SPATIAL ORGANISATION OF SOCIAL FACILITIES —A CASE STUDY OF BULANDSHAHR DISTRICT

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by
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TO MY STUDENTS

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Certified that the dissertation entitled "Spatial Organisation of Social Facilities - A Case Study of Bulandshahr District" submitted by Shri Ramesh Chand in fulfilment of six credits out of the total requirements of twenty-four credits for the award of the Degree of Master of Philosophy (M.Phil.) of the University, is, to the best of our knowledge, a bonafide work and may be placed before the examiners for evaluation.

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LIST OF ABBREVIATIONS

AAAG	Annals of the Association of American Geographers
AE	Agro-Economic
Ag.	Agricultural
ARN	Arniya (Village)
ASR	Anupshahr (Town)
ASS	Agricultural Seed Store
Av.	Average
BBN	Bhawan Bahadur Nagar
BHQ	Block Head Quarters
BnK.	Bank
BPO	Branch Post Office
BSR	Bulandshahr (Town)
°C	Centigrade
C	College
Cin.	Cinema Talkies
CMPT	Coefficient of Median Population Threshold
CMPTI	Coefficient of Median Population Threshold Index
Cms.	Centimetres
Cr.	Credit
CS	Composite Score
CSMPTI	Composite Score of Median Population Threshold Indices
DBI	Dibai (Town)
DDP	Dairy Development Programme
Disp.	Dispensary
DHQ	District Head Quarters
DNK	Dankaur (Town)
DNP	Danpur (village)
DP	Density of Population
DU	Distance from the Nearest Town
EAU	Electricity for Agricultural usage
FM	Fair Market
FPC	Family Planning Centre
GCS	Grape Cultivation Scheme
GP	Growth of Population
GUL	Gulaothi (Town)
HC	Health Centre
HMSO	Her Majesty's Stationery Office
Hosp.	Hospital
H.Qrs.	Head Quarters
HSS	Higher Secondary School
IAPP	Intensive Agricultural Area Programme
JHS	Junior High School
JNB	Jahangirabad (Town)
JWR	Jewar (Village)
Km.	Kilometre
KR	Kachcha (unmetalled) Road
KRJ	Khurja (Town)
Lat.	Latitude
Lit.	Literacy
LKH	Lakhaoti (village)
Long.	Longitude
LSS	Large Scale Service Society
LTA	Leisure Time Amenities
Md.	Medical
MCW	Maternity and Child Welfare Centre
MIP	Minor Irrigation Project

mm.	Millimetre(s)
Mod.	Moderate/Moderately
MPT	Median Population Threshold
MPTI	Median Population Threshold Index
Msq.	Mosque
Mts.	Metres
NACS	Non-Agricultural Credit Society
NGJI	National Geographical Journal of India
NGSI	National Geographical Society of India
NIR	Net Irrigated Area
NICD	National Institute of Community Development
NIRD	National Institute of Rural Development
NND	Nearest Neighbourhood Distance
No.	Number
NPC	Nyay Panchayat (Rural Court of Justice) Centre
NPWF	non-primary work force
OECD	Organisation of European Community Development
OSD	Open Surface Drainage
PA	Public Administration
PCO	Public Call Office
PHQ	Pargana Head Quarters
PL	Public Library
PR	Pucca (Metalled) Road
PS	Primary School
PSOP	Police Station/Outpost
PTO	Post and Telegraph Office
PSU	Pahasu (Town)
PWF	Primary Work force
UNG	Unchagaon (village)
UP	Uttar Pradesh
UPSFC	Uttar Pradesh State Financial Corporation
RLY.	Railways
RM	Regulated Market
RR	Reading Room
SC	Scheduled Caste
ST	Scheduled Tribe
SIA	Siyana (Town)
SJS	Social Justice and Security
Sl.	Serial
SKD	Sikandrabad (Town)
SKP	Shikarpur (Town)
Sz.	size
Tel.	Telephone
THQ	Tahsil Head Quarters
Tmp.	Temple
UNG	Unchagaon (village)
VH	Very High
V. Hosp.	Veterinary Hospital
VL	Very Low
Vol.	Volume
WM	Weekly Market

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CHAPTER 1

INTRODUCTION

1.1 PREAMBLE

It is a common belief that the infrastructural facilities play a catalytic role in the process of development.[1] This implies that distribution of improved amenities and social infrastructure have a positive role to play in the process of economic growth. It is generally admitted that investment in infrastructure, such as health, education, transport and communications, is an economically viable investment and promotes the process of development of regions or countries. In order that an economic plan becomes a living reality, and not a dead letter, and in order that that plan may contribute to accelerate the pace of economic development, it is necessary that certain minimum social amenities are provided. The success of a regional development planning programme is contingent on the infrastructural facilities.[2]

It is, however, felt that the policy makers often give undue weightage to cities and urban settlements in providing the social facilities and services and perhaps at the cost of rural development. Consequently, the concentration of infrastructural facilities and improved

amenities in the cities had led to growing social disparities between rural and urban areas. A balanced development of social infrastructure in the country would not only lessen the pressure of population in the cities it would also improve the quality of life of a large number of people living in the countryside. In India, for example, about eighty per cent of the country's population lives in villages. Moreover, the migration problem to the cities has serious implications for planned urban development.

In order to correct the present situation and for enhancing the socio-economic welfare of the people in rural areas, the basic need is to consider rural space as a multi-fuctional system with varying dimensions of development processes and structure.[3] In a region, or administrative areal unit, the system of multi-functional organization is a subject of variation according to the level of its general development phenomena. Therefore, prior to eliminate the state of variations or inequalities in the levels of socio-economic development of an area it is necessary first to analyse the existing spatial organization of its geonomic landscape and with special reference to the present level of distribution of infrastructural facilities. It is because the spatial organization is 'the aggregate pattern of use of space by a society',[4] and it determines 'the optimum structure of movement'[5] of man and material in intra and inter-regional

dimensions. 'Basically, we assume that spatial organisation is the outcome of man's attempt to use his territory efficiently'.[6] Therefore, for the fulfilment of the aims to attain the state of optimal spatial organisation of social facilities, it seems pertinent to determine the extent of the existing inequalities and identify the lagging areal units so that corrective measures could be initiated. In this study an attempt has been made to identify the spatial organisation of social facilities in Bulandshahr district of Uttar Pradesh.

1.2 STATEMENT OF THE PROBLEM

The present dissertation deals with the spatial organisation of social facilities in Bulandshahr district. The district includes 1,385 settlements in all, out of which there are 12 towns and 1,373 villages of different size-groups. The objectives, hypotheses to be tested and the significance of the study have been stated below :

1.2.1 Objectives

The main objectives of the present study are listed below :

(i) to describe the physical economic and social facets of the personality of the reorganised district of Bulandshahr;

(ii) to evaluate the spatial distribution of population and human settlements, and their characteristic

inter-relationships;

(iii) to attempt a review of the theories of spatial organisation and to assess the work done in this field with special reference to India;

(iv) to examine the spatial patterns of distribution of social facilities in the area of study and to identify their correlates;

(v) to determine the levels of development of blocks on the basis of the distribution of social facilities; and lastly

(vi) to reflect on the policy implications of this locational analysis of the social facilities in the district.

1.2.2 Hypotheses to be Tested

It is proposed to test the following hypotheses in the course of this study :

(i) spacing of settlements is a function of their size;

(ii) the larger settlements command a larger area and achieve a higher order of hierarchy in their functions or facilities;

(iii) the size of hinterlands of the lowest-order service centres varies indirectly with the level of development, i.e., the less developed an area the larger are the hinterlands of the lowest order of service centres;

(iv) it is expected that each of the given variables such as the size of settlement, density of population, growth of population, literacy rate, proportion of non-primary workforce to the total workforce, proportion of net irrigated area to net cultivated area and the distance of settlement from the nearest urban centre will be positively related to the composite score of social facilities;

(v) it is further expected that the proportion of Scheduled Caste population to the total population and percentage share of primary workforce to the total workforce will reveal an inverse relationship with the composite score of social facilities.

1.2.3 Chapter Scheme

The study has been divided into seven chapters. The first chapter deals with the objectives, significance, data base and methodology adopted to analyse the problem of study.

The second chapter deals with the criteria for the choice of the area selected for the present study and gives an account of its physical and social setting. In cultural setting special emphasis has been laid on population characteristics and economy of the area under study.

The third chapter is devoted to explain the state of spatial organisation of settlements analysing the size and distance relationships of settlements has been made on the basis of statistical and cartographic techniques.

The fourth chapter reviews the concepts of 'development' and 'spatial organisation'. The concepts of 'spatial organisation' and the view-points and approaches of various scholars and the current theories and models of spatial organisation have been discussed. The concentrations of Christaller, Lösch, Tinbergen and Friedman have been evaluated. Further, an attempt has been made to review the research work done by the Indian and foreign social scientists on the theme of spatial organisation of social facilities.

In the fifth chapter an account of the spatial distribution of social facilities of Bulandshahr district has been presented. The spatial distribution of forty social facilities, clubbed under twelve sub-categories and seven major categories, has been described. On the basis of the social facilities levels of development of the blocks of Bulandshahr have been determined. The patterns of clustering of social facilities has also been analysed.

An analysis of the functional hierarchy of settlements has been attempted in the sixth chapter. It also

discusses the levels of development of blocks on the basis of composite scores of median population threshold (MPT) indices. The composite score technique of MPT indices, based on modified 'Reed-Muench' method[7] has been employed for determining the hierarchic orders of settlements. Having taken note of the methods used so far in delineating the hinterlands of service centres, an attempt has been made to develop a composite score gravity model based on the median population threshold indices of social facilities. The non-intact and intact range methods have been developed to identify the hinterlands of the service centres of various orders of functional hierarchy. Comparing the hinterlands based on these two methods the two separate nesting sets of hinterlands of service centres have been identified. On the basis of composite scores of MPT indices of social facilities the block-wise levels of development have been determined. A relationship between the size of hinterlands of service centres and the levels of development has also been examined. On the basis of the levels of development an approach for the co-ordination between the existing system of sectoral planning and the spatial planning in order to attain an optimal state of spatial organisation of social facilities in the district has been suggested.

The seventh chapter brings out the relationship between social facilities and a number of variables. The

quantal value of social facilities of each settlement is represented by their composite score of MPT indices. On the other hand as many as nine correlates of social facilities viz., settlement size, density, growth of population, literacy rate, size of Scheduled Caste population, primary and non-primary work force, net irrigated area and the distance of settlement from the nearest town, have been taken into account. Various aspects of the relationships have been assessed with the help of correlation and multiple regression analysis.

The eighth and the last chapter presents a summary of conclusions and highlights the planning implications of this study.

1.3 SIGNIFICANCE OF THE STUDY

The present study is an attempt to determine the relative importance of social facilities on the basis of computation of their median population thresholds. This non-arbitrary technique proves to be very helpful and seems to be logically sound to compute the composite scores of social facilities or functions (i.e., functional mass) of settlements. The functional hierarchy of settlements and the block-wise levels of distribution of social facilities may easily be identified by applying the techniques as developed in the present study. The study may prove to

be very useful and may pave the way for eliminating regional disparities in the distribution of social facilities. Thus, the study is supposed to provide the bases for determining the process of an indicative (directional) planning, on the one hand, and locational planning for social facilities on the other. Therefore, the present study is quite relevant to the approach aimed at striking a balance between the sectoral and spatial pulls in regional planning.

1.4 DATA BASE

Almost all the data used in the present study have been collected from secondary sources. These sources are listed below :

1.4.1 Census Publications

(a) Decade-wise general population data for the district as a whole from 1901 to 1971 have been taken from the 'Census of India : General Population Tables' of U.P.[8], 1971.

(b) The village-level data on population, area, social facilities, general land use, occupational structure, literacy etc. for the years 1961[9] and 1971[10&11] have been collected from the respective District Census Handbooks.

1.4.2 District Statistical Handbooks

The general statistics of the district have been

computed from the bulletin of Annual Plans[12&13] regarding the Fifth Five Year Plan of Bulandshahr district published by the U.P. Government.

1.4.3 Bulletin of Ground Water Survey

The information regarding climate and underground water conditions of the district was taken from the bulletin of Ground Water Survey published by the department of the Ground Water Investigation Organisation, Government of U.P., Roorkee.[14]

1.4.4 Lead Bank Reports

The data regarding the economy of the district have been taken from the 'Lead Bank Survey Report'[15] and District Action Plan[16] published by the Development Studies cell of Punjab National Bank, New Delhi.

1.4.5 Statistical Bulletin of Panchayats

The information regarding the nyay panchayats was furnished from the statistical bulletin of Block societies, gaon panchayats and nyay panchayats[17] published by District Panchayat Raj Officer, Bulandshahr.

1.4.6 District Gazetteer of Bulandshahr

The information regarding relief, climate, soil, drainage, natural vegetation and flora and fauna of the

district is mainly based on the Gazetteer of Bulandshahr district.[18]

1.4.7 Survey of India Topographical Sheets

The following topographical sheets covering the area of the district published by the Survey of India, Dehra Dun were used in the preparation of maps :

Quarter inch sheets	...	53H, 53L
Half inch sheets	...	53H/N.W.,S.W., N.E., S.E., and 53L/N.W.,S.W.
One inch sheets	...	53H/6,7,8,10,11,12,14, 15 and 16 53L/2,3,4,6,7 and 8

1.4.8 Settlement Reports

Data on agricultural land use and soils were taken mainly from the settlement reports. The key map of Bulandshahr district used in the present study is based on the map contained in the final Settlement Report[19] of Bulandshahr, 1891. The boundaries of the district have, however, been adjusted to the 1971 position. Thus, two maps on half-inch and quarter-inch scales have been used in the present study.

1.4.9 District Level Offices

The data for facilities which were not available in published records were collected from the departmental offices in the district. The statistics regarding the 1976

re-organisation of the district, agro-economic services and police security establishments etc., were collected in the manner mentioned above.

1.5 SPATIAL UNITS OF STUDY

Most of the work has been done on the village level but some of the aspects have been analysed at the block and the district levels also. The levels of development and the ranking on the basis of distribution of social facilities have been attempted at the block level. The aspects of general population and the trends during the period 1901-1971 have been described for the district as a whole.

1.6 METHODOLOGY

Various statistical methods and techniques have been employed in the course of this study.

(i) For determining variations in the distribution, density and growth of population and in the block-wise levels of development based on social facilities, quartling and pentiling, like averaging rules, have been employed.

(ii) The concentration of population has been analysed with the help of Lorenz curve.[20]

(iii) Spatial patterns of distribution of settlements have been identified on the basis of 'near neighbour (N-N technique) analysis.[21]

(iv) The spatial patterns of settlements have been examined applying 'Gimny's Coefficient' technique.[22]

(v) The average spacing among settlements in the district has been worked out on the Mather's model[23] of average spacing.

(vi) Correlation coefficient has been used to determine the relationship between average spacing and mean size of settlements at block level and it has further been tested to know its statistical significance. A regression line measuring relationship between average spacing and mean size of settlement has been determined. The correlation and multiple regression analyses have been employed for measuring relationship between the social facilities and their correlates.

(vii) To work out the relative importance of social facilities with one another and to compute the value of composite scores of settlements based on the median population threshold indices

of social facilities of settlements, a modified Reed-Muench method[24] has been applied.

(viii) Scalogram technique has been used to identify the functional hierarchic orders of settlements and the delineation of hinterlands has been done by applying the 'composite score gravity' model.

The statistical information has been depicted on maps and diagrams through suitable cartographic methods.

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CHAPTER 2

THE STUDY AREA

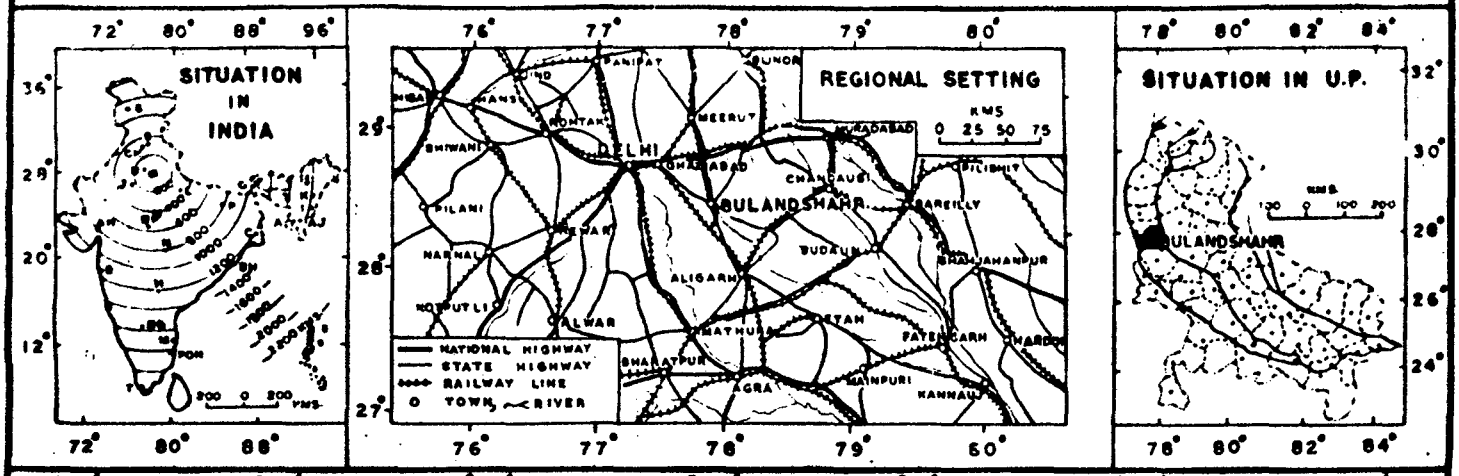
2.1 CHOICE OF THE AREA AND ADMINISTRATIVE ORGANISATION

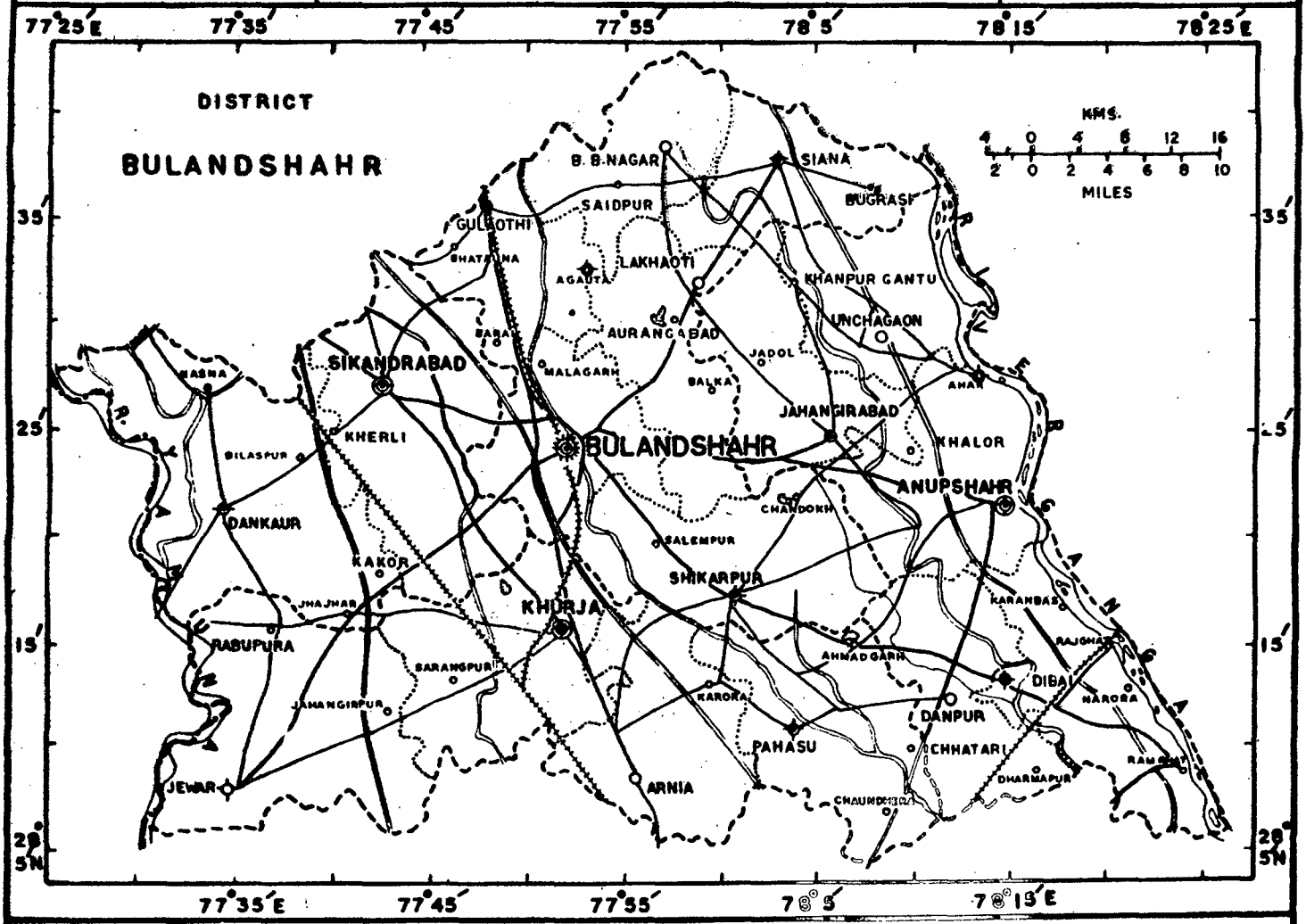
Bulandshahr district, the area of the present study, is one of the most developed districts of U.P. as far as agriculture is concerned. The district has been selected with a view to examine the spatial organisation of social facilities and amenities and to assess their adequacy in promoting a higher level of development.

