	6258	7260

1	2	3	4
Name of The Town	**Rank**	**Actual Pop.**	**Estimated Po**
Chhachhrauli	72	6140	7147
Nuh	73	5992	7037
Pinjore	74	5742	6932
Hassanpur	75	5109	6829
Jakhalmandi	76	4609	6728
Ateli	77	2993	6631

Source :- Based on
Census of India, 1981
Part X-A, Town Directory,
Haryana.

Appendices 2.8.3.

Rank-Size Distribution of Town of Haryana, 1991.

1	2	3	4
Name of The Town	**Rank**	**Actual Pop.**	**Estimated Pop.**
Faridabad Complex Administration	1	613828	549861
Yamunanagar U.A.	2	219642	289632
Rohtak	3	215844	199062
Panipat	4	191010	152560
Hisar U.A.	5	180774	124112
Karnal U.A.	6	176120	104853
Sonipat	7	142992	90922
Ambala U.A.	8	139615	83059
Gurgaon U.A.	9	134639	72065
Bhiwani	10	121449	65374
Ambala M.C.	11	119535	59858
Sirsa	12	112542	55230
Jind	13	85307	51289
Thanesar	14	81275	47892
Rewari	15	75294	449312
Kaithal	16	71096	42328
Panchkula Urban Estate	17	70334	40020
Hansi	18	59638	37959
Palwal	19	59127	36108
Bahadurgarh	20	57195	34435
Narnaul	21	51880	32916

1	2	3	4
Name of The Town	**Rank**	**Actual Pop.**	**Estimated Po**
Fatehabad	22	45500	31530
Narwana	23	38530	30260
Mandi Dabwali	24	36197	29092
Tohana	25	34215	28014
Gohana	26	32467	27016
Charkhi Dadri	27	32247	26089
Shahbad	28	31451	25226
Jhajjar	29	27674	24421
Kalka	30	27018	23667
Hodal	31	25626	22960
Barwala	32	24875	22296
Ellenabad	33	22256	21670
Pehowa	34	21975	21080
Gharaunda	35	21152	20522
Cheeka	36	21090	19995
Ganaur	37	20925	19494
Safidan	38	20056	19019
Kalanwali	39	19850	18568
Mahendergarh	40	19606	18138
Ladwa	41	19441	17729
Samalkha	42	18262	17338
Ratia	43	17635	16965
Assandh	44	16618	16608
Sohna	45	16342	16266
Taraori	46	15803	15939

1	2	3	4
Name of The Town	**Rank**	**Actual Pop.**	**Estimated Po**
Pundri	47	15533	15625
Maham	48	14935	15324
Kalanaur	49	14525	15034
Beri	50	14509	14756
Bawani Khera	51	14160	14488
Nilokheri	52	13906	14230
Naraingarh	53	13824	13982
Haileymandi	54	13245	13742
Kharkhoda	55	13145	13511
Kalayat	56	12867	13288
Babiyal	57	12739	13072
Taoru	58	12534	12863
Ferozepur Jhirka	59	12409	12662
Narnual	60	12183	12466
Sadaura	61	11824	12277
Julana	62	11411	12094
Pataudi	63	11257	11916
Indri	64	11117	11744
Siwani	65	11114	11577
Dharuhera	66	10848	11414
Radaur	67	10163	11257
Uchana	68	10159	11104
Loharu	69	9031	10955
Bawal	70	9013	10810
Punahana	71	8663	10669

1	2	3	4
Name of The Town	**Rank**	**Actual Pop.**	**Estimated Po**
Uklanamandi	72	8599	10532
Kanina	73	8597	10398
Tosham	74	8369	10268
Farruknagar	75	8046	10142
Pinjore (Rural) C.T.	76	8004	10018
Hathin	77	7863	9898
Buria	78	7848	9780
Kheri Sampla	79	7838	9666
Nuh	80	7490	9554
Chhachrauli	81	7330	9445
Mustafabad	82	7302	9338
Hassanpur	83	7130	9234
Bilaspur	84	7121	9132
Dundahera	85	6910	9033
Farakhpur	86	5578	8936
H.M.T. Pinjore	87	5501	8841
Jakhalmandi	88	5267	8748
Uncha Siwana	89	4859	8657
Ateli	90	4457	8568

Source :- Based on
Census of India, 1991
Series No. 1, Paper 1 of 1992,
Vol. 1, Final Population Tables,
India.