Bulandshahr lies in the central part of the upper Ganga-Yamuna doab. Situated in 28°4' - 28°45' N. Lat. and 77°25' - 78°27' E. long; the district extends over 4,385.22 square kilometres.[1] Its population, according to 1971 Census was 1,877,816 persons.[2]

The district is divided into four tahsils each consisting of 12 parganas. It has 17 community development blocks. It is bounded by district Ghaziabad on the north, by district Aligarh on the south; the river Yamuna separates it from the Union Territory of Delhi, and the Gurgaon district of Haryana on the west; and the river Ganga separates it from Moradabad and Budaun districts on the east. Among the four tahsils of the district Bulandshahr

LOCATION OF BULANDSHAHR DISTRICT





REFERENCE

STATE BOUNDARY	DISTRICT BOUNDARY	TAHSIL BOUNDARY	BLOCK BOUNDARY
DISTRICT HEAD QRS.	TAHSIL HEAD QRS.	PARGANA HEAD QRS.	BLOCK HEAD QUARTERS
TOWN	LARGE SIZE VILLAGE	ROAD METALLED	ROAD UNMETALLED
RAILWAY LINE	RIVER	CANAL	POND

FIG. 1

is the largest, while Sikandarabad is the smallest. The remaining two tahsils of Khurja and Anupshahr are more or less of equal size. The average density of population of the district is 440 persons per sq. kilometre. The proportion of scheduled caste population to the total population is 20.66 per cent while the average literacy rate is 22.0 per cent.[3]

There are 1,489 settlements, including 94 uninhibited ones. Out of the total 1,385 inhabited settlements 1,373 are rural. The district has 12 urban centres, viz., Bulandshahr, Khurja, Sikanderabad, Jehangirabad, Shikarpur, Siyana, Dibai, Gulaotti, Anupshahr, Dankaur, Bugrasi and Pahasu. Other major towns in the neighbourhood of Bulandshahr include Delhi (70 kms.), Meerut (69 kms.), Aligarh (69 kms.), and Ghaziabad (56 kms.). They are well connected with the district towns by road and/or rail routes. The inclusion of Bulandshahr district within the proposed National Capital Region (NCR) of Delhi is likely to have a major impact on the future pattern of development.

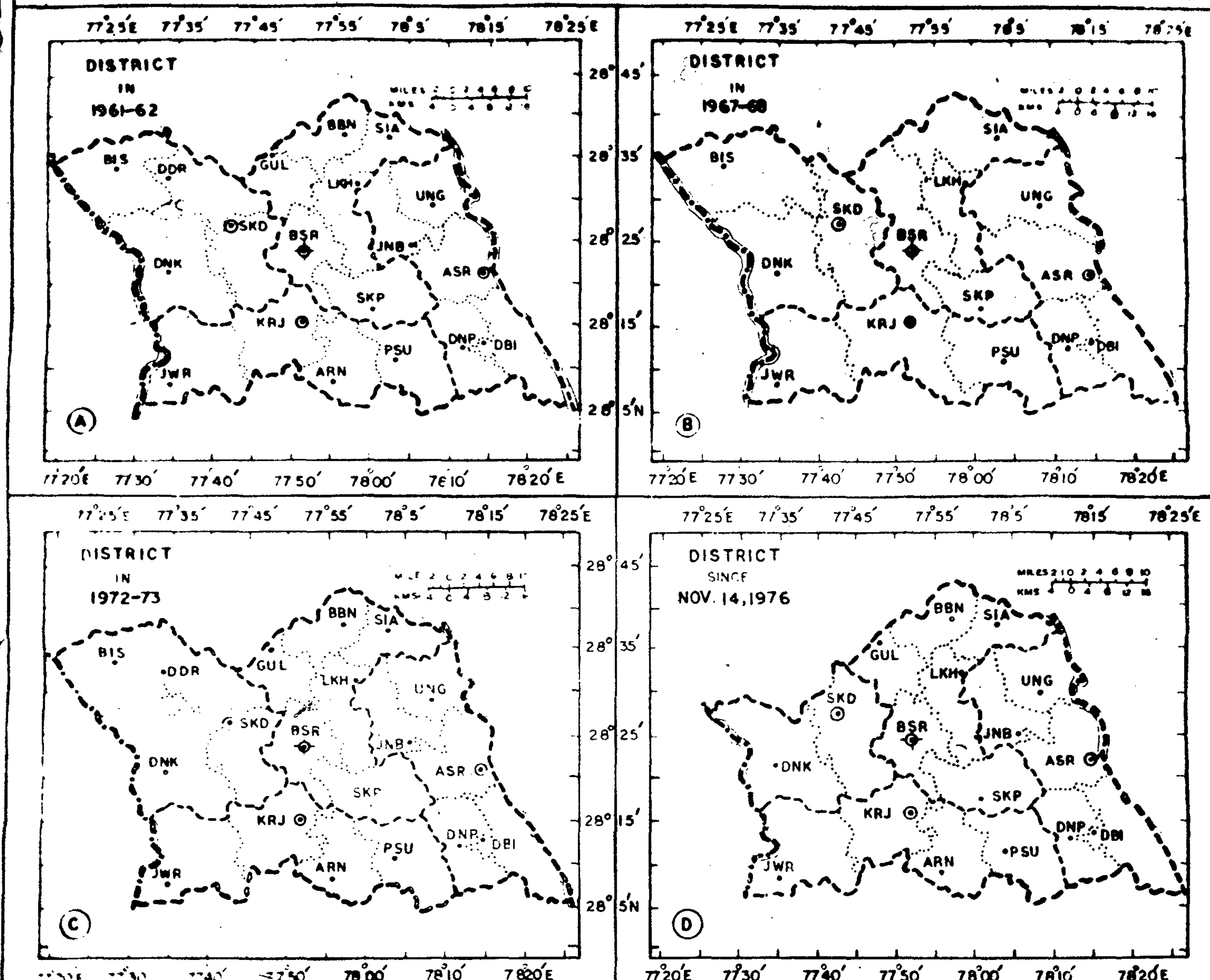
2.1.1 Administrative Changes

The district of Bulandshahr has undergone administrative reorganisation as a result of the creation of the new district of Ghaziabad on 14th November, 1976. But the data pertaining to population, socio-economic facilities, area and land use statistics and other informations of

DISTRICT BULANDSHAHR (U. P.)

ADMINISTRATIVE AREA ADJUSTMENTS

(1961 — 1976)



REFERENCES

BLOCK BOUNDARY — TAHSIL BOUNDARY — BLOCK HEAD QRS. — TAHSIL HEAD QRS.

DISTRICT BOUNDARY — STATE BOUNDARY — DISTRICT HEAD QRS. — RIVER

ABBREVIATIONS

BIS = BISRAKH DDR = DADRI DNK = DANKAUR SKD = SIKANDRABAD GUL = GULAOTHI

BSR = BULANDSHAHR BBN = B. B. NAGAR SIA = SIYANA LKH = LAKHAOTI SKP = SHIKARPUR

JWR = JEWAR KRJ = KHURJA ARN = ARNIA PSU = PAHASU UNG = UNCHAGAON

JNB = JAHANGIRABAD ASR = ANUPSHAHR DNP = DANPUR DBI = DIBAI

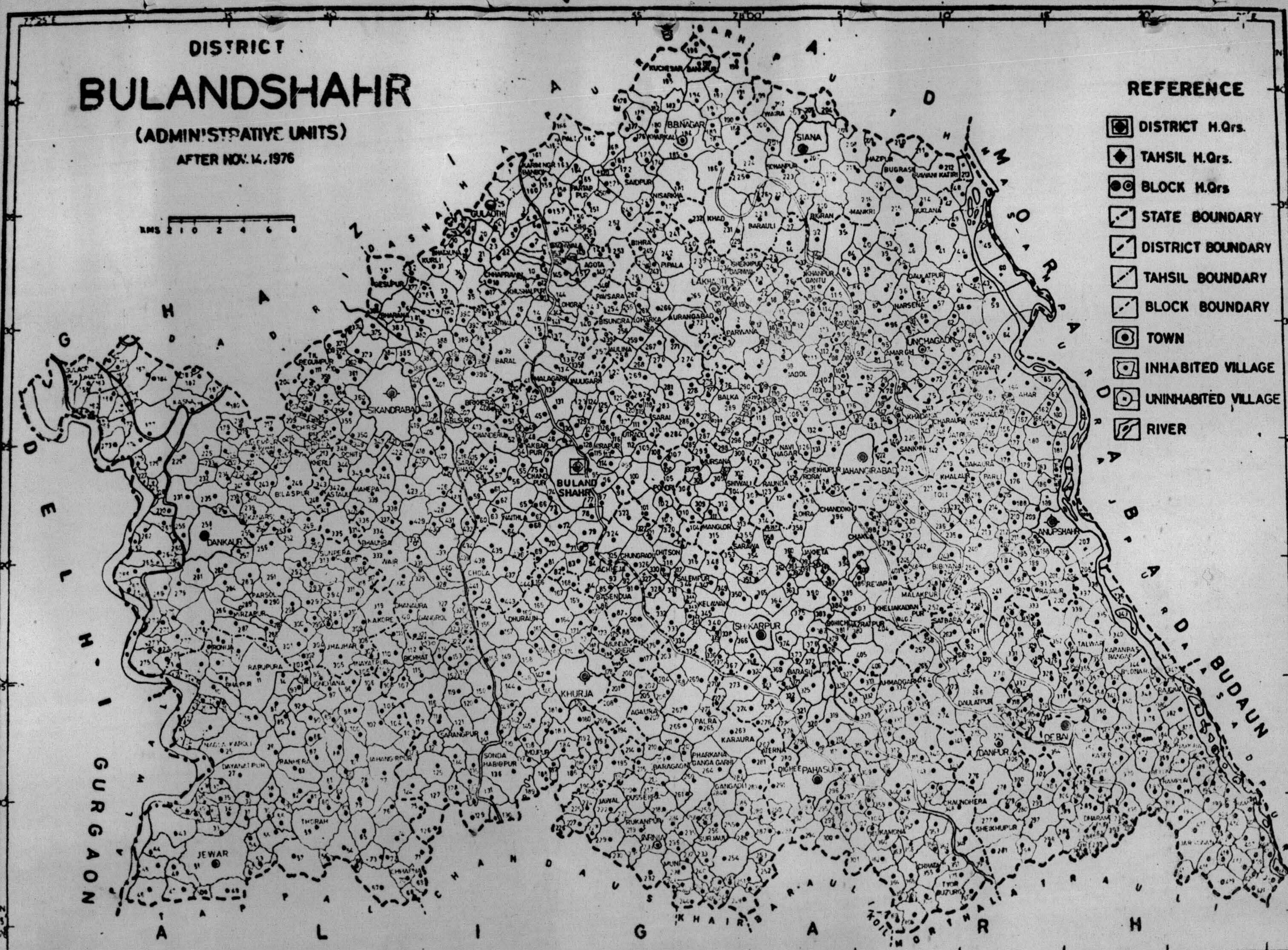
sectoral work force at village level are available in census records of 1971.[4] However, the 1971 village level data have been compiled and adjusted for the newly created district after reorganisation.

The district also witnessed adjustments in the development blocks in the wake of 1976 reorganisation. There were 19 community development blocks (Fig. 2 A) in 1961. Out of these, in 1967-68 five blocks viz., Dadri, Gulaothi, Bhawan Bahadur Nagar, Arniya and Jahangirabad (Fig. 2B) were done away with and merged with the other contiguous blocks. This arrangement continued till 1972-73. Consequently, the 1971 census identified the erstwhile 14 blocks as reorganised in 1967-68. In 1972-73, the number of blocks was again increased to nineteen and the original blocks existing in 1961 were revived with some adjustment to the boundaries (Fig. 2C). The whole Dadri pargana of tahsil Sikandrabad comprising of two blocks Bisrakh and Dadri was transferred to the newly formed district of Ghaziabad on 14th November, 1976.

2.2 PHYSICAL SETTING

2.2.1 Structure and Relief

The general surface of the district presents an almost uniform appearance with a gradual slope from north-west to south-east. The area is formed of recent alluvium of the



DISTRICT
BULANDSHAHR
(ADMINISTRATIVE UNITS)
AFTER NOV. 14, 1976
REFERENCE
DISTRICT H.Qrs.
TAHSIL H.Qrs.
BLOCK H.Qrs
STATE BOUNDARY
DISTRICT BOUNDARY
TAHSIL BOUNDARY
BLOCK BOUNDARY
TOWN
INHABITED VILLAGE
UNINHABITED VILLAGE
RIVER
KMS 2 1 0 2 4 6 8
GHAZIABAD
DELHI
GURGAON
ALIGARH
BUDAUN
MORADABAD
BULAND SHAHR
SIKANDRABAD
DANKAUR
JEWAR
KHURJA
SHIKARPUR
PAHASU
DEBAI
ANUPSHAHR
JAHANGIRABAD
SIANA
UNCHAGAON
LAKHAOTI
GULAOTHI
B.B.NAGAR
DANPUR

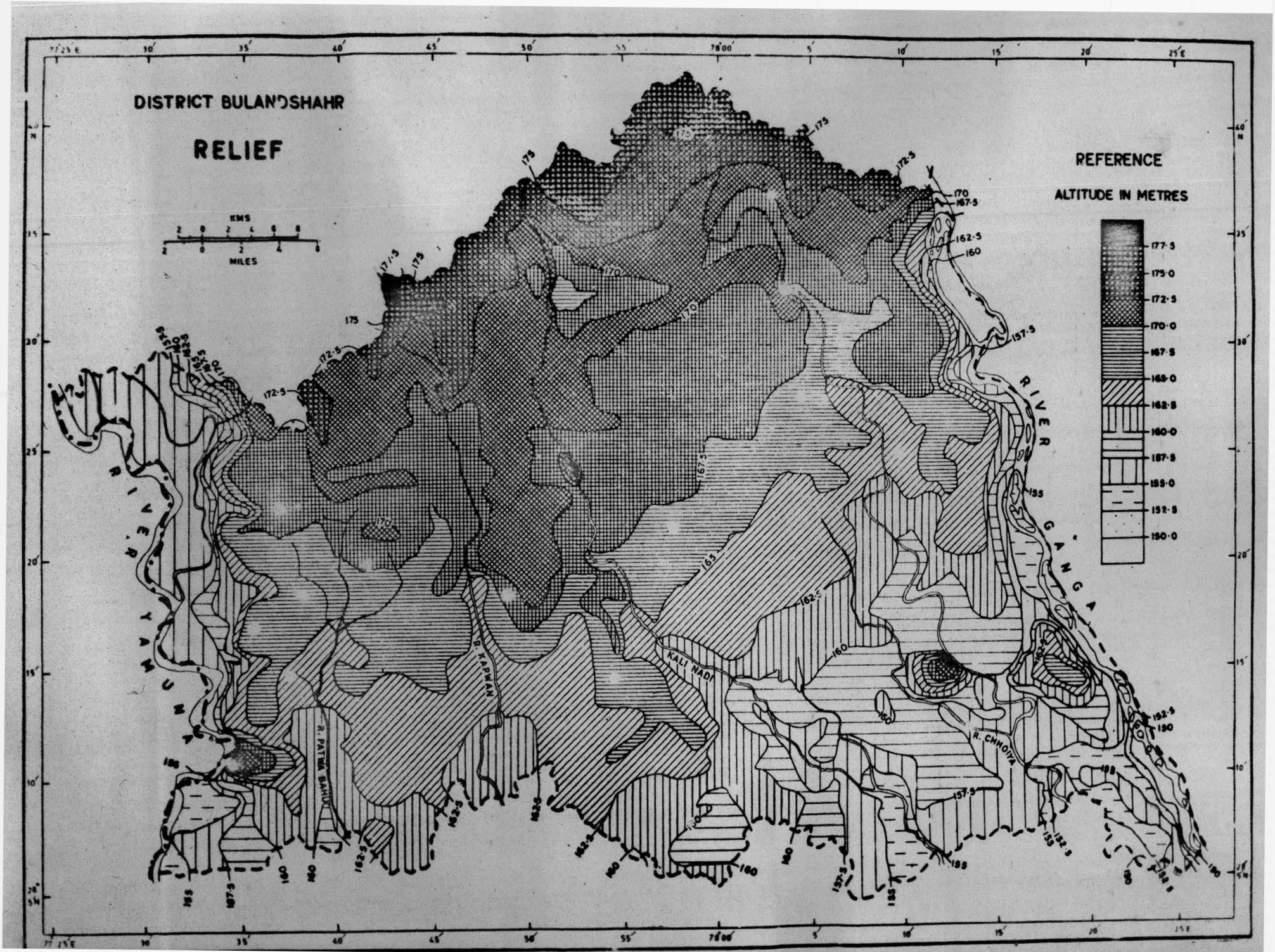
FIGURE 3

Indo-Gangetic plain. The old alluvium is generally formed of unconsolidated fluviatile deposits consisting of silt, clay and kankar.

The average slope of the area is about 45.5 centimetres per kilometre (28 inches in the mile) and the elevation above the mean sea level varies from 177.9 metres at Gesupur village of the Sikandrabad block in the north-west to 148.6 metres at Ramghat along the Ganga river in the Dibai block on the south-east. The town of Bulandshahr which lies close to the centre of the district is 184.73 metres above the mean sea level.[5] On an average the area on the relief map (Fig. 4) of the district, except the khadar belt of the Yamuna and the Ganga respectively, is traversed by the contours lying in east-west direction. The block of the Bhawan Bahadur Nagar and the northern parts of the blocks of Sikandrabad, Gulaothi and Siyana have highest level of altitude in the district. The lowest altitudinal level with an exception of two hillocky spots of Indore and Karanbas villages in Dibai blocks, is found in the blocks of Pahasu, Danpur and Dibai. There are two major depressions, one around the Agauta village and the other to the north of Baroli Basdeopur village in the blocks of Gulaothi and Siyana respectively.

2.2.2 Drainage

The main rivers of the [illegible]anga, Yamuna,


DISTRICT BULANDSHAHR
RELIEF
REFERENCE
ALTITUDE IN METRES
177·5
175·0
172·5
170·0
167·5
165·0
162·5
160·0
157·5
155·0
152·5
150·0
KMS
MILES
RIVER YAMUNA
RIVER GANGA
R. KAPWAN
R. PATWA BAHUDA
KALI NADI
R. CHHOIYA

Kali and the Chhoiya also known as Nim. The other drainage lines are the Hindan, Bhuriya, Patwaha Bahu and the Karwan. The Ganga and Yamuna as well as the other rivers, such as Hindan and Bhuriya have anastamosing channels (Fig. 5A).

The Yamuna river forms the western boundary of the district while the Ganga forms its eastern boundary. Both the Ganga and the Yamuna pass through their khadar tracts witnessing a high degree of sand deposition. This leads to frequent shifting of their channels.

Among the minor streams, the Kali flows in a clearly defined valley with an average width of about 0.8 km. Formerly, the river was merely a natural drain but as a result of the recommendations of the studies conducted by Currie (1965)[6] and Daniell et. al., on the drainage problems of the district, its channel has been improved.