APPENDICS 3.1•

1971

S.No.	Name of the Town	A	B	C
1.	2	3	4	5
1.	Ambala M.C.	20.84	39.39	39.77
2.	Ambala Cantt (C-B)(City)	31.27	38.89	29.84
3.	Ateli	20.27	51.67	28.06
4.	Bahadurgah	32.33	33.00	34.66
5.	Ballabhgarh	52.04	24.23	23.73
6.	Bawal	29.73	35.57	34.70
7.	Beri	26.03	32.10	41.86
8.	Bhiwani	51.76	29.19	19.05
9.	Buria	28.81	29.91	41.28
10.	Charkhi Dadri	31.99	36.32	31.69
11.	Chhachhrauli	27.96	31.97	40.07
12.	Faridabad	54.22	25.19	20.60
13.	Faridabad Tonwship	61.74	15.28	23.23
14.	Farrukhnagar	31.09	42.54	26.37
15.	Fatehabad	26.11	46.56	27.33
16.	Ferozepur Jhirka	31.83	37.13	31.04
17.	Ganaur	34.86	37.13	28.01
18.	Gharannda	32.27	35.91	31.82
19.	Gohana	21.08	49.32	29.60
20.	Gurgaon	20.43	31.15	48.42
21.	Haileymandi	23.17	54.50	22.38
22.	Hansi	28.25	46.80	24.95
23.	Hisar	29.42	33.23	37.36
24.	Hodal	32.91	40.73	26.36
25.	Jagadhri	51.21	27.20	21.59
26.	Jagadhri W.Rly.C.	3.68	91.24	5.08
27.	Jakhalmandi	16.16	66.84	17.00
28.	Jhajjar	24.99	41.21	33.80
29.	Jind	19.20	47.22	33.59
30.	Julana	27.97	46.88	25.15
31.	Kaithal	25.88	45.09	29.03
32.	Kalanwali	25.91	54.77	19.32
33.	Kalka	16.03	62.82	21.15
34.	Kanina	18.96	36.31	44.72
35.	Karnal	23.23	34.32	42.45
36.	Ladwa	33.37	41.70	24.93
37.	Lohare	20.61	47.98	31.41
38.	Maham	24.40	43.42	32.17
39.	Mandi Dabwali	27.10	50.63	22.27
40.	Mohindergarh	18.67	42.47	38.99
41.	Naraingarh	22.78	32.97	33.20
42.	Narnaul	22.16	39.13	38.70
43.	Narwana	26.81	48.36	24.83
44.	Nilokheri	24.89	23.07	52.04
45.	Nuh	20.02	46.02	33.96
46.	Palwal	28.00	39.71	32.29
47.	Panipat	28.73	41.35	29.92

S.No.	Name of the Town	A	B	C
1	2	3	4	5
48.	Pataudi	21.20	41.60	37.20
49.	Pehowa	26.94	39.26	33.80
50.	Pundri	28.72	39.56	31.72
51.	Radur	32.42	37.00	30.58
52.	Rewari	24.34	53.21	22.45
53.	Rohtak	21.13	39.59	39.28
54.	Sadaura	27.67	37.62	34.71
55.	Safidor	26.15	45.71	28.14
56.	Shahbaot	67.80	19.17	13.01
57.	Sirsa	24.29	46.45	29.27
58.	Sohna	27.02	45.89	27.08
59.	Sonipat	35.38	36.17	28.45
60.	Thanesar	20.71	38.00	41.29
61.	Tohana	24.71	51.94	23.35
62.	Toshan	31.10	31.00	37.90
63.	Uchana	24.66	55.07	20.27
64.	U.Klanamandi	19.02	65.45	15.53
65.	Yamunanagar	45.45	31.65	22.90

APPENDICES 3.2.