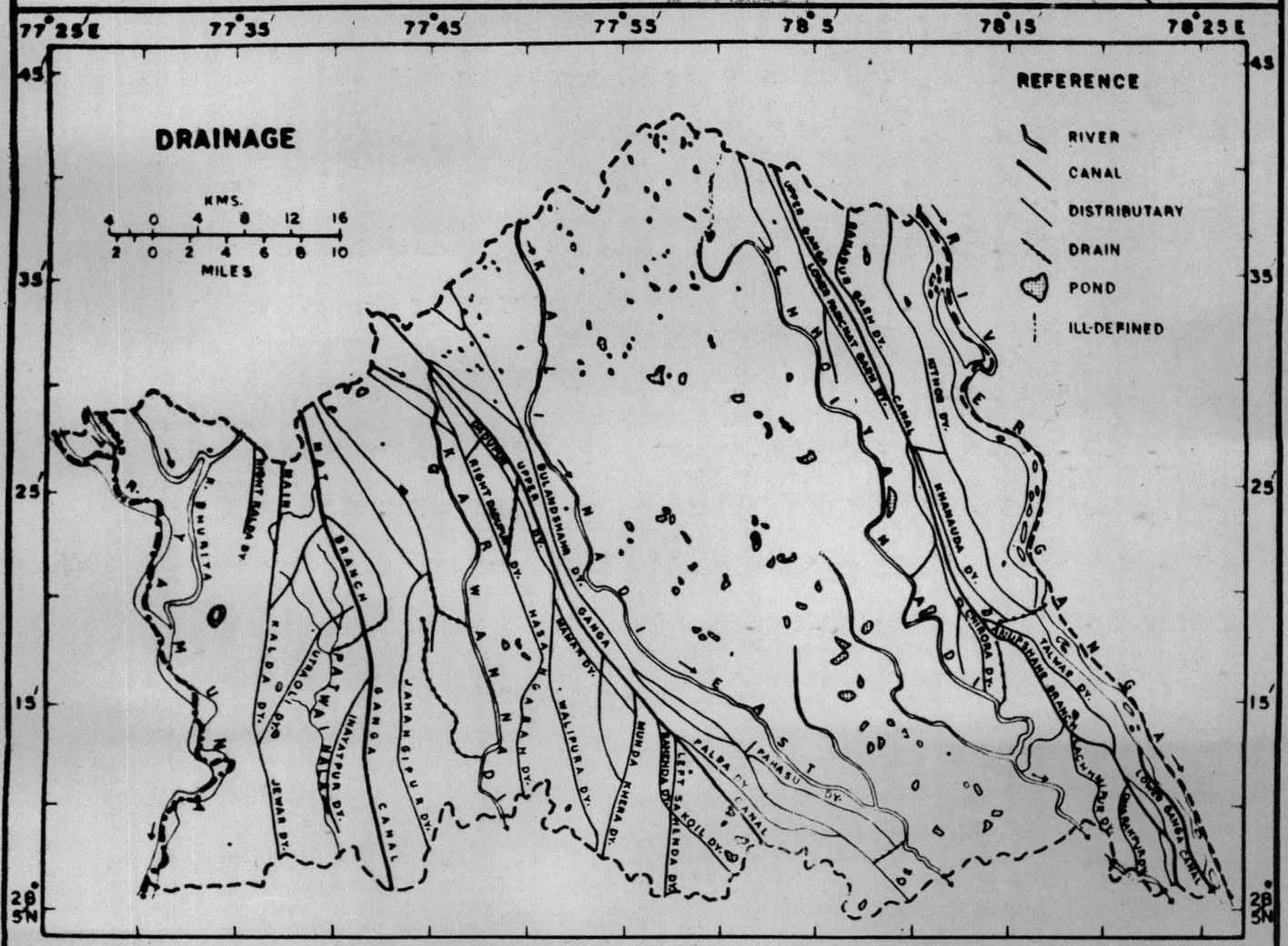
There are numerous lakes and depressions in the district. The most extensive are those at Aurangabad Chandokh and Mustafabad in pargana Shikarpur; near Aurangabad Sayyad in pargana of Baran; at Ahmadgarh in Pahasu and Kuchesar in the Siyana pargana. These depressions are usually under water in the rains, but dry up afterwards. The soil of these depressions is firm clay, and is often culturable.

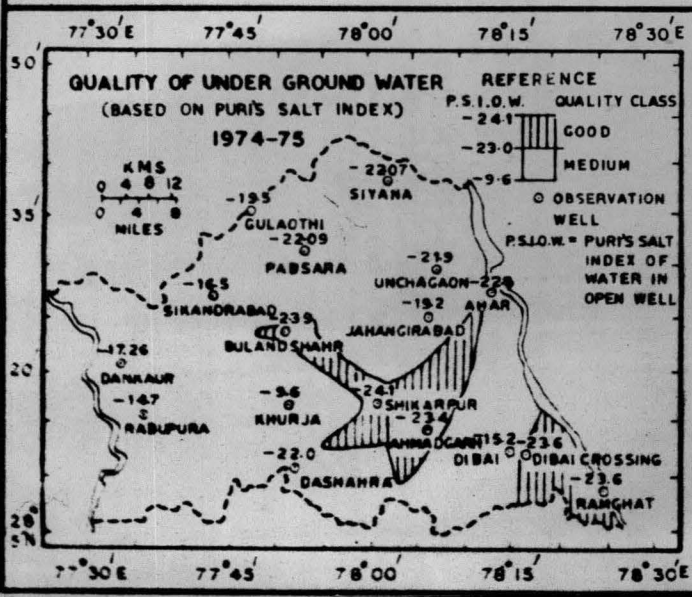
2.2.3 Climatic Characteristics

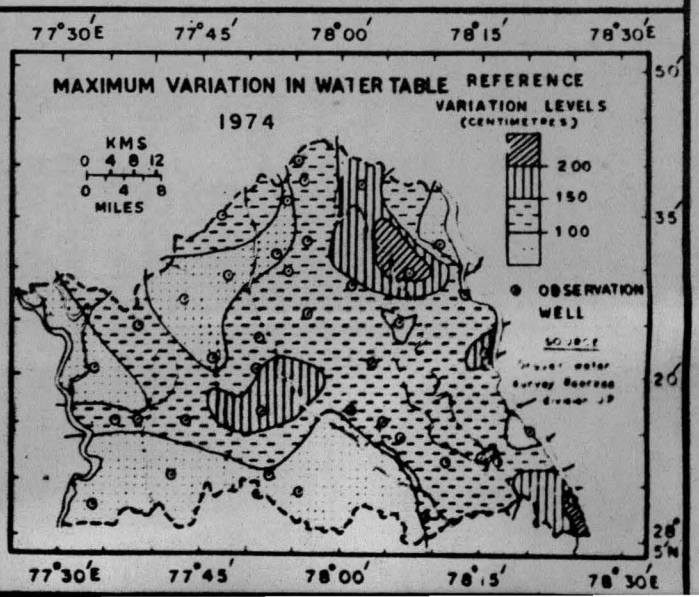
The climate of the Bulandshahr district varies greatly

DISTRICT BULANDSHAHR

WATER FEATURES—SURFACE & SUBTERRANEAN







through the year. It experiences moderate type of sub-tropical monsoon climate. The hot winds prevail in the later part of the spring and the beginning of summer and at that time the climate is dry and very hot, but when the rains set in, it is moist.

Winters are fairly cold and summers are quite hot with frequent heat spells characterised by strong surface winds known locally as loo. In summers the temperature shoots up to 44°.5 C, while in winter it may fall down to 3° C. The highest temperature is recorded during the months of May and June and consequently, the crops of the area require more and more water for irrigation. The average temperature in the winter season is about 20°.6 C. The coldest months of the year - January and February - experience frequent frost. The normal annual rainfall of the district is 673.7 millimetres. During 1971-75 Sikandrabad tahsil received the highest amount of rainfall of 1,381.54 mm. among the four tahsils of the district. Khurja received the lowest amount of rainfall, ie, 775.76 mm. August is the wettest month of the year and receives 373.85 mm., while April with 0.52 mm is the driest month.

2.2.4 Ground Water Resources

The district is rich in groundwater resources fit for irrigation purposes. According to the hydrologists'

classification to determine the suitability of water for irrigation, it ranges between the good to medium categories.[7] The total annual normal recharge of groundwater (1974-75) is 1,529.41 x 10^6 m^3 out of which about 45 per cent (662.80 x 10^6 x^3) and 37 per cent (550.77 x 10^6 m^3) is the amount of recharge of water by rain and by seepage from canals respectively. The remaining 18 per cent is due to the recharge of groundwater by the water used in the fields for irrigation and other processes.[8] According to the government statistics the total draft of groundwater in the year 1974-75 for the whole district was 905.20 x 10^6 m^3 which shows that the remaining 47.3 per cent amount of the total available groundwater which lies unused so far may profitably be utilised for irrigation purposes.

The average variation of water-table during monsoon was observed to be 1.46 metres in the period 1972-75. The maximum variation during 1974-75 (Fig. 5C) is identified nowhere more than 2.5 metres. The areas of highest variation in water-table, i.e., between 2.0 and 2.5 metres in the year 1974-75, are the Unchgaon-Narsena patch in the pargana Ahar and a very small patch lying south-east to Ramghat in Dibai. The areas characterised by the maximum variation in the water table of the lowest order, i.e., less than 1.0 metre include the almost southern half of the Khurja tahsil, the western parts of the Dankaur pargana, the low lying areal belt extending from Chola village to

Saidpur via Sikandrabad, Baral and Pahsara settlements and the Daulatpur and Rajghat areas in Anupshahr tahsil. The regions are either low lying lands or the very near neighbourhoods of the two major rivers the Yamuna and the Ganga. The rest area of the district except the areas of the two categories as mentioned above is characterised by the maximum variation in the water table ranging between 1.0 and 2.0 metres. Thus, it is very obvious that the district, which has its 71.9 per cent cultivated area as irrigated[9], has enough potential of groundwater to reduce the percentage of its unirrigated area to nil very conveniently.

2.2.5 Geomorphic Units

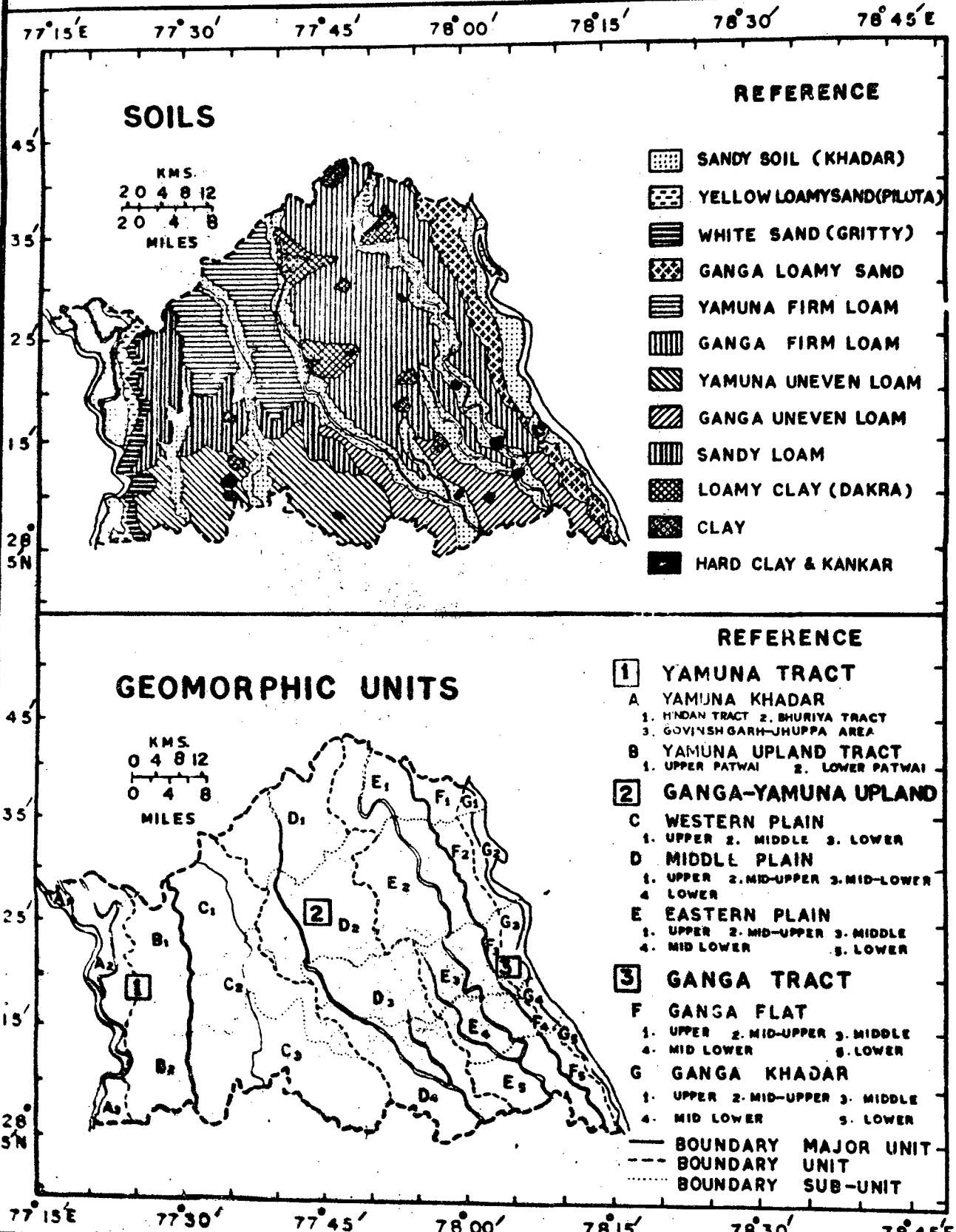
The district of Bulandshahr lies on a flat plain as it is a part of the Ganga-Yamuna plain. However, keeping in view the micro land features one can identify three major geomorphic units and 27 sub-units (Fig. 6B). The major units are : (i) The Yamuna Tract, (ii) The Central Plain and (iii) The Ganga Tract. The Yamuna and the Ganga tracts are limited to their khadar and flat (near khadar) areas while the remaining whole interfluve of the Ganga and the Yamuna has been considered here as the Central plain.

2.2.5.1 The Yamuna Tract

(i) The Yamuna Khadar consists of : (i) the Yamuna

BULANDSHAHR

SOILS AND GEOMORPHIC UNITS



khadar tract and (ii) the Yamuna upland tract. The Yamuna khadar varies in width from 10 kilometres near village Tugalpur of Dankaur pargana to about 2 kilometres near Taqipur village in the pargana of Jewar. The upper Yamuna khadar is drained by the Hindan and the Bhuriya rivers which flow from Gulaoli village of pargana Dankaur to the village Faleda of Jewar. Further inland between the Bhuriya and the ridge there has developed a badland topography. In the upper khadar tract there are a few depressions containing deposits of alluvial clay of considerable fertility. But the lower khadar spreads over an area west of Jewar and south of village Ballabhnagar and in soil texture and fertility status generally resembles the upper khadar.

(ii) The Yamuna Upland : The western boundary of the Yamuna upland region is formed by a high ridge of hard clay and kankar beds running from north to south. The upper part of the Yamuna upland constitutes a part of the well-marked sandy ridge of the area while the lower part is the level land with uneven loamy soil. The upland tract of the Yamuna, is also the catchment area of the Patwaha Bahu drainage line lying in between the highland ridge and the Mat branch canal.

2.2.5.2 The Central Plain

The second major geomorphic unit of the district is

which drain this tract and their basins from three distinctive geomorphic sub-tracts. These sub-tracts are : (i) the western upland plain or the Karwan plain, (ii) the middle upland plain or the Kali plain and (iii) the eastern upland plain or the Chhoiya plain respectively.

(i) The Karwan Plain : The Karwan plain lies between the upper Ganga canal and the Mat branch. The central part of this plain is covered by the sandy ridge and the lower part is the level plain of the uneven loam covering the major parts of the Khurja and the Jewar parganas.

(ii) The Kali Plain : This plain lies in the catchment area of the river Kali. The upper part of this plain covers the areas of Gulaothi and some parts of the Bhawan Bahadur Nagar blocks. The mid-upper part of the plain spreads over the remaining Lakhaoti block and the upper two-third part of the Bulandhshahr block. The mid-lower plain is the Shikarpur area and the lower region spreads over the Pahasu area.

(iii) The Chhoiya Plain : The Chhoiya catchment area lies in between the Kali Nadi plain and the Anupshahr canal. The upper most part of this plain covers the eastern half of the Bhawan Bahadur Nagar block and the western half of

the Siyana block. The mid-upper part covers the Jahangirabad block and the western half of the Unchangaon block. The middle part of the plain is drained by the Nim Nadi and the Chhoiya. The mid-lower plain is characterised by a upland ridge in village Indore. The lower part of the plain extends over the Dibai and the Danpur blocks. This is by far the lowest area in altitude among all the sub-regions of the central upland plain.

2.2.5.3 The Ganga Tract

This tract stretches along the Ganga river and varies in its width from 6 km. in the north to 2 km. in the south. The generally low-lying area along the river banks is known as khadar in common parlance. Its bulk character is occassionally interrupted by some river cliffs. The Ganga at the district border is marked by the river cliffs all along its right bank and on the other by having a slip-off slopes. The khadar is further divided into five elongated patches on the basis of levels of the relief. Another sub-tract is the Ganga flat land which can also be divided into five different level patches with a width of about 4 kilometres.

2.2.6 Soils

On the basis of relief, drainage and other records, fourteen soil-types can be identified (Fig. 6A). They can be grouped under 3 major and 6 minor categories. Broadly

speaking the following 3 major soil-groups can be noted : (i) Sandy soils, (ii) Loamy soils, and (iii) Clayey soils.

2.2.6.1 Sandy Soils

This major group of soils is confined to riverine (khadar) tracts. On the basis of their texture and composition the sandy soil can further be classified into the following three sub-types :

(a) soils of the Yamuna khadar tract;
(b) soils of the Ganga khadar tract; and
(c) soils of the khadar tracts of the other streams

The soils of the Yamuna khadar tract, as the names suggest are confined to the Yamuna khadar along with the khadar tracts of the Hindan and the Bhuriya. The soil is locally known as 'buk' soil in the Hindan khadar and is characterised by a fine texture which distinguishes it from the other sandy soils.

The sandy soils of the Ganga khadar tract are found all along the bank of the river up to a maximum width of four kilometres.

The sandy soils of the khadar tracts of other streams, viz., the Karwan, Kali and the Chhoiya in the inter fluvial zone is characterised by finer grains.

The sandy soils are specially suited to coarse millets and a variety of vegetables and melons.

Yet another variety of sandy soils is the loamy sand found in two tracts each bordering on the Yamuna and the Ganga khadar or either extremity.

2.2.6.2 The Loamy Soils

The loamy soil is the characteristic soil of the district. A number of sub-types can be identified : (i) firm loam, (ii) uneven loam and (iii) sandy loam. The firm loam known locally as 'scota' is most commonly found, particularly in the Ganga and Yamuna upland tracts. The areas of the upper, mid-upper and the mid-lower geographic units between the Kali and the Chhoiya rivers are included under the Ganga firm loam. The uneven loamy soils cover southern zone of the district. The Kali Nadi divides it into the eastern and western sub-types.

A third type of the loamy soil is the sandy loam. It is by and large conterminous with the sandy ridge locally known as bhur.

2.2.6.3 Clayey Soils

The clayey soils are generally found in the water-logged areas and the depressions. The clayey soils of the district lend themselves to the following sub-divisions:

(i) pure clayey soil, (ii) loamy clay and (iii) hard clay impregnated with kankar. The pure clay is found where the perennial lakes or water bodies exist. The soil of the other depressions and ponds, which are ephemeral and dry up in the summer season, is loamy clay (the dakra soil).

2.2.7 Flora and Fauna

The district is not rich in flora and fauna. The district has a very scanty cover of the forest. At one time considerable tracts were covered with thick jungle of dhak trees (Butea frondosa), all over the district. The most important of these were in the western portion of pargana Siyana and in the adjacent villages of Agauta, extending thence into Ahar and Baran, and through the western part of Anupshahr into Shikarpur. The other areas which still have stands of dhak are in the neighbourhood of Dayanatpur in pargana Jewar and Hazratpur in pargana Shikarpur. Among the common trees are the babul (Acacia arabica) and kiker (prosopis juli flora) trees are the Shisham (A. sissoo), Nim (Azadirahta indica), Pipal and Sirs. In the khadar of Hindan and Bhuriya rivers, which consists of a few depressions of the alluvial clay deposits is an inferior stretch of land, there are large area of Kair. The date-palm is a common tree along the banks of the streams.

Since the district is poorly wooded, it does not have much wild life. The only exceptions are the low-lying areas in the neighbourhood of the rivers which offer refuge to a variety of wild animals. The wild animals generally found in the district include wolves, hyenas, blue bulls, wild pigs, jackals, foxes, deers and rabbits. The common birds are peacocks, ducks, partideges and snipe. Among the reptiles a variety of snakes is commonly found.[10]

2.3 SOCIO-ECONOMIC SETTING

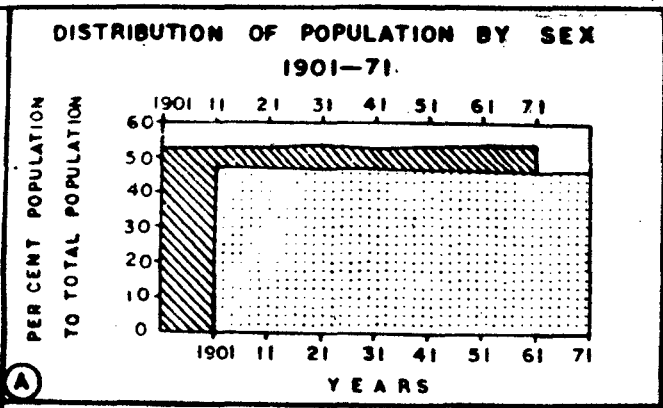
2.3.1 Population

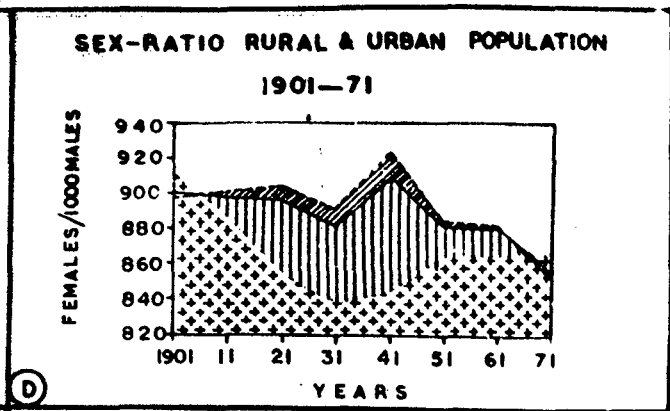
The district, after its reorganisation in 1976, occupies fortieth place in terms of area and fifteenth in terms of population amongst the districts of the State. The total population of the district according to the 1971 census is 1,877,816 persons.[11] The share of rural population is as high as 86 per cent (1,614,469) which is distributed over 1,373 villages. There are 12 towns with a total population of 263,347 persons. The urban population accounts for about 14 per cent of the total population of the district.

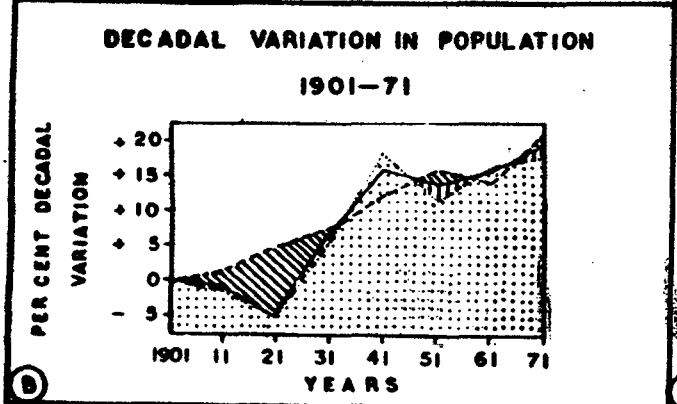
The proportion of males in the total population (Appendix III, Fig. 7A) has varied from 52.64 per cent in 1901 to 53.94 per cent in 1971. The percentage decadal variation (Appendix III, Fig. 7B) in population shows wide fluctuations. The female population has registered

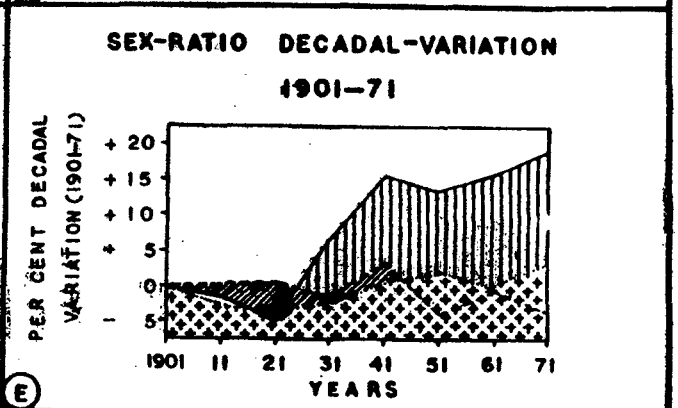
DISTRICT BULANDSHAHR

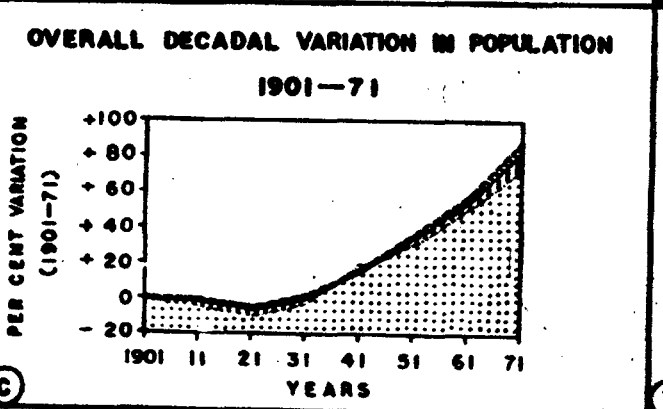
SOME MAJOR CHARACTERISTICS OF POPULATION 1901-71

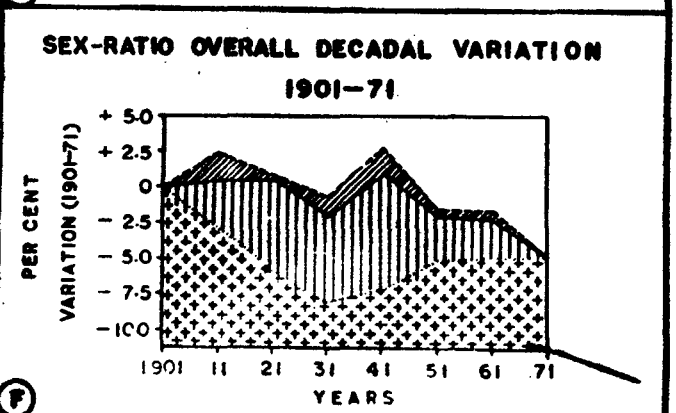


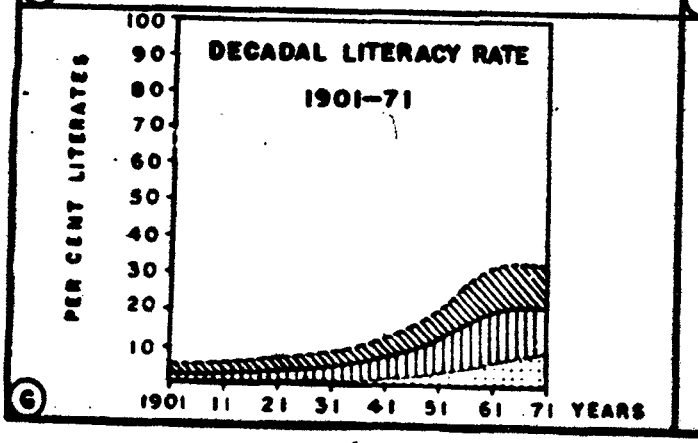












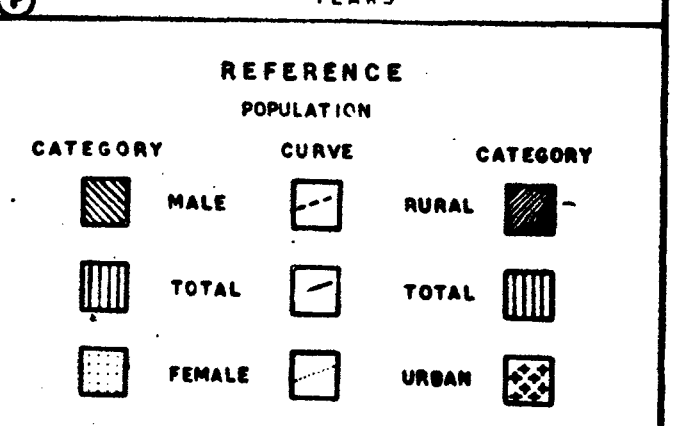


FIG. 7

the highest negative growth of -5.12 per cent in the year 1921 and highest positive growth of 17.73 per cent. Excepting 1941 and 1961, the growth of rural population has been higher than the growth of the total population during the 70-year period since 1901.

It becomes clear from an overall assessment of the growth of population during 1901-71, that the growth (Appendix III, Fig. 7C) has been higher in the rural population but lower in the urban population as compared to the growth of the total population in the district.

2.3.1.1 Density of Population

The average density of population of the district is 440 persons per square kilometre, which is higher than the state average of 300 persons. The most densely populated tahsil of the district is Bulandshahr having a density of 524 persons per square kilometre. It is followed by the tahsil Anupshahr with a density of 438 persons and Khurja with a density of 380 persons. Table 2.01 brings out the pattern more clearly.

Among the 17 community development blocks of the district the highest density of population (452 persons per sq. km.) has been recorded in Bulandshahr block and the lowest (214 persons per sq. km.) in Dankaur block. Bulandshahr block is followed by Gulaothi block with 421

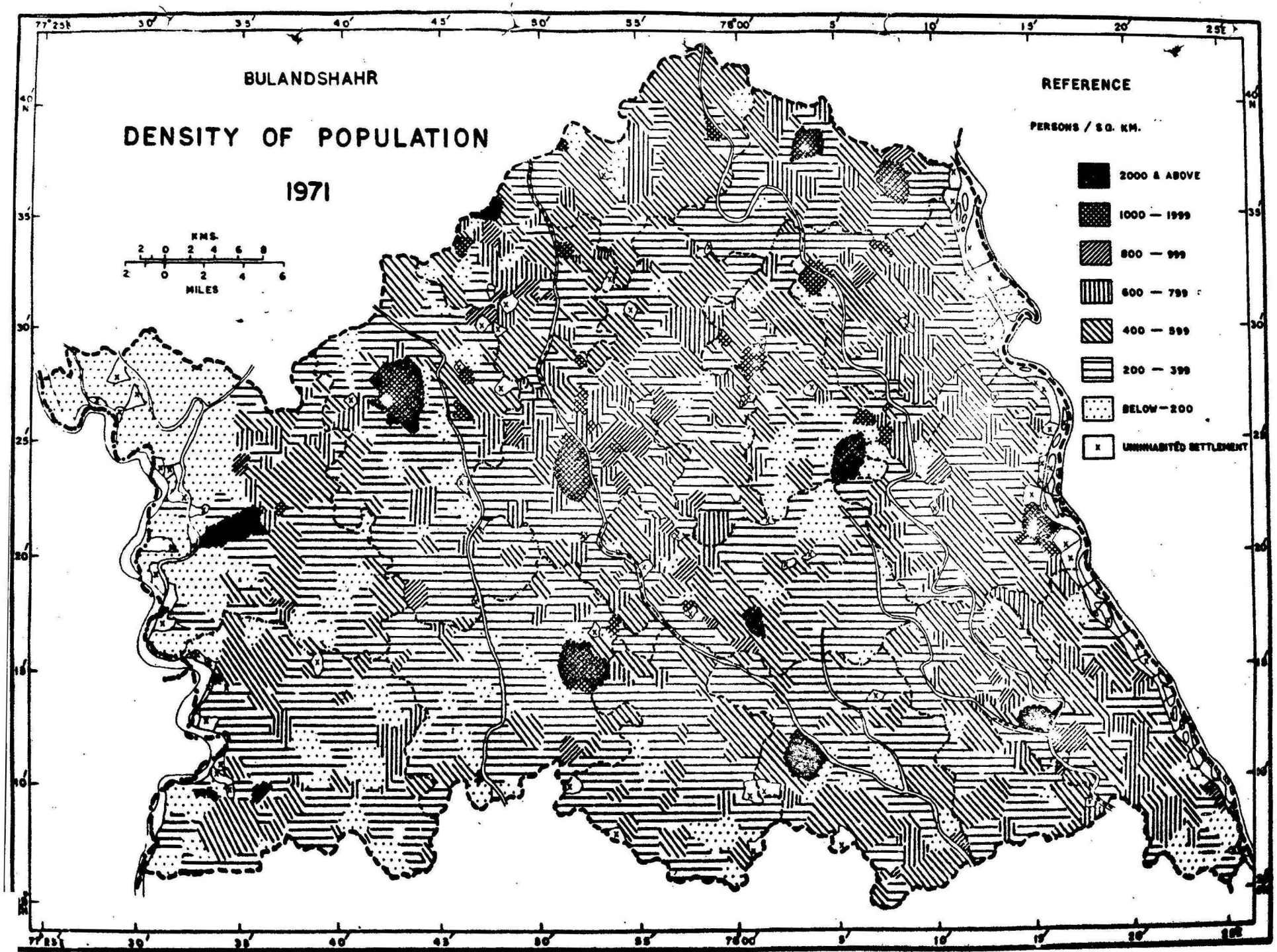

BULANDSHAHR
DENSITY OF POPULATION
1971
KMS.
2 0 2 4 6 8
2 0 2 4 6
MILES
REFERENCE
PERSONS / SQ. KM.
2000 & ABOVE
1000 — 1999
800 — 999
600 — 799
400 — 599
200 — 399
BELOW — 200
UNINHABITED SETTLEMENT

FIG. II

persons per square kilometre.

TABLE 2.01 Tahsilwise Villages Having the Highest and Lowest Density of Population in Bulandshahr District in 1971

Tahsil	Lowest Density of Population		Highest Density of Population	
	Village	Persons Per sq.km.	Village	Persons Per sq. km.
Sikandrabad	Chak Garhi Begampur	3	Junedpur	1255
Bulandshahr	Alipur	11	Ahmadnagar	3050
Khurja	Jafarnagar Gadaipur	20	Siroli Khadar	2438
Anupshahr	Kubri	2	Jai Rampur Khadar	1824
District Bulandshahr	Kubri	2	Ahmadnagar	3050

Source : District Census Handbook of Bulandshahr (1971), Part X-B.

2.3.1.2 Age Composition

The population of the district is broad based as the percentage of persons in young and very young age-group is about 41.0 as against 9.6 per cent of elderly persons (55 years and above). Persons in the age-group 15-34 account for 30.5 per cent of the total population. The respective figures for the age-groups, 5-14, 35-54, 0-4 and 55 and

over being 25.9, 19.9, 15.1 and 9.6 per cent.

2.3.1.3 Sex Ratio

There are 855 females per 1000 males. The sex ratio is, however, lower than the state average (879 females per 1,000 males). The sex ratio in the district has varied between 838 in 1931 and 922 in 1941 from 1901 to 1971 (Appendix III, Fig. 7D). In the rural and the urban areas of the district it is 841 and 865 females per 1,000 males respectively. During 1901-71, the percentage decadal variation in sex ratio (Appendix III, Fig. 7E) indicates fluctuating trend. Since 1901, the decadal variation in sex ratio of the total population decreased by 5 per cent during the decade 1921-31, but, afterwards it showed a continuous increase. The urban population showed a negative growth in sex ratio during 1901-41 and later on it is consistently positive.

From 1901 to 1971 the sex ratio in urban population has shown a declining trend and showed an upward trend after 1931 but it has failed to attain the level of 1901 (Appendix III, Fig. 7E).

2.3.1.4 Social Characteristics

The social structure of population of the area has been defined here by the magnitude and the extent of distri-

bution of population of scheduled caste and scheduled tribes who generally constitute the weaker sections of the society. 20.66 per cent of the total population of the district is comprised of Scheduled Castes. Out of the total Scheduled Caste population female population is higher (51.5 per cent) than the male population (48.5 per cent). The important scheduled castes in order of rank are the Chamars (72 per cent), Balmikis (11 per cent), Khatiks (6 per cent) and the Dhobis (4 per cent). They are mostly concentrated in the rural areas and only about 2.0 per cent live in towns.[12] The proportion of Scheduled Tribes, which accounts for only about 0.06 per cent, is negligible.

2.3.1.5 Literacy

The district has literacy rate of 22.0 per cent as against the state average of 21.8 per cent. The literacy rates for the male and female components are 32.6 and 9.3 per cent respectively. It is evident that number of literates has increased by about seven fold (Appendix III, Fig. 7G) during the period 1971-1901. In each decade it has increased with gentle gradient but after 1951 it has shown an abrupt increase. During the past seventy years only during 1921 female literacy rate has shown a marginal decline. The higher literacy rate in the urban population as compared to rural is explained by the greater consciousness and educational opportunities available there.

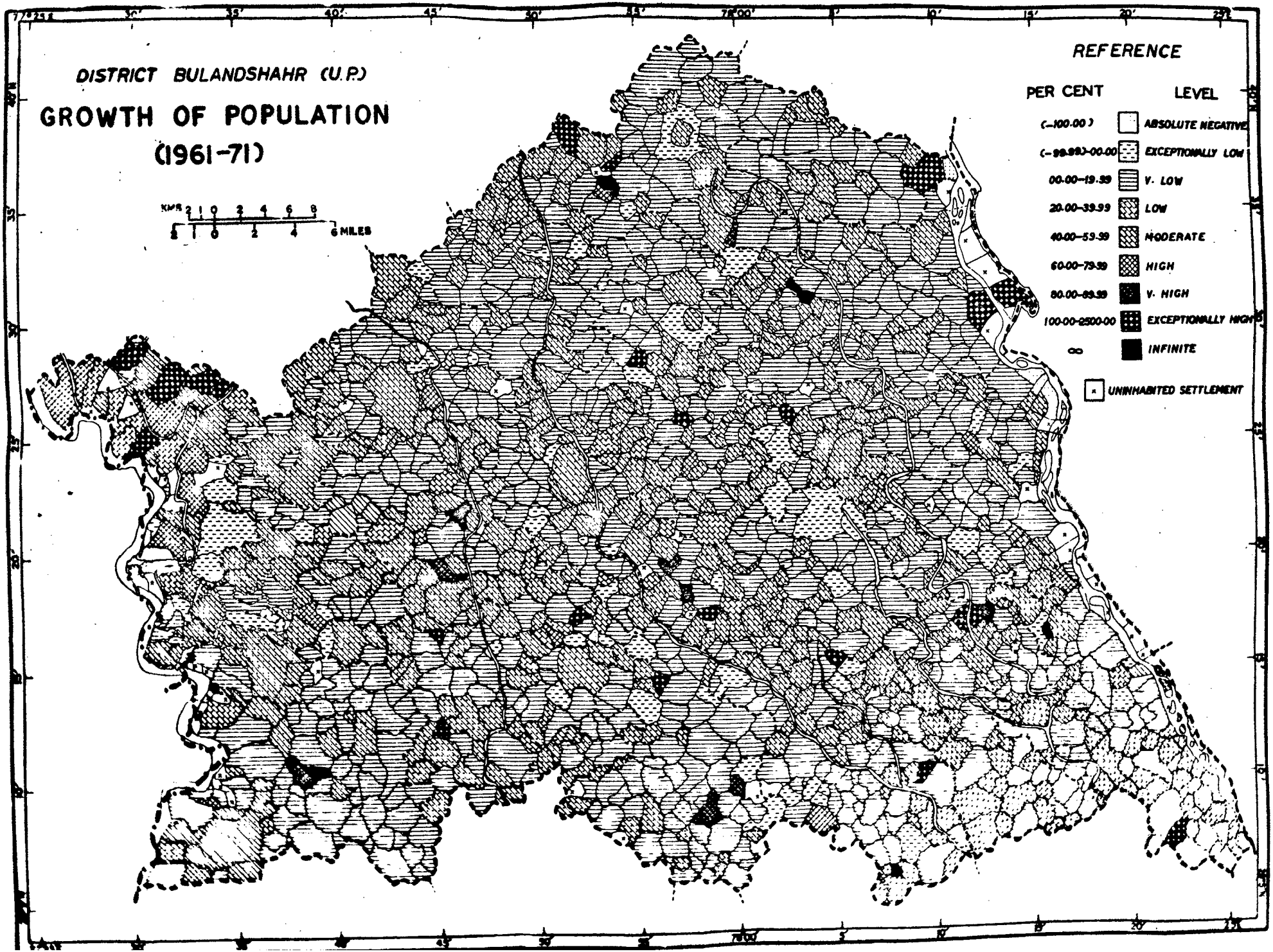
2.3.1.6 Population Growth

The growth of population during 1961-71, has been 19.34 per cent which is slightly lower than the state average of 19.79 per cent. The variation in population since 1901 shows continuous increase after 1921. The increase was the highest during the decade 1961-71. The Table 2.02 clearly depicts the variation in the growth pattern.

TABLE 2.02 Variations in Population (1901-71)

Year	Population (Persons)	Decadal Variation (Persons)	Percentage Decada Variation
1901	1,137,039	-	-
1911	1,222,743	-14,296	-1.26
1921	1,066,149	-56,594	-5.04
1931	1,136,873	70,724	8.63
1941	1,317,223	180,350	15.88
1951	1,499,884	182,661	13.87
1961	1,737,397	237,513	15.84
1971	2,083,343	335,946	19.34
Average Decadal Growth (1901-71)		-	11.76
Overall Growth (1901-71)		-	82.35

Source : District Census Handbook of Bulandshahr, (1961), p. 7.


DISTRICT BULANDSHAHR (U.P.)
GROWTH OF POPULATION
(1961-71)
KMS 2 1 0 2 4 6 8
8 4 2 0 2 4 6 MILES
REFERENCE
PER CENT LEVEL
(-100.00) ABSOLUTE NEGATIVE
(-99.99)-00.00 EXCEPTIONALLY LOW
00.00-19.99 V. LOW
20.00-39.99 LOW
40.00-59.99 MODERATE
60.00-79.99 HIGH
80.00-99.99 V. HIGH
100.00-2500.00 EXCEPTIONALLY HIGH
∞ INFINITE
UNINHABITED SETTLEMENT

A tahsil-wise analysis of population growth reveals that the highest growth of population (24.0 per cent) has been registered in the tahsil of Sikandrabad. The percentage increase in other tahsils, such as, Bulandshahr, Anupshahr and Khurja being 19.8, 17.5 and 17.0 respectively. The Table 2.03 reveals the variations in population growth at tahsil level during the decade 1961-71.