S.No.	Name of the Town/U.A.	1991 A	B	C
1.	Ambala M.C.	22.84	39.61	37.55
2.	Ambala U.A.	21.46	24.32	54.21
3.	Assanoh	20.34	55.79	23.87
4.	Ateli	15.34	55.52	29.15
5.	Babiyal	29.12	15.35	55.54
6.	Bahadurgarh U.A.	21.81	30.56	47.62
7.	Barwala	26.02	48.22	25.77
8.	Bawani Khera	23.25	40.25	36.50
9.	Bawal	29.74	29.74	40.73
10.	Beri	16.72	33.50	49.18
11.	Bhiwani	31.43	34.90	33.66
12.	Bilaspur	20.45	30.90	48.65
13.	Buria	43.10	21.35	35.55
14.	Charkhi Dadri	26.60	39.50	33.90
15.	Cheeka	25.55	51.74	22.71
16.	Chhachhrauli	20.00	32.69	47.31
17.	Dharuhera	69.67	14.72	15.61
18.	Dundahera	44.42	28.05	27.53
19.	Ellenabad	26.75	53.84	19.41
20.	Faridabad C.A.	58.63	20.29	21.08
21.	Farrakpur	33.66	31.42	34.91
22.	Farrukhnagar	24.58	41.16	34.26
23.	Fatehabad	31.26	43.90	25.16
24.	Ferozepur Jhirka	22.40	42.06	35.54
25.	Ganaur	23.51	43.45	33.04
26.	Gharauuda	26.77	40.13	33.09
27.	Gohana	21.28	40.26	38.46
28.	Gurgaon U.A.	26.57	32.94	41.09
29.	Haileymaudi	27.60	40.12	32.18
30.	Hansi	32.03	42.09	25.89
31.	Hassanpur	29.71	36.59	33.70
32.	Hathin	30.66	33.15	36.19
33.	H.M.T. Pinjore	81.40	4.08	14.52
34.	Hisar U.A.	30.49	37.19	32.32
35.	Hodal	27.21	44.12	28.67
36.	Indei	19.57	45.45	34.98
37.	Jakhalmandi	14.36	59.13	26.51
38.	Jhajjar	23.46	38.14	38.40
39.	Jind	22.80	45.81	31.29
40.	Julana	28.48	49.10	22.42
41.	Kaithal	20.78	47.33	31.89
42.	Kalanwali	24.61	48.89	26.50
43.	Kalanaur	14.92	43.76	41.32
44.	Kalka	34.39	37.89	27.72
45.	Kalayat	29.23	39.00	31.77
46.	Kanina	17.43	42.58	39.98

S.No.	Name of the Town/U.A.	A	B	C
47.	Karnal	26.07	33.47	40.46
48.	Kharkroda	30.09	36.70	33.21
49.	Kheri Sampla	16.17	47.21	36.62
50.	Ladwa	23.20	41.62	35.18
51.	Loharu	21.58	50.68	27.74
52.	Maham	18.52	48.91	32.57
53.	Mahindergarh	13.99	47.08	38.93
54.	Mandi Dabwali	24.84	51.25	23.91
55.	Mustafabad	25.04	37.09	37.87
56.	Naraingarh	25.02	30.83	44.15
57.	Nainaund	24.40	37.54	38.05
58.	Narnaul	17.80	47.49	37.71
59.	Narwana	29.75	47.43	22.82
60.	Nilokheri	24.16	28.18	47.66
61.	Nuh	19.23	44.16	36.61
62.	Palwal	31.71	41.26	27.03
63.	Panchkula (U.E.) Urban Estate	27.16	19.47	53.36
64.	Panipat	45.40	30.94	23.65
65.	Pataudi	25.20	44.48	30.31
66.	Pehowa	20.39	42.64	36.96
67.	Pinjore (Rural)	51.61	21.02	27.37
68.	Punahana	19.48	48.45	32.08
69.	Pundri U.A.	29.37	44.57	26.05
70.	Radaur	20.05	35.78	44.17
71.	Ratia	24.90	55.87	19.23
72.	Rewari	26.24	44.74	29.02
73.	Rohtak	25.13	40.62	34.25
74.	Sadaura	22.70	35.67	41.63
75.	Safidor	26.46	46.10	27.44
76.	Samalkha	31.56	43.55	24.88
77.	Shah bad	24.68	36.78	38.54
78.	Sirsa	26.87	46.23	26.90
79.	Siwani	30.10	40.01	29.88
80.	Sohna	24.28	42.76	32.96
81.	Sonipat	30.74	33.99	35.27
82.	Taoru	33.42	41.97	24.60
83.	Taraori	27.10	45.94	26.95
84.	Thanesar	17.82	29.47	52.71
85.	Tohana	25.49	48.75	25.76
86.	Tosham	31.12	40.16	28.72
87.	Uklanamandi	19.00	58.92	22.08
88.	Uchana	18.45	60.29	21.26
89.	Uncha Siwana	6.46	4.41	89.13
90.	Yamunanagar U.A.	39.49	31.43	29.08