TABLE 2.03 Tahsilwise Decadal Growth of Population During 1951-71

Tahsil/ District	Population (persons)			Population Growth(%)	
	1951	1961	1971	1951-61	1961-71
Sikandrabad	317,238	376,668	464,734	18.7	24.0
Bulandshahr	455,701	534,571	640,248	17.3	19.8
Khurja	340,199	385,738	451,304	13.4	17.0
Anupshahr	386,747	440,420	517,047	13.9	17.5
D.Bulandshar	1,499,884	1,737,397	2,073,343	15.8	19.3

Source : District Census Handbooks of Bulandshahr 1961 and 1971. (The data refer to the district prior to its reorganisation in 1976).

Among the community development blocks the highest and the lowest growth in population during 1961-71 was registered in Dankaur (25.9 per cent) and Arniya (13.18 per cent) respectively.

2.3.2 Economy

The economy of the district is agriculture-oriented

and it may be considered to be an industrially backward area. The main features of the economy of the district may broadly be envisaged as follows[13]; (i) Farming is the mainstay of the people, (ii) More than 75 per cent of the geographical area of the district is under cultivation and the increase in the gross cropped area is indicative of intensification of cultivation, (iii) The district has more or less uniform agro-climatic complex in terms of growing seasonal cropping pattern and endowed with the availability of fairly good irrigation facilities, (iv) The impact of 'green-revolution' is evident from the fact that area under high yielding varieties is steadily increasing with higher consumption of fertilisers, (v) A little provisions for the short term credit to meet the cost of agricultural inputs given by the commercial banks on the one hand and the arrangement to educate the farmers on the benefits of new varieties and detailed packages of practices etc. through extension programme have elevated the level of agricultural production, and (vi) The farmers' attitude towards the adoption of new technology has been favourable.

2.3.2.1 Structure of the Work-force

(A) Workers : Out of the total population of the district 26.7 per cent are economically active people. The non-workers account for about 63.1 per cent of the total popu-

lation. The participation rate is lower than the state average of 34.4 per cent workers to the total population. In the district the highest percentage of work force is found to be in Unchagaon block while the lowest is found in Jewar block.

(i) Workers in Primary Sector : The work force engaged in primary sector to the total work force is about 72.9 per cent. The percentage share of cultivators (273,336 persons) to the total work force is about 54.7 per cent and about 87,949 persons (17.2 per cent) are agricultural labourers. In comparison to 1961 there has been an increase in the number of agricultural labourers from 8.4 per cent to 17.2 per cent but the number of cultivators has decreased from 56.3 per cent to 54.5 per cent in 1971.

(ii) Workers in Secondary Sector : The workers engaged in secondary sector account for only 8.7 per cent to the total work force. On an average the Bulandshahr block has the highest proportion of workers engaged in secondary sector while the lowest proportion is recorded by Pahasu block.

(iii) Workers in Tertiary Sector : The tertiary sector has employed 18.4 per cent of the total working force. Khurja being a leading business centre of the district records the highest proportion of workers engaged in

tertiary sector while the lowest proportion under this category is registered by Danpur block. The percentage of workers engaged in transport to the total work force of the district has increased in 1971 over 1961 to some extent but on the contrary the number of persons engaged in industries, trade and other services has gone down.

(B) Non-workers : The non-working population is pretty large and accounts for 77.3 per cent of the total population. Among the non-workers female predominate constituting more than 64 per cent. More than half of the non-workers (about 58.6 per cent) are in the age group 0-14. About three-fourth of the total non-workers are male dependents.

2.3.2.2 Agriculture

The recent changes in the agricultural pattern and technology have been significant. The adoption of mechanisation, fertilisers' use, irrigation, high yielding varieties and insecticides have been encouraging. The development of infrastructural facilities has facilitated this change.

(A) Land Utilisation : The Table 2.04 presents the profile of the category-wise land use pattern for the year 1970-71.

The forests have very insignificant proportion in the total area which account for only 1.88 per cent. The net sown area accounts for 76.25 per cent of the total geographical area. Only about 5 per cent lies as culturable waste

etc. shows the potential for further extension of the net sown area.

TABLE 2.04 Land Utilisation Statistics[14] During 1970-71

S.No.	Purpose for which land is used	Area (Hectares)	Per cent
1.	Total land	4,93,767	100.00
2.	Forest	2,290	1.88
3.	Barren and Unculturable land	23,214	4.70
4.	Land put to non-agricultural uses	36,101	7.31
5.	Culturable waste	21,198	4.29
6.	Permanent pastures & other grazing Lands	2,084	0.42
7.	Land under trees and groves (not included in net area sown)	7,486	1.52
8.	Current fallow	12,174	2.47
9.	Other fallow lands	5,706	1.16
10.	Net area sown	3,76,514	76.25
11.	Area sown more than once	-	-

(B) Size of Land Holding : The average size of land holding in the district is between 2 to 5 acres. The Table 2.05 gives the distribution of size of land holdings in the district.

TABLE 2.05 The Statistics of the Size of Land Holding in the District Bulandshahr 1969-70

	Size of Holding (Acres)	Percentage
1.	Upto 1.0	36.1
2.	1.0 - 2.0	19.7
3.	2.0 - 5.0	26.5
4.	5.0 - 10.0	13.7
5.	10.0 - 15.0	2.9
6.	15.0 - 25.0	1.1
7.	25.0 and above	0.02
	TOTAL	100.00

Source : Punjab National Bank's Lead Bank Survey Report, Bulandshahr (U.P), 1971, p. 6.

Thus it is observed that 82.3 per cent holdings are below 5 acres. The holdings ranging between 5 and 15 acres are 16.6 per cent. The large size holdings account for only 1.1 per cent which have an area between 15 and 25 acres.

(C) Cropping Pattern : The table 2.06 shows the cropping pattern of the district for the year 1970-1971 and 1974-75.

The table indicates a general shift of cropping pattern from coarser grains to wheat and paddy. Oil seeds

TABLE 2.06 Cropping Pattern

Kharif Crops	Area (per cent to total) 1970-71	1974-75	Rabi Crops	Area (per cent to total) 1970-71	1974-75
Paddy	5.1	6.6	Wheat	80.3	88.9
Maize	70.4	71.6	Barley	13.4	5.3
Bajra	18.3	13.2	Gram	5.4	4.1
Jowar	6.2	8.6	Oilseeds	0.9	1.7
TOTAL	100.00	100.0	TOTAL	100.0	100.0

Source : Bulletin of Agricultural Statistics, Department of Agriculture, Lucknow, U.P., 1971-72 and 1974-75.

specially mustard, though sown on a very small area has also picked up. Sugarcane is one of the important non-foodgrain crops of the district which covered an area of about 48,473 hectares during 1970-71. A study of the production statistics reveals that it, in general, has increased keeping pace with increase in acreage. The acreage response of the main crops with special reference to wheat in the district seems to be the result of farmer's own decision based on the cropped area sown in the preceding year.[15]

(D) Coverage of High Yielding Varieties : The impact of 'green revolution' can be well seen by the extent of area under high yielding varieties in the district. Under assured

irrigation conditions which are available in the district there has been a major shift to these varieties. The yields of wheat are at par with other districts of the division. The Table 2.07 gives an idea of the coverage of high yielding varieties programme of the district.

TABLE 2.07 Area Under High Yielding Varieties in Bulandshahr District for 1969-70

H.Y.V. Crops	Area (Acres) Targets	Achievements	H.Y.V. Crops	Area (Acres) Targets	Achievements
Hybrid Maize	12,000	11,698	U.P. Maize	106,000	115,681
Hybrid Bajra	3,000	3,005	U.P.Wheat	82,602	99,075
Hybrid Jowar	200	221	Mexican Wheat	220,000	223.397
Exotic Paddy	3,000	3,000			

Source : District Action Plan of Punjab National Bank, Bulandshahr (U.P), 1978, p. 12.

(E) Irrigation : The main sources of irrigation are government and private tubewells and the net work of the Upper Ganga Canal. The Table 2.08 gives the source-wise irrigated area during 1970-71.

From Table 2.08 it is clear that the largest coverage of irrigated area is under tubewell-irrigation which accounts

TABLE 2.08 Source-wise Irrigated Area of Bulandshahr District 1970-71

S.No.	Source	Area Irrigated (Hectares)	Per cent to Total
1.	Canals	89,919	30.4
2.	Tubewells	139,338	46.5
3.	Other Wells	62,141	21.0
4.	Tanks, Lakes and Ponds	198	0.8
5.	Other Sources	3,805	1.3
	TOTAL	295,401	100.00

Source : Bulletin of Groundwater Investigation Organisation, Roorkee (U.P), 1976, p. 6.

for about 50 per cent of the total irrigated area of the district. During 1974-75 about 77 per cent of the cultivated land has been reported as irrigated and the area under the tubewells irrigation is increasing every year in comparison to canals.

(F) Fertiliser Consumption : Distribution of fertilisers is mainly the responsibility of Agriculture Department. Targets in its distribution were achieved in respect of nitrogenous and phosphatic fertiliser and only 69 per cent of the target was achieved in respect of potash during 1970-71.

The targets and achievements of various kinds of fertiliser in different years are given in the Table 2.09.

TABLE 2.09 Targets and Achievements of Fertiliser Distribution in Bulandshahr District During 1970-71, 1974-75 and 1975-76

(Metric Tons)

Fertiliser (Content) Type	1970-71 Target	1970-71 Achievement	1974-75 Target	1974-75 Achievement	1975-76 Target
Nitrogenous	15,090	15,762	14,234	14,014	25,530
Phosphatic	7,455	7,504	4,302	2,280	5,100
Potasic	4,480	3,099	3,590	1,720	2,960

Source : District Action Plan of Punjab National Bank, Bulandshahr (U.P), 1976, p. 11.

2.3.3.3 Special Development Schemes

In the district, development schemes began with the middle of the sixties for boosting the level of socio-economic prosperity. Some of the important special schemes are being mentioned as follows :

(A) Intensive Agricultural Area Programme (IAAP) : This scheme is in operation in the district since 1965. This looks after the distribution of high yielding varieties seeds in the area for boosting up the agricultural production.

(B) Minor Irrigation Project (MIP) : This project has been launched under A.R.C. (Agriculture Rural Credit) Scheme. In the beginning Jewar and Pahasu blocks of Khurja tahsil were selected.

(C) Dairy Development Programme (DDP) : For Bulandshahr, proximity to Delhi, makes selling of milk a lucrative occupation. The total milch cattle in the district is about 292,815 (Live-Stock Census, 1966). There is, however, no milk chilling plant in the district. Thus, the biggest institutional drawers of milk are Delhi Milk Scheme (DMS) and Glaxo Factory, Aligarh. Therefore, in the district, Confederation of Agricultural Relief Association with its headquarters at Delhi and commercial banks of the district are providing finance to agriculturists for the development of dairy in the area and making arrangements for sale of milk.

(D) Grape Cultivation Scheme (GCS) : It has been established by various experiments that the grape cultivation may successfully be done in all soils of the district. Therefore, land development bank has adopted this scheme in financing to the tune of Rs. 8,000 per acre. The Agriculture Department provides the necessary technical know-how to the cultivators.

2.3.3.4 Industries

The district is considered to be an industrially

backward district. Upto March 1973 there were only two large scale industries Panniji Sugar and General Mills and Cooperative Textile Mills both at Bulandshahr. Later, two more large scale units namely J.K. Fibre Tech. and Willards India Limited were established at Sikandrabad Industrial Area. A sugar mill in cooperative sector is proposed to be set up at Anupshahr soon.

The government has developed two industrial estates (Khurja and Mandi Shyam Nagar) and is developing an industrial area (Dadri-Sikandrabad Road) in order to promote rapid industrial growth in the district. The state government has also arranged financial assistance through U.P. State Financial Corporation (UPSFC).

Besides 4 large scale units there are 69 units registered under Factories Act. The units are concentrated mainly at Khurja, Bulandshahr and Mandi Shyam Nagar. 409 small scale units registered with Director of Industries, U.P., were in operation at the end of financial year 1972-73. There are 116 cottage industries under supervision of Khadi Gramodyog Board. There are financial assistance and arrangement of power from the state government.

NOTES AND REFERENCES

1. As computed from the District Census Handbook of Bulandshahr at village level data but as per information furnished by the District Statistics Officer, Bulandshahr, the area figure is 4,344.00 square kilometres.

2. This population figure is obtained by computing the village level data of the new district on the basis of the 1971 census. The population of the settlements that were transferred to the newly formed district of Ghaziabad on 14th November, 1976 has been excluded from the population of the pre-organised district as in 1971. The list of excluded villages is given in Appendix I. But the total population for the new district as per information furnished by the District Statistics Officer, is 1,909,565 which differs from the population computed by the author.

3. U.P. Sarkar, Panchwin Panch Varshiya Zila Yojna, Varshik Yojna, Janapad Bulandshahr, 1977-78, pp. 3-4.

4. Census of India (1971), District Census Handbook : Town and Village Directory, District Bulandshahr, U.P. series, Part X-B, Allahabad 1972.

5. H.R. Nevill, District Gazetteer, Bulandshahr, Vol. V, Allahabad, 1903, pp. 1-2.

6. R.G. Currie, Settlement Report of Bulandshahr District, Allahabad, 1865, p. 7.

7. U.P. Govt., Groundwater Investigation Organisation, (GWIO), Technical Feasibility of Groundwater Development on Compact Area Basis, District Bulandshahr, Groundwater Survey Roorkee Division, TM. No. 46, GUA (R-61), May 1976, p. 4.

8. ibid., pp. 9-11

9. U.P. Sarkar (1977-78), op. cit., p. 5.

10. H.R. Nevill, op. cit., pp. 14-15.

11. The population figure has been computed from the 1971-DCH of Bulandshahr district having, all the 178 villages (164 inhabited and 14 deserted) plus one town of Dadri transferred to the Ghaziabad District on November 14, 1976, taken into account as per information received from the letter of the D.M. Bulandshahr No. 3386 Sa.Ka./Saat dt. July 31, 1976 to the Commissioner and Secretary, Revenue Board, U.P., Lucknow (See Appendix I).

12. ibid., p. VIII

13. Punjab National Bank, Lead Bank Survey Report, Bulandshahr, U.P., Development Studies Cell, PNB, New Delhi, No. 24, September 1971, pp. 55-56.

14. Government of U.P., Bulletin of Agricultural Statistics, 1970-71, Dept. of Agriculture, Lucknow.

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CHAPTER 3

SPATIAL ORGANISATION OF SETTLEMENTS

3.1 INTRODUCTION

Theoretically, the concept of the settlement structure is based on their spatial distribution and functional organisation. The spatial distribution includes the patterns of growth, location and the population size of the settlements, and the functions of the settlements either are welfare oriented, growth promoting, productive or exploitative.

3.2 GROWTH PATTERN OF SETTLEMENTS

The Appendix VI shows that the percentage decadal growth[1] either at simple or compound rate has never been more than 1.30 per cent. This rate of growth is lower than that of the state (3.47 per cent) observed in the year 1961.

The Table 3.01 reveals that at the time of reorganisation of the district on November 14, 1976 as many as 164 inhabited villages and one town of Dadri were transferred to the newly formed district of Ghaziabad. Thus, now the district of Bulandshahr comprises of 1385 total inhabited settlements including 12 towns.

TABLE 3.01 Progress in the Number of Human Settlements 1901-76 in the District of Bulandshahr

Year	1901	1911	1921	1931	1941	1951	1961	1971	1976
No. of Rural Settlements	1509	1521	1514	1523	1517	1524	1539	1537	1373
No. of Towns	23	21	19	19	20	13	13	13	12
TOTAL	1532	1542	1533	1542	1537	1546	1552	1550	1385

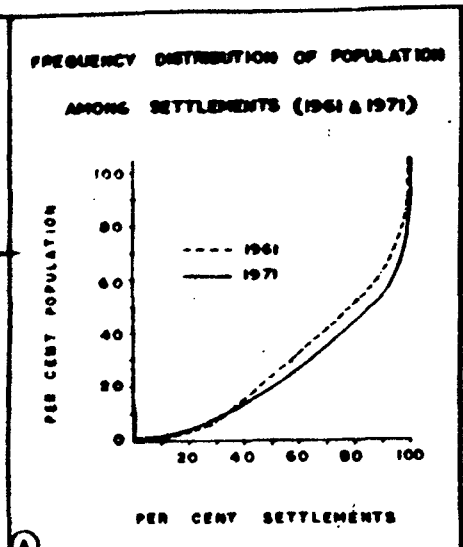
3.3 PATTERNS OF THE SIZE OF SETTLEMENTS

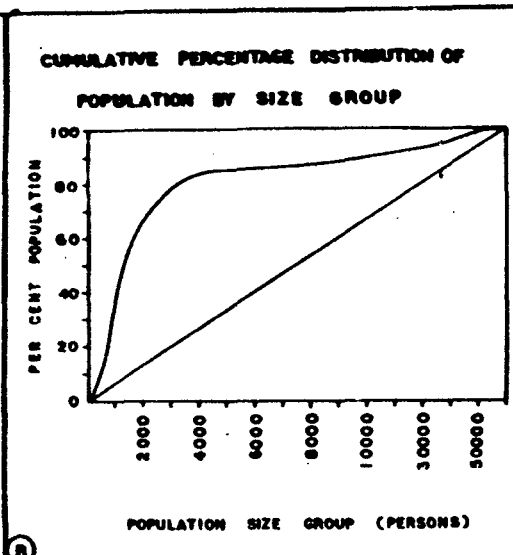
The identification of the need of and making provision for the social facilities is very closely linked with the pattern of the distribution and size of the human settlements. It is observed that the percentages of population and also of settlements under population size class of less than 1000 persons have decreased in 1971 in comparison to that of the year 1961. On the contrary the percentages of the population and the settlements with 2000 to 5000 persons and the size class of 10,000 persons and above witnessed increase.

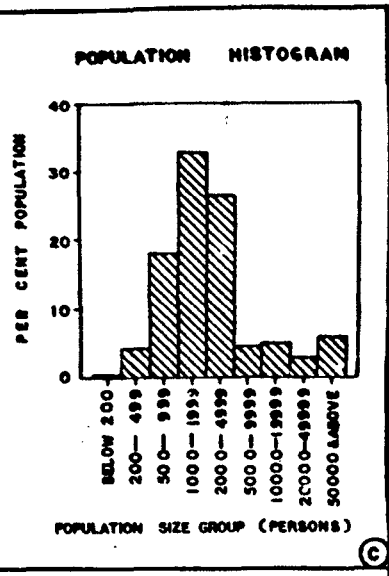
The proportion of population accomodated by the settlement with 500-1000 and 5000-10,000 persons has decreased while their respective percentages have gone up. This is also

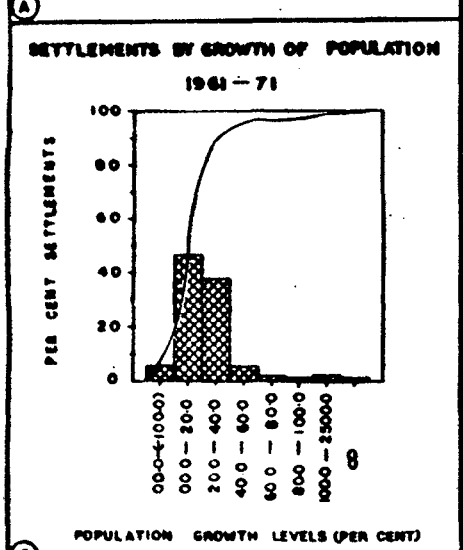
BULANDSHAHR

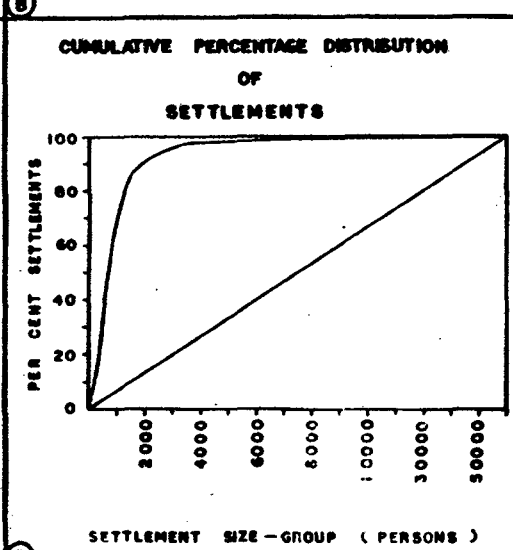
SIZE AND DISTRIBUTION PATTERNS OF SETTLEMENTS 1971

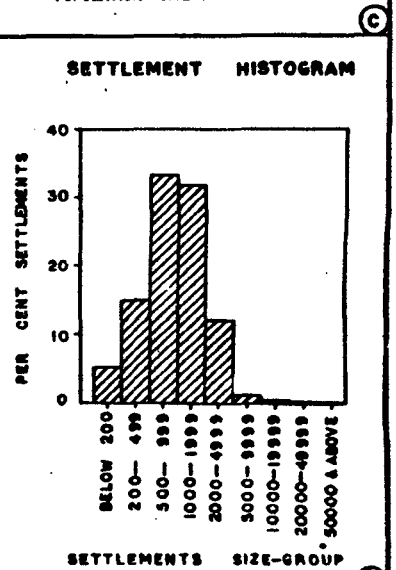


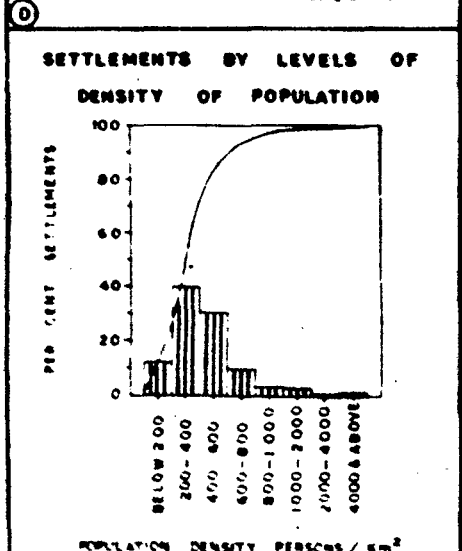


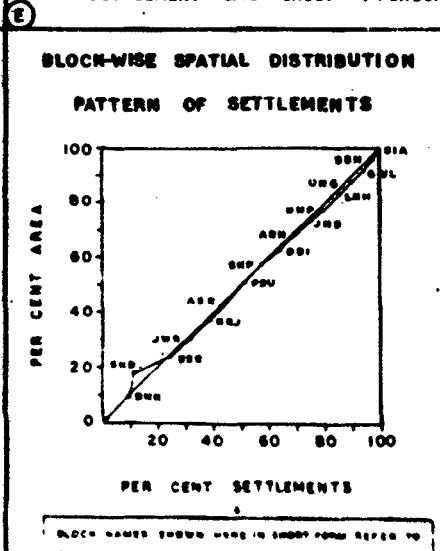












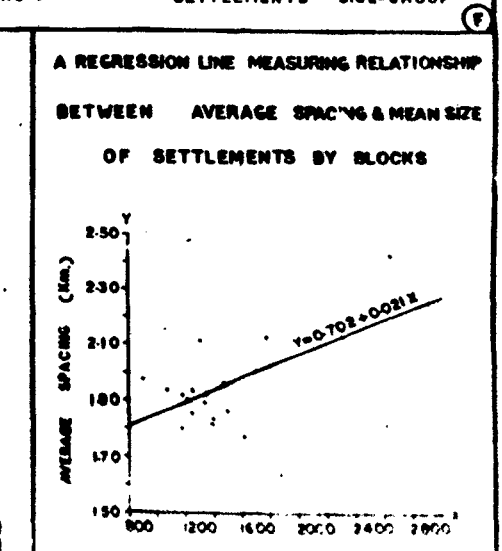


FIG. 8

clear (Fig. 8A) that about 34 per cent of the total settlements in the size classes 500 and 1000 persons accomodated 10 per cent of the total population. In 1961 about 80 per cent settlements accomodated 50 per cent of the total population in 1971 the same proportion of settlements accomodated only 45 per cent population.

About 77.24 per cent of the population of the district is distributed among the settlements belonging to the size class of 500 to 5000 persons. The population in the settlements with less than 500 persons and 500 and 1000 persons account for 4.58 per cent of the total population. The proportion of population distributed among small (population below 500 persons), medium (500-2000 persons) and the large size (above 2000 persons) settlements being 4.57 per cent, 50.98 per cent, and 44.45 per cent respectively. About 33 per cent of the total population is found in the villages belonging to the size group of 1000-1999 persons.

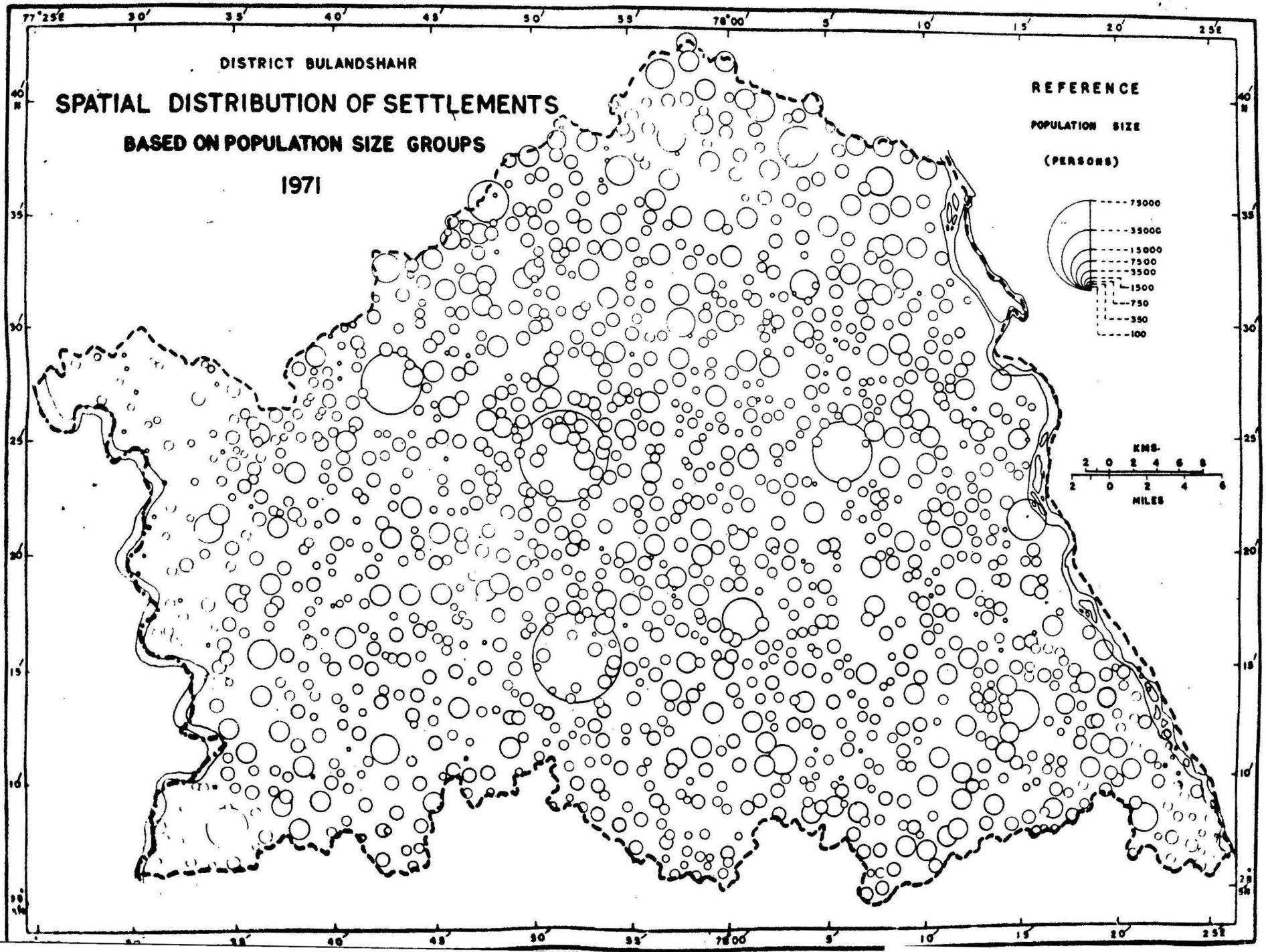
3.3.1 Settlements by Their Population Size

From the illustration (Figs. 8E & F) and the Appendix V, it is clear that about 26.07 per cent settlements are small in size having less than 500 persons (with 4.57 per cent of population). About 65.21 per cent of the settlements are categorised medium size settlements (with 500-1999 persons) accomodating 50.98 per cent of the total

population. The remaining 8.72 per cent of the settlements may be termed as large size (2000 persons and above) account for 44.45 per cent of the population. The urban settlements accomodate 14.0 per cent of the population.

3.3.2 Spatial Distribution of Settlements by Population Size

The general distribution of settlements (Fig. 9) is random but taking the size of the settlement into consideration peculiar patterns emerge . The settlements with a population less than 200 persons (Fig. 9 and 13A) are very few in number and show no specific pattern of their distribution. The sandy ridge extending in Sikandrabad, Dankaur and Khurja and Lakhaoti and Jahangirabad blocks has the highest concentration (Figs. 9 and 13B) of the small settlements. The settlements (Figs. 9 and 13C) having population between 500 and 1000 persons are almost absent in the area lying north west of Kasna village in Dankaur block and in the upland tract stretching between the Kali and the Chhoiya rivers in the blocks of Pahasu, Danpur and Shikarpur. There are no settlements that have population less than 1000 persons in Siyana block. The settlements with the population ranging between 1000 and 2000 persons (Figs. 9 and 13D) are concentrated in the blocks of Gulaothi and Bulandshahr. Except the northern parts of the Sikandrabad block in most of the western half


DISTRICT BULANDSHAHR
SPATIAL DISTRIBUTION OF SETTLEMENTS
BASED ON POPULATION SIZE GROUPS
1971
REFERENCE
POPULATION SIZE
(PERSONS)
75000
35000
15000
7500
3500
1500
750
350
100
KMS.
2 0 2 4 6 8
2 0 2 4 6
MILES
77°25'E
30'
35'
40'
45'
50'
55'
78°00'
5'
10'
15'
20'
25'E
40' N
35'
30'
25'
20'
15'
10'

of the district the settlements of the size of 2000-5000 persons are absent and in the remaining parts the settlement of this size show a pattern which can be said to be approaching cluster. The settlements having the population more than 5000 persons are comparatively closely spaced.

3.3.3 Settlements by Population Growth

The illustration (Fig. 8D) and the Table 3.02 brings out clearly the growth of population and the number of proportion of settlements falling in each growth class.

TABLE 3.02 Settlements of Bulandshahr According to Their Population Growth (1961-71)

Population Growth (Per cent)	Frequency Distribution of Settlements		
	Total no. of settlements	Per cent	Per cent cumulative frequency distribution
-99.99 - 0.0	77	5.6	5.6
0.00 - 19.99	640	43.3	51.9
20.00 - 39.99	525	37.9	89.8
40.00 - 59.99	77	5.6	95.4
60.00 - 79.99	20	1.4	96.8
80.00 - 99.99	8	0.5	97 .3
100.00 - 2500	26	1.9	99.2
Infinite	12	0.8	100.0
Total	1385	100.0	100.0

Source : District Census Handbook of Bulandshahr, Pt. X-A, 1971.

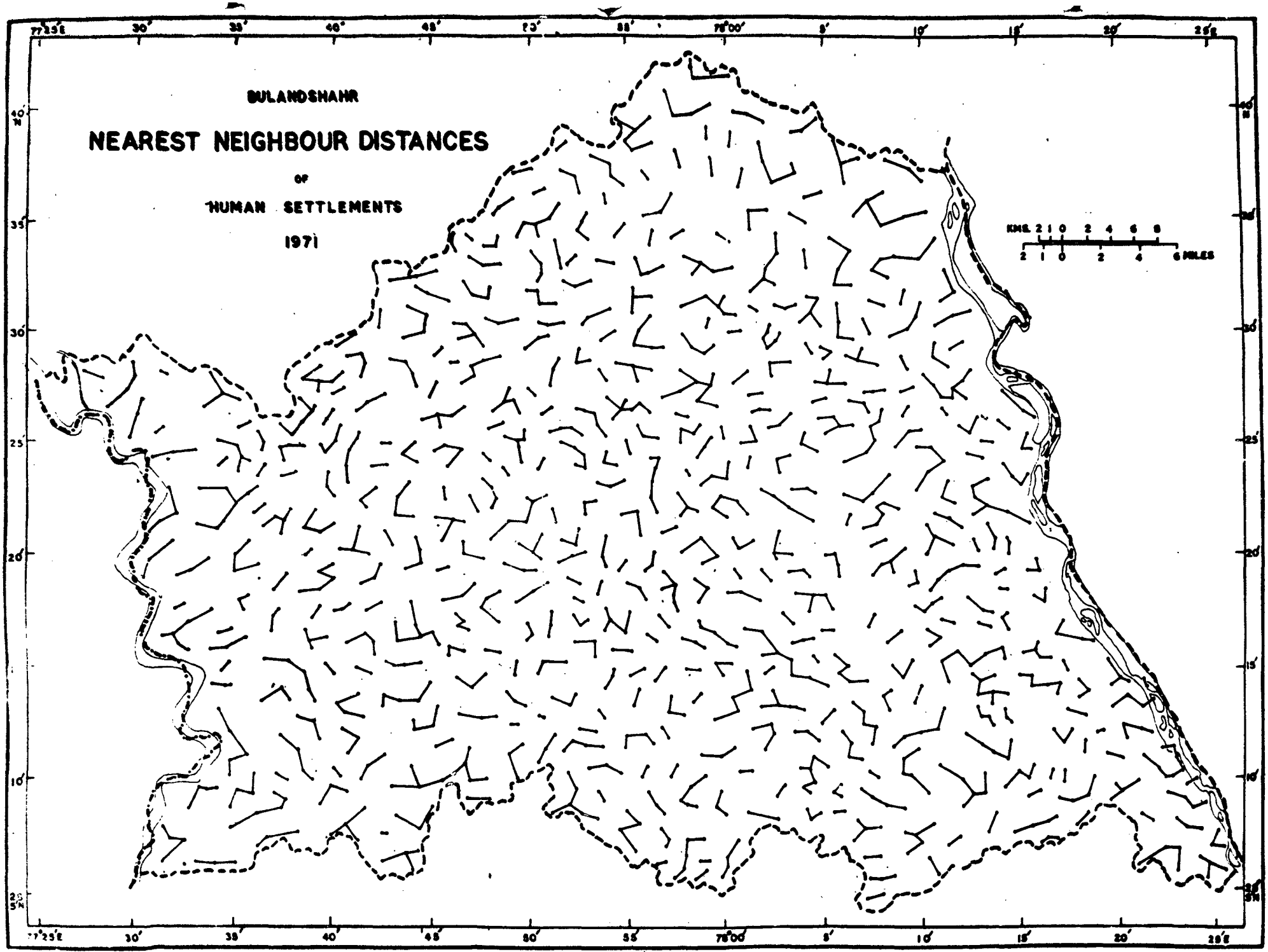

BULANDSHAHR
NEAREST NEIGHBOUR DISTANCES
OF
HUMAN SETTLEMENTS
1971
KMS. 2 1 0 2 4 6 8
2 1 0 2 4 6 MILES

FIG. 12

As many as 12 villages of the district in 1971 attained the infinite growth of population during the decade (1961-71) as they were totally uninhabited in the year 1961.

The village of Bhawan Bahadur Nagar has registered a negative growth rate of 61.4 per cent during 1961-71. About 640 villages accounting for 46.3 per cent of the total inhabited settlements recorded a population growth between zero and 20.00 per cent. About 525 settlements (37.9 per cent) have recorded a population growth between 20 and 40 per cent. Only 26 settlements (1.9 per cent) have registered very high growth rate of population ranging between 100.00 and 2500.00 per cent.

3.4 SPATIAL PATTERNS OF SETTLEMENTS

The spatial framework comprising the settlements and population provides a basis for regularity in the organisation of some settlements as central places.[2] The settlement structure of the district has two distinct and important characteristics : (i) the pattern of spatial distribution of settlements is random and (ii) there is an mean actual N-N distance of 1.19 kilometres between settlements (Appendix VIII).

The measurement of the spatial pattern by nearest neighbour analysis[3] as a measure of the pattern reveals the tendency of random distribution (R = 1.35) approaching

towards uniformity. But in the case of the rural settlements the 'R' value (Appendix VIII) is worked out to be 1.36 which shows that there is no basic difference in the pattern of settlements.

The mean actual and the mean expected distances for the district as a whole are 1.19 kms. and 0.88 kms. respectively. The settlements in the tahsils of Anupshahr, Bulandshahr and Khurja are more randomly distributed than those of the tahsils of Sikandrabad as their R values (Table 3.03) are 1.32, 1.33, 1.36 and 1.43 respectively. In the block of Siyana the villages are larger in size but are distributed very sparsely.

TABLE 3.03 Spatial Pattern of Distribution of Settlements in Bulandshahr District 1971 - Nearest Neighbour Analysis

S.No.	Tahsil	Area (sq.km.)	No. of settlements	'R' value
1.	Sikandrabad	755.5	246	1.43
2.	Bulandshahr	1221.7	395	1.33
3.	Khurja	1186.5	354	1.36
4.	Anupshahr	1180.3	390	1.32
	DISTRICT	4344.0	1385	1.35

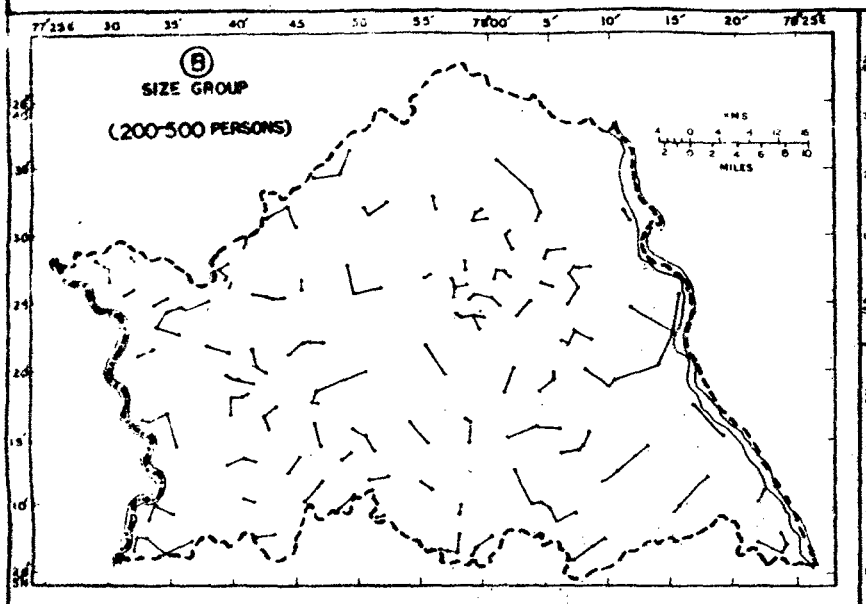
Scale of N.N. Technique : R = 0 is complete clustering
R = 1 is random distribution
R = 2.1491 is even distribution

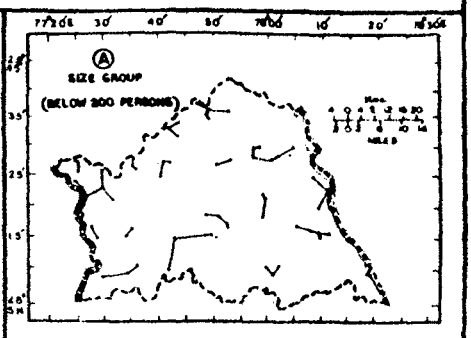
DISTRICT BULANDSHAHR

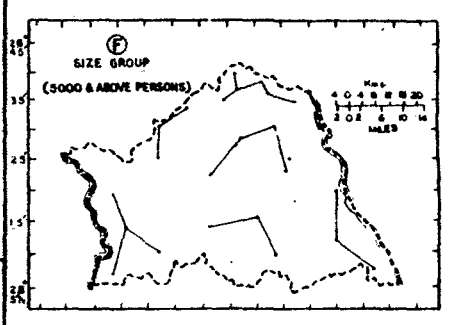
NEAREST NEIGHBOUR DISTANCES OF HUMAN SETTLEMENTS

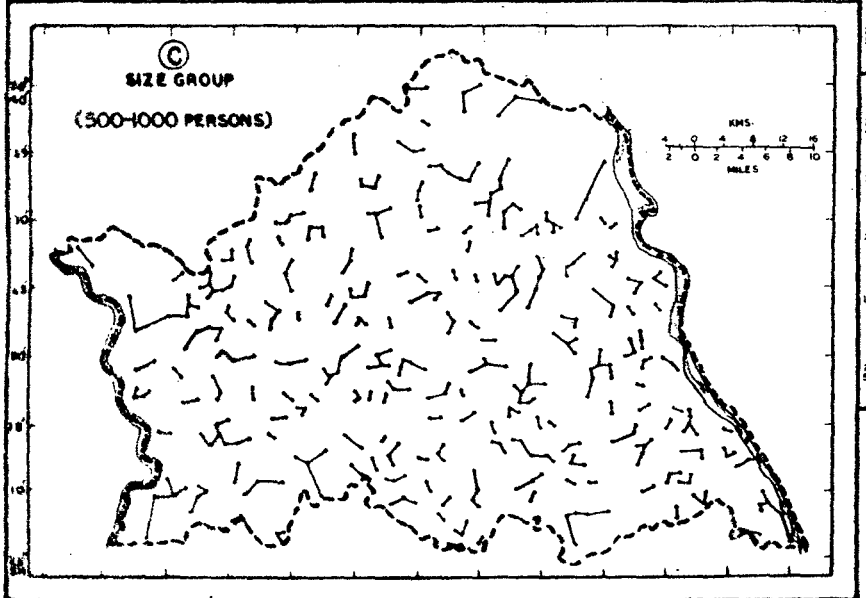
1971

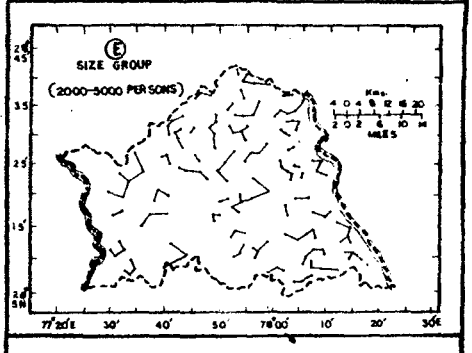
BASED ON THEIR POPULATION SIZE GROUPS

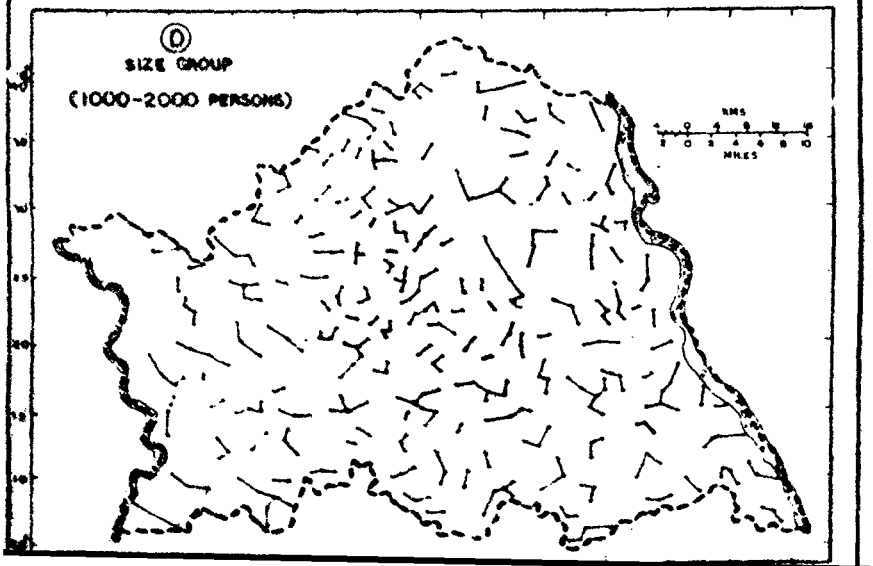


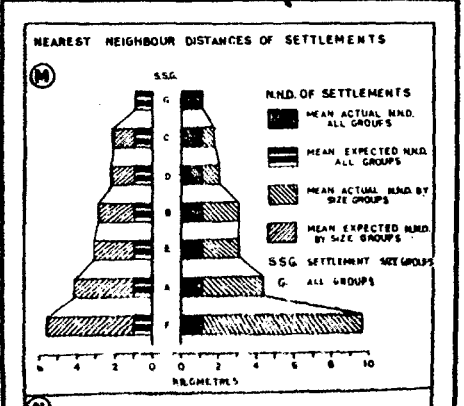


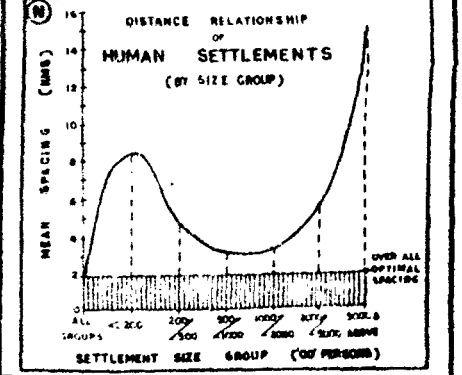












The maps (Figs. 9 & 12) show some important characteristics regarding the spatial patterns of settlement that emerge as :

(i) the area lying along the Dankaur-Til Bagampur axis being a tract of good quality loam brought by Yamuna consist of smaller villages of the size less than 500 persons giving a pattern of concentration;

(ii) an approaching cluster pattern may be seen in Anupshahr tahsil among the medium size villages. Siyana and Bhawan Bahadur Nagar blocks consist of big size villages distributed in a random pattern.

On making N-N analysis for the settlements, the villages with population of less than 200 persons have been found to have a distribution random to clustering. The other categories of settlements are characterised by random pattern. The R value in various size groups varies from 0.88 for lowest size-group to 1.88 in case of highest category of settlements. It shows that since the whole district is an agricultural region therefore, the pattern of clustering or uniformity is not found.

Another evidence of random distribution pattern of settlement is provided by the Gini's[4] coefficient ratio (Fig. 8H and Appendix IX and X) (0.0237) which shows lack

of concentration in the distribution of settlements. The Fig. 8H shows that Sikandrabad block is slightly deviated from the line of equal distribution, otherwise in other blocks it is approaching the line of even distribution. However, the curve for blocks Dankaur, Bulandshahr, Pahasu and Siyana, coincide with the line of even distribution.

3.5 SPACING OF SETTLEMENTS

The spacing technique as used by Mather (Appendices XI and XII) and various other scholars[5] has been adopted. This is evident from the Appendix-XII and the illustration (Fig. 11M) that the settlements are distributed at an average spacing of 1.91 kilometres from each other. Inter-settlement distances vary from 0.5 km. to 5 km. in the upland tract and from 1 km. to 10 kms. in the khadar tract of the district. The spacing between settlements with 500-900 persons is found to be 3.22 km. and it is 15.05 kms. in case of the settlements with a population size of more than 5000 persons.

3.6 MEAN SIZE AND SPACING OF SETTLEMENTS AND THEIR CORRELATES

The hypothesis that spacing is a function of the size of the settlements is tested with the help of simple correlation and regression analysis. The results show that the two variables (i) 'X' being the mean size of settlements,

and (ii) 'Y', the mean spacing (in kilometres) in rural settlements are significantly correlated ($r = 0.484$) at 5 per cent level of significance. The calculated value of 't' was worked out as 2.142 which at the 15 degrees of freedom at 5 per cent level is greater than the tabulated 't' value ($t = 2.13$). It means that the settlement size and spacing of settlements have positive linear relation with each other. Then a regression line $Y = 0.702 + 0.021X$ (Fig. 8-I, Appendix XV) has been fitted to determine the linear relationship between the spacing and size of settlements.

NOTES AND REFERENCES

1. Census of India (1971), General Population Tables, Part II-A, U.P., pp. 8-11.

2. P.J. Clark and F.C. Evans, 'Distance to Nearest Neighbour as a measure of Spatial Relationship in Population', Ecology, Vol. 35, 1954, pp. 445-53.

3. The nearest neighbour scale referred to as 'R' value is calculated as follows :

$$R = \bar{r}_A / \bar{r}_E$$

A and E being the actual (A) and expected (E) mean distances from each settlement to its nearest neighbour.

$$\bar{r}_A = \frac{\Sigma r}{N}$$

where N is the number of settlements in the study area

$$\bar{r}_E = \frac{1}{2\sqrt{P}}$$

where $P = \frac{N}{T} = \frac{\text{No. of settlements}}{\text{Total area of the region}}$

(refer Appendix VIII also)

4. O.D. Duncan, The Measurement of Population Distribution, Population Studies, July 1957, p. 40.

5. A.B. Mukherjee, 'Spacing of Rural Settlements in Rajasthan : A Spatial Analysis', in R.L. Singh et. al. (eds.), Readings in Rural Settlement Geography, N.G.S.I., 1975, pp. 252-68.

CHAPTER 4

SPATIAL ORGANISATION OF SOCIAL FACILITIES THE CONCEPTUAL FRAME

4.1 INTRODUCTORY STATEMENT

Every developing nation makes an attempt to develop its resources at the optimum rate in the shortest possible course of time.[1] The delineation of resource regions, patterns of their interaction and the perspective of growth during an operationally defined period of time is of great importance in a developing society which is going through planned change.[2] Underlying the delineation of resource regions is the realisation that development of territories does not take place in isolation, but through inter-linked process, the nature of which is not always obvious. The elements involved, the nature of their inter-linkages and the resultant dynamics in the transformation of the landscape, on the one hand, and the manpower on the other are the salient aspects to determine the systematic planning strategy for the development of a region. Before dealing with the conceptual frame of spatial organisation and empirical account of the spatial structure of social facilities of the study area it would be worthwhile to discuss the various aspects of regional development and planning so as to deter-

mine the actual place of the concept of spatial organisation within the general frame of concepts of development and planning. A critical appraisal of the concepts of spatial organisation and planning for social facilities and other aspects like the concept of development and planning perspective for development i.e., formal and operational types and spatial aspects of development planning has been attempted in the following pages.

4.2 CONCEPT OF DEVELOPMENT

Conceptually the term 'development ' has been defined as a change from a given situation to attain a better one and thus change is a basic component of development.[3] Therefore, it is obvious that improvement as one situation transforming it to a better situation is the normative of desirable change. On this 'basis' John Kenneth Galbraith recognises three types of economic development : (i) symbolic modernization, (ii) maximised economic growth, and (iii) selective growth.

Development is not a single function approach to welfare of the society. There are multi-dimensional changes which follow the economic development. Development consciousness in the individuals is as much necessary as it is for the state, because some tangible achievements can be obtained in any branch of economy.

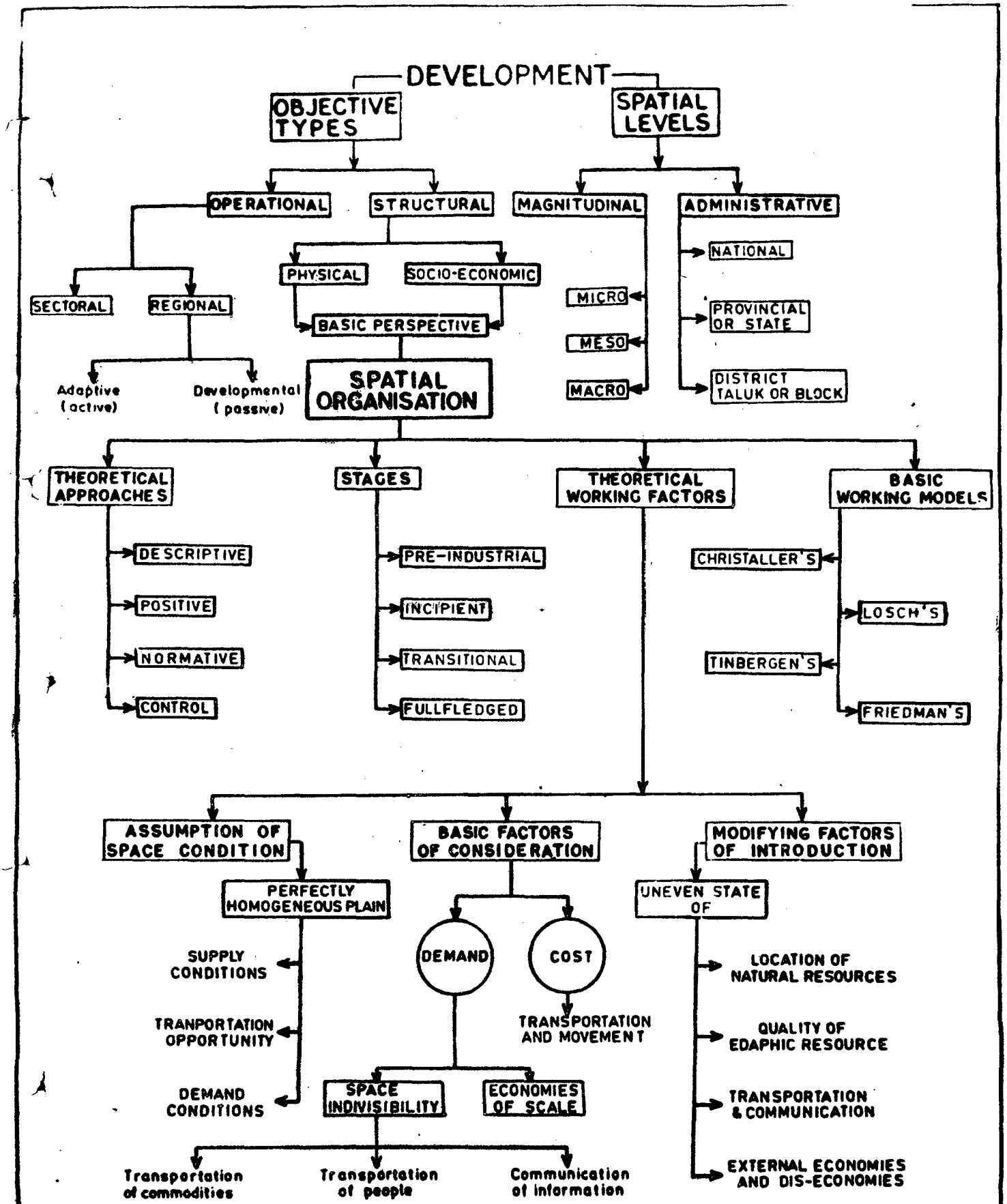


FIG. 14 — A THEMATIC FRAME OF DEVELOPMENT PERSPECTIVE WITH SPECIAL REFERENC TO SPATIAL ORGANISATION.

The concept of development is not merely quantitative but it is also qualitative. In its qualitative aspects it coincides with the welfare objective. It is not enough to observe what is produced and distributed rather economic development should also boost economic and social welfare. In comparing the poor with the rich countries one should take into account population growth, real per capita income and economic and social welfare. However, the concept of welfare involves value judgements regarding various aspects but it still cannot be neglected altogether.[4]

Planning implies rational coordination of numerous activities for the development of the country or region which includes material well being of its people. It will naturally encompass many aspects of community life of the people of the region.

The conceptual frame of development and planning (Fig.14) suggests the arrangement of the classification of different aspects and attributes of the concept of area development and planning indicating the proper place of the various aspects of spatial organisation. Very briefly, based on different conceptual criterion planning may be classified in seven ideal types which cover almost all the theoretical approach of the planning action involved in the development of a region or country. These seven approaches are imperative and indicative planning, short-

term and long-term planning, normative and systems planning, economic and developmental planning, multi-level planning, sectoral and regional planning.

Spatial or regional planning is considered as an attempt to achieve spatial integration and functional co-ordination of economic activity in space. Regional planning is as important and essential as local and national planning in any progressive country irrespective of its geographic character and political philosophy. Broadly speaking, regional planning implies : (a) an accurate formulation of the needs of the nation as a whole and a precise knowledge of what the people want in each region; (b) an accurate assessment of the limits and opportunities imposed on the natural and resource endowments of each region; and (c) an appropriate choice of policies and strategies for the development of a spatial pattern of human activities which can lead to autonomous processes of socio-economic change in the desired direction.[5]

4.3 SPATIAL DISTRIBUTION

The analysis of the existing spatial organisation of the region is necessary for the fulfilment of the aims of balanced regional development. It is because the spatial organisation is 'the aggregate pattern of use of space by a society'[6], and it determines 'the optimum structure of

movement'[7], we assume that spatial organisation is the outcome of man's attempt to use his territory efficiently.

Spatial organisation may be referred to as the distribution in geographical space of human activity in its entirety, with the recognition of a certain order inherent in this distribution generated by the push and pull of systematic factors governing locational inter-relations between human activities. It is preferable to use the term 'spatial organisation' rather than the term 'space economy'[8]. The latter is more restricted in scope as it pertains to the field of economic activity only and lacks the explicit recognition of directability which is implicit in the former.[9] Further, to deal with the nature of spatial organisation, we also assume that the wide variety of landscape patterns, and the theories constructed to account for them, have three common principles guiding man's use of space : (a) to maximise the net utility, or productivity of areas and places at minimum effort; (b) to maximise spatial interaction at minimum effort or cost and (c) to bring related economic activities close together as competing aims permit.[10]

It is known that the evolution of spatial organisation is the function of the natural processes of interaction and functional structure based on the factors of socio-economic activities over the space in due course of a larger stretch

of time. Thus, it may be assumed that the spatial organisation is the outcome of a continuous process whether planned or unplanned and takes place in its utmost developed form through some specific stages. Friedmann[11] identifies four stages of spatial organisation (Fig. 14) namely (i) pre-industrial , (ii) incipient, (iii) transitional and (iv) full-fledged respectively which reveal the realities of vertical development on the one hand and horizontal on the other.

The field of the spatial organisation has been a relatively neglected field of study as compared to that of locational analysis, spatial economics based on either a partial or general equilibrium approach, and regional economics.[12] In the field of geography such studies have been somewhat lacking specially in connection with the formulation of theoretical frame of the concept of spatial organisation seems to be very indicative and guiding yard-stick to geographers in the field of spatial planning for socio-economic development.

4.3.1 Thesis of Spatial Organisation

Before proceeding to discuss the chronological and attributive assessment of the trends and scope of spatial organisation it would be relevant to understand the theories of spatial organisation and the models developed so far. Therefore, an attempt has been made to analyse briefly

the theoretical frame of spatial organisation in the following section.

Before embarking on any substantial discussion of the content and validity of theories of spatial organisation we should make clear what types of questions the theory should endeavour to answer. It seems useful to distinguish between four types of questions and accordingly the same number of theoretical approaches to the theories of spatial organisation. The first question is about what exists. The corresponding theoretical approach is the descriptive one which aims at providing conceptual frameworks and operational measures and yardsticks which aid to identify and describe the existing patterns of distribution of economic activity. Most works in this direction have been done by geographers and belongs to this category.[13] The second type of question is why existing patterns are as they are. Corresponding to this type of question there are the 'so called' positive theories which aim at explaining characteristics of spatial patterns of either deductively or inductively. In contrast with the extensive descriptive literature, very little has been done in this field from an explanatory point of view which provides only a very general undertaking.[14] A third question which may and in fact, is oftenly, asked is what ought to be. The corresponding theory which aims at providing an answer is termed

'normatic' and is usually in case of spatial organisation referred to as theories of optimum patterns of settlements. It should, however, be noted that since a normative theory necessarily involves value premises as essential parts no optimum in an absolute sense can be found.[15] The normative theory, only indirectly, is applicable to practical planning.

However, if a normative theory of spatial organisation is based on an explicit objective functional, it is useful from the point of view of providing guidelines and criteria for fourth class of theories which may be called control theories. A control theoretical approach to spatial organisation is concerned particularly with questions how to intervene and direct change in spatial organisation in order to achieve pre-determined goals. The term control theory is chosen to indicate the broader scope intended, as compared with the more restricted term planning and it also deals precisely with the type of questions arising in policy making, planning, implementation and evaluation.

To define the systematic working factors and their interplay which govern with the structure and evolution of spatial organisations, it seems advisable to proceed in two steps (Fig. 14). First, we assume a perfectly homogenous plain with evenly distributed supply and demand conditions and equal transportation opportunities in all directions and consider only the most general factors

determining the structure of the spatial organisation that emerges. In the second step we introduce a number of modifying factors (Fig. 14) that bring us closer to reality.

The basic factors which bear upon the structure of spatial organisation can be summarized under these headings, viz., the demand for space indivisibilities and economies of scale, and costs of transportation and movement. The interplay of these three essential elements is sufficient to explain the general pattern of clustered dispersion of agglomeration points within larger, fairly evenly populated agricultural areas.

Space reducing activities include transportation of commodities and people and communication of information. They reduce the impact of space upon human interaction. Transportation of commodities, people and information can, however, only be done at certain costs in terms of economic resources. The size of the transportation costs determines the mobility of commodities, services and factors of production. Higher the transportation costs lower the mobility. On the basis of variation in transportation costs and economies of scale, goods may roughly be classified as international, national, regional and local.[16]

Taking these three elements together it can be

with transportation costs force dispersion. If they are all at work simultaneously, and we assume that factors of production, i.e., labour and capital are mobile, so that they can adjust to the relative force of factors, their interplay would result in an uneven density pattern of human activity over space. The precise features of the spatial pattern which arise out of the process of interplay would depend on the relative strength of the factors. It has been proved finally that the attention should be drawn to the close resemblence of production and consumption of economic services and social and cultural activities, which suggest that the latter are treated adequately within the frame of economic analysis.[17]

In addition to the basic general factors and their interplay which determine the nature of spatial organisation, a number of additional factors of a less general character are : (a) uneven location of natural resources[18], (b) uneven quality of the soil with respect to space utilizing activities[19], (c) uneven distribution of transportation and communication facilities[20] arising from, among other things, topographical conditions and (d) external economies and external diseconomies.[21] The inclusion of these factors and their relations to the basic general factors is principally aimed at explaining the more specific features of spatial organisation that can be found in reality and the reasons as to why they deviate from each other.

4.3.2 Models of Spatial Organisation

Various geographers and economists have advanced a number of models and theories pertaining to the spatial organisation of various economic activities. It would be worth while to examine their underlying implications and strength in order to make use of the inferences drawn by them for this study.

The state of development of any discipline can be assessed and defined simply identifying its own indigenous corpus of theory. In this respect geography has been somewhat lacking, and as recently as 1967 and 1969, Harvey[22] suggests that a major task ahead of geographers is to develop theoretical approach in geography with special reference to the theories of spatial structure and process.

Most of the theories of the location of economic activity have been developed by non-geographers, mainly economists Vön Thunen, Launhardt, Weber, Lösch, Isard, Greenhut and others. Christaller's (1933 and 1966)[23] central place studies are the geographer's significant contribution to theory. A large volume of work has been published by geographers exploring the concept of urban functions (Dickinson[24], Gottmann[25] and Berry[26]). Probably the other field in which geographers have made an outstanding contribution is in the study of diffusion under the leadership of Hagerstrand[27] in particular. Other theoretical constructs

are generally derivative in nature such as the Gravity Model of Interaction derived from Newtonian physics; migration models developed from Revensten's[28] ideas on the minimisation of distance moved; concepts of regional specialisation and consequential trade relationship taken directly from economics etc. However, the 1960s witnessed a distinct shift in emphasis such that geographers have consciously tried to relate their own work to some corpus of theory or have attempted to develop theory.[29]

So far as the formulation of models on spatial organisation in geography is concerned, the contribution made by Christaller, Lösch, Tinbergen and Friedmann are by far the most important. However, the ideas of Christaller have been able to evince more attention.

His ideas were elaborated by Lösch (1954) and have been refined in many geographical works later on.

4.3.3 Christaller's Model of Spatial Organisation

Christaller's problem was to devise a spatial arrangement of central places which would minimise the travel costs of population in gaining access to the services they require. His objective function, therefore, was to minimise consumer travel costs for the system of cities, subject to certain constraints.[30]

Christaller started his analysis of spatial organisation with extremely simplified assumptions. He assumed a homogenous plain with even distribution and quality of agricultural conditions and natural resources. At each point of this plain, the population density is equal, and so are consumer preferences and production techniques for each product. Any number of goods, i.e., commodities and services can be produced. Christaller based his model upon three basic factors namely, (i) the existence of space utilising activities, (ii) transportation costs and (iii) economies of scale of which the latter two generally differ from product to product. Thus it is obvious that Christaller aims at a "general deductive theory" which explains the "size number and distribution of towns"[31], or in other words a positive model explaining the horizontal as well as vertical features of spatial organisation.

The central place system of spatial organisation as developed by Christaller has the following characteristics :

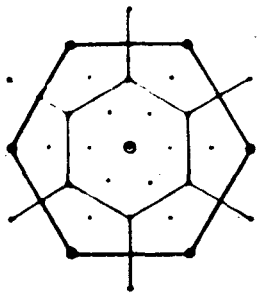
(i) the central places are located regularly spaced clusters forming triangular lattices;

(ii) they are centrally located within a hexagonally shaped trading area;

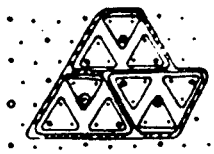
(iii) higher order central places are more widely spaced than lower order ones,

THE SYSTEMS OF CENTRAL PLACES

MARKETING PRINCIPLE (K=3)



ARRANGEMENT



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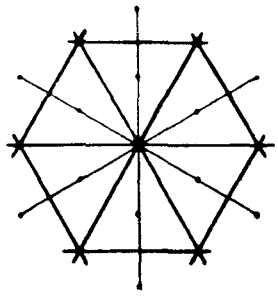
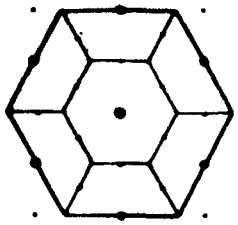


TRANSPORT ROUTES

TRANSPORTATION PRINCIPLE (K = 4)



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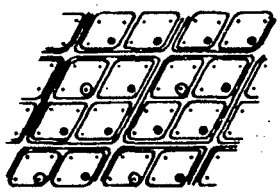

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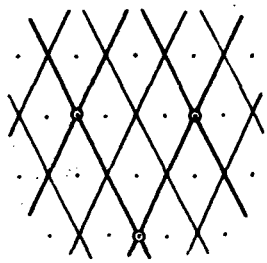
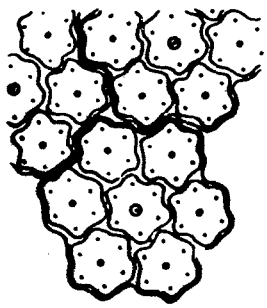
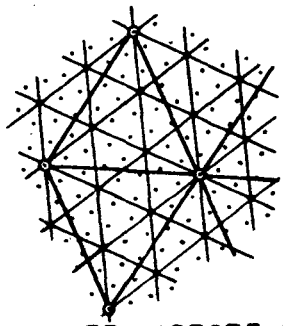


TRANSPORT ROUTES

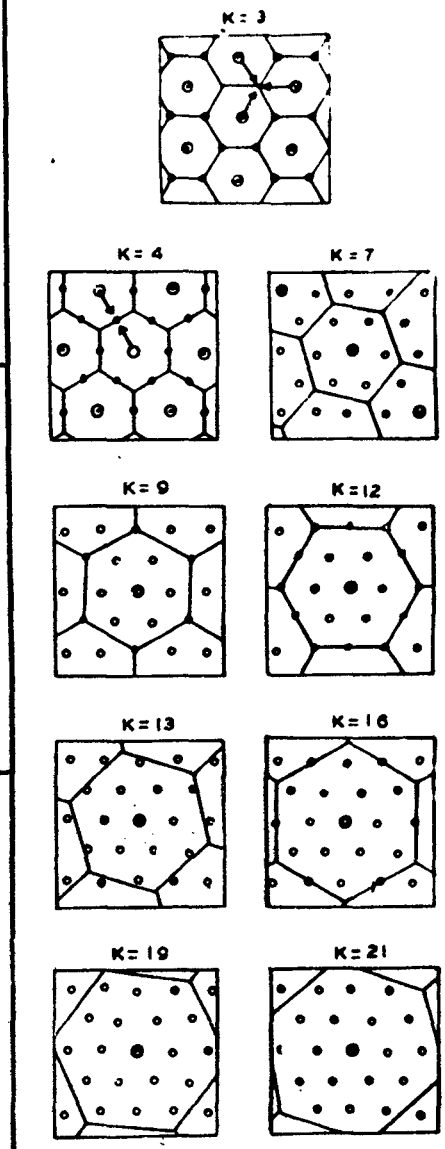
ADMINISTRATIVE PRINCIPLE (K= 7)



ARRANGEMENT & NESTING



TRANSPORT ROUTES



(A) IDEAL CENTRAL PLACE PATTERN'S ACCORDING TO CHRISTALLER.

Source: R.L. Morrill, 1974 P. 76

- HAMLETS
- VILLAGES
- TOWNS
- SMALL CITY

(B) NINE SMALLEST HEXAGONAL TERRITORIES IN A LÖSCHIAN LANDSCAPE.

Source: Lösch 1954 P. 118

- Central place.
- Dependent place shared between 2 or 3 competing central places.
- Dependent place entirely within the territory of a central place.

FIG 15

(iv) lower order central places are located at gravity centres of triangles formed by places at the next higher order;

(v) vertically the spatial organisation is characterised by the fact that the higher order centres are larger with respect to a number of activities, range of goods produced, volume of business and trading areas than lower order centres;

(vi) higher order centres supplying all goods which are supplied by lower centres but in addition, a number of goods of a wider range that differentiate them from and set them above the lower order;

(vii) by making an additional assumption, namely, that a definite hierarchy can be established in the system in which number of levels corresponding to the number of classes of goods can be identified,[32]

(viii) the number of places served by a central place at the next higher order in the system is fixed. This is a key assumption in the theory. By varying this parameter different forms of spatial organisation (Fig. 15) are generated. Christaller considered three possible values (Fig. 15-A) from the same. The market principle in accordance with which the nesting follows the rule of 3, the 'traffic principle' following the rule of 4 and the 'administrative principle' following the rule of 7 at all.[33]

The marketing principle is based on the assumption that all the areas could be served by a system of 3 settlements in such a way that each settlement serves its own hinterland and an area or population equivalent to two other settlements in addition which is termed as 'K = 3 principle'. Bringing in the transport principle, i.e., 'K = 4 principle', the pattern of settlement hierarchy would be such that many settlements would lie on the main transport routes connecting the higher order centres. The efficient administrative control of settlements would result in the evolution of distinct complementary regions and with the introduction of administrative principle, i.e., 'K = 7 principle' a complete hexagonal system is postulated.

The corresponding number of central places and complementary regions among the above-mentioned three principles are listed in Table 4.01.

4.3.1 'K' Principles in Indian Conditions

The alternative arrangements in reality are not mutually exclusive. For example, in the Indian context, the administrative centres have acquired certain infrastructure and economic activities and they cannot be ignored in evolving a strategy for future pattern of organisation. Likewise the settlements on main lines of transportation have more opportunities to grow as central places than those away from it.[34]

TABLE 4.01 Pattern of Central Place Hierarchy
Alternative Arrangement

Market Principle K = 3		Transport Principle K = 4		Administrative Principle K = 7	
No. of Centres	No. of Complementary regions	No. of Centres	No. of Complementary regions	No. of Centres	No. of Complementary regions
1	1	1	1	1	1
2	3	3	4	6	7
6	9	12	16	42	49
18	27	48	64	294	343
54	81	192	256	2058	2401
162	243	768	1024	14406	16807
486	729	3072	4096	100842	117649

Source : L.S. Bhat, et. al., Micro Level Planning : A Case Study of Karnal Area, Haryana, India, 1976, p. 6.

4.3.2 Modification of Central Place Theory

Research on central place theory in recent years has brought to light significant evidence of the variation in the thresholds, ranges and grouping of central place functions.[35] The recent works, of Berry and Garrison evoke interest.[36] The population threshold is defined as the minimum number of consumers that are required to support any particular function.

Another important aspect attributed to the recent development in the theory is the shape of the hexagonal model. It is observed that the equal area hexagons, as suggested by both Christaller and Lösch are unlikely to occue in reality. The high density of population at the central core advocated by Lösch tends to result in similar trade areas while away from the core the size of the areas tends to increase.[37]

The theory of central places has been modified in various respects as summarized below :

(i) the assumption that an area is a uniform plain is referred to permit physical and cultural variation such as varying population density or a particular settlement pattern;

(ii) The assumption of simultaneous development over limitless space is relaxed to allow for the gradual development of central place patterns from areas of early settlement;

(iii) the assumption that people will always make an optimal response and have perfect information also does not hold good;

(iv) it is recognised that places of greater size influence larger areas than the smaller places, even if the smaller ones offer the same goods;

(v) it is recognised that the central place theory conflicts

with agricultural rent theory requiring mutual modifications;

(vi) it is accepted that other economic activities specially manufacturers contribute to the growth of towns.

4.3.4 Lösch's Model of Spatial Organisation

Starting with the same basic assumptions as that of Christaller's, Lösch developed a model of spatial organisation (Fig. 15-B) which has a more elaborate economic base and contains Christaller's assumption as a special case. The basic characteristics of Lösch's model can be summarised as follows[38] :

(i) there is one superior centre where all goods are produced;

(ii) there is real specialisation, division of labour and trade between centres, i.e., smaller centres supply larger centres with their specialised products;

(iii) there is concentration of centres in "city rich" sectors separated by interstitial sectors which are less densely packed with centres;

(iv) nothing can, without further assumptions, be said about the relative sizes of centres except for the superior one being larger than all others. Centres with the same number of functions do not necessarily provide the same kinds of function;

(v) assuming size of centres is proportional to the number of plants, it can be shown that within "city rich" sectors size of sectors - increases with distances from the central place and that smaller centres tend to locate about half way in between larger ones[39];

(vi) although Lösch asserts that the vertical organisation would be hierarchical, this is doubtful and cannot be proved without further assumptions. On the contrary it seems that he has followed the model that the size distribution is continuous.[40]

4.3.4.1 Lösch's Conclusion

Lösch's model is far less rigid both in its vertical and its horizontal organisation than Christaller's. The major achievements of the model is that it proves that even starting from a homogenous plain and taking into account only variations in economies of scale and transportation costs between different goods, specialisation of production, inter-centre trade and a complex system of markets can be derived.[41]

4.3.4.2 Christaller's Versus Lösch's Model

Christaller and Lösch both started their analysis with very similar and extremely simplified assumptions. However, there are some differences between the two models arising out of their different ways of treating the key

problem, namely, the combination of the market areas of individual plants into a systematic organisational structure. Christaller starts with the goods that have the widest spatial range and develops his organisation from above, while Lösch starts at the bottom with the goods having the smaller spatial range and subsequently derives the organisation from below. These two types of organisation which emerge are quite different. It appears that the two models apply to different types of goods - Losch model to transportable commodities and Christaller's to immobile services.

The next basic difference between Lösch and Christaller is that Lösch leaves the number of centres to be served by a centre at the next higher order free to be determined in the model. These two differences in the derivation of the systems are the only reasons why the Losch system becomes much more complicated. In other words while Christaller model can be looked upon both from a micro point of view i.e., from the point of view of the distribution of production of individual goods, and from an aggregate macro point of view, i.e., spatial and size distribution of agglomerations, Lösch's model does not have any aggregative feature. It is strictly speaking, more a model of spatial organisation location, and trade of individual goods, than a model of overall spatial organisation.[42]

The main points of criticism against Lösch's model have been to the forefront. First, that being a model of spatial specialisation, it appears an un-necessary restriction that all goods are produced at the superior centre, This criticism does not apply to the Christaller model when regarded as a model of the service sector only. The second objection applies to both Christaller and Lösch and is more severe since it points to an inconsistency in the way of deriving the spatial organisations.

Although some empirical evidence supporting the model of the optimal "economic landscape" was proved by Losch himself and later also by Bogue[43], but according to the view point of Boventer the original Lösch's system has to be modified to such an extent that the very little remains of its material content.

4.3.5 Tinbergen's Model of Spatial Organisation

Recently, Tinbergen has formulated a model of spatial organisation of human activity along lines similar to those of Christaller. The basic difference is that while Christaller aimed at deriving the horizontal and vertical organisation, simultaneously, Tinbergen assumes the separation of problem into two parts, firstly, the determination of size distribution by the centres and their industrial composition and secondly, the location of the centres.

Tinbergen attempted to find the combination of plants belonging to each sector in each centre which minimises the total costs of transportation and production and formulated three hypotheses as follows :

(i) each centre containing an industry of rank h contains also all industries belonging to lower ranked industries. Thus, the centres can be ranked according to their highest ranking industry;[44]

(ii) from each centre only goods from highest ranking industry are exported. This export pays for the import of agricultural products and for goods produced by higher ranking industries, which are not represented in the centre;

(iii) in all centres the highest ranking industry is represented only with one plant.

Although Tinbergen posed the normative problem of finding an optimum spatial organisation, his model is also valued from an explanatory (positive) point of view. The assumption is, however, unrealistic and thus the conclusions are largely impracticable. Tinbergen's model is a little less rigid in its vertical spatial organisation and allows for a more continuous rank size relation. In fact the model treats a one point economy rather than a dispersed one. Nothing is said about the horizontal organisation which reflects the real impact of space as an obstacle to economic interaction. Finally, no attempt has been made to integrate

locations of natural resources, internal and external economies of agglomerations, transportation cost and space utilizing activities.

4.3.6 Friedman's Model of 4-Stages of Spatial Organisation

Spatial organisation is a field of study where the question whether the egg or the hen was first cannot be avoided, as spatial organisations do not come into being at once, but are results of processes dominated inter-temporal linkages, in which certain things come first and depending upon their configuration, determine what other things come later on.[45] It is this recognition that lies behind a recent model of spatial organisation suggested by Friedmann. His model deviates from those of Christaller, Losch and Tinbergen by being firstly dynamic, i.e. aiming at explaining how spatial organisations evolve, secondly, it is expressed in qualitative statements, and finally, which is perhaps more important, it is directed towards conditions in developing countries. Friedmann distinguishes four stages in the evolution of spatial organisation during the process of national economic development.[46] These stages (Fig. 14) are stated as (i) pre-industrial organisation, (ii) incipient industrialisation, i.e., the stage of development and backwardness or primacy oriented organisation, (iii) transitional stage, and (iv) the full-fledged spatial organisation.

Strictly speaking, Friedmann's model is not full-fledged model of the evolution of spatial organisation. It does neither specify the conditions and mechanisms of the changing trends of transitional stage of spatial organisation nor distinguish properly between descriptive positive and normative elements. However, the model gives a very useful point of departure for long term regional planning.[47]

4.4 SPATIAL ORGANISATION OF SOCIAL FACILITIES - A REVIEW OF LITERATURE ON INDIA

The development of infrastructural facilities in general and of socio-economic services in particular, no doubt, is one of the important conditions for the state of balanced regional development of a country. Without understandkng the existing pattern of spatial organisation of the area concerned no concrete planning for the development of social facilities may be formulated. The available literature, specially in India, indicates that the works brought out so far on various themes like 'Integrated Area Development', 'Micro-level Planning', 'Community Development', 'District Taluk or Block-level Planning', and 'Planning for Control Central Places' etc. are, in fact, dealing with the problem of spatial organisation of social facilities. No attempt seems to have been made to study the spatial organisation of social facilities and amenities with a view to suggest a concrete plan at micro level.

The literature on the theme of spatial organisation of social facilities has to be sifted out from the works contributed in the field of 'Area Development Planning', 'micro level planning' and like particularly in Indian conditions. Thus, the review of literature on the theme of 'spatial organisation of social facilities' has been made on two lines. Firstly, on the basis of chronological succession and secondly, on the basis of attributive characteristics of the works done on the lines related to the theme directly or indirectly.

The works pertaining to the themes of 'Area Development' with special reference to the aspect of 'spatial organisation of social facilities' are a few in number. Further, the works brought out in India on these themes generally follow the methodology followed in the western world.

In India, the works brought out on the theme of spatial planning for socio-economic structure have their beginning from the mid-sixties. The foremost endeavour in this direction has been made by the National Council of Applied Economic Research (NCAER)[48] in 1965. This organisation brought out a report on market towns and spatial planning. Further, in 1968 R.S. Bhamri[49] clarified through his paper, the theoretical framework of the balanced growth and supply factors in the context of balanced regional development.

An account on the theme of micro-level planning for the location of growth centres was brought out in 1970 and the aim of the balanced regional development was kept in view to start with the plans for regional development undertaken for the Fourth Five Year Plan by the government of India.[50] The same year National Institute of Community Development (NICD), Hyderabad, brought out a base work of S. Wanamali[51] on the problem of regional planning for social facilities. In this work Wanmali examined the applicability of the central place hypothesis. A.N. Bose[52] suggested on institutional bottlenecks existed in the way of an development of backward areas in India.

In 1971, Wanmali[53] further explained the importance and the process of ranking of settlements for planning purposes. In 1971, a very important work edited by L.K. Sen and others[54] examined and presented and approach for the planning of rural growth centres for an integrated area development strategy. This study was undertaken for Miryalguda taluka of Nalgonda district in Andhra Pradesh and which could be accepted as a pioneering venture by an interdisciplinary team of social scientists and research scholars at the National Institute of Community Development, Hyderabad. This work really paved the way for future researches to evolve newer strategy for optimal area planning.[55]

Some positive efforts were made by the organisation of the Census of India in connection with the area development

approach in 1972 by publishing a centenary monograph. B.K.Roy Burman and C.S. Chandrashekhar[57] contributed on the themes of integrated regional approach and the frame of balanced regional development respectively. Baldeo Raj Nayer[58] suggested some concrete steps helpful in regional planning for economic growth. Satyesh Chakraborty[59] expressed the need of adoption of all those techniques which are relevant for integrated area development at micro level and submitted some research objectives for the rural area development. A new strategy to rural area development was also submitted by S. Brahame[60] which could be profitably applied for planning at micro level. Again a unique contribution was made by the NICD, Hyderabad through the edited work of L.K. Sen and others[61] to clarify the understanding of the spirit and purpose of regional planning for social welfare in detail. The work consists of four parts including 40 articles. These parts have been classified on a sound logical grounds e.g. (i) micro-level planning and natural growth centres, (ii) infrastructure development and trends of change, (iii) theories concepts and methods, and (iv) planning processes, problems and techniques respectively.

B.N. Das and A.K. Sarkar[62] in 1972 contributed on an article suggesting a strategy for rural area development at micro level taking a case study of Karnal (Haryana) area.

A.K. Bhattacharya[63] has suggested some basic considerations towards regional frame of rural urban planning. He has critically reviewed and examined the theories and concepts on spatial organisation and regional planning as postulated or supported by W. Christaller (1933), August Lösch (1944), Francois Perraroux (1955), Louis E. Davin (1933), Gavin McCrone (1969), Collin Clark and M.R. Haswell (1964), and J.H. Von Thunen (1826) from time to time. K.S. Rama Gowda[64] has clarified his strategy for simultaneous regional planning both for rural and urban development.

In 1973, an appraisal of strategies pertaining to the rural agricultural development was made by C.R.Pathak[65] viewing specially the latest comprehensive area development programme worked out by the West Bengal Government. India's Fourth Five Year Plan (1969-74) provided for a "Pilot Project in Growth Centres"[66], which was to be concerned with the development of a methodology to contribute towards the villages of rural India with adequate access to the goods and services essential to social and economic development in the long run process of raising national productivity levels and equalising levels of welfare.[67]

In 1974, L.K. Sen and G.K. Misra[68] produced a good work pointing out the techniques of regional planning at micro level for estimating the future needs of electricity for the development of agriculture, industries and social facilities.

To point out the economic fallacies of balanced regional development in Indian conditions with special reference to tribal region of Madhya Pradesh an endeavour has been made by M.L. Patel[69] contributing his ideas on conceptual and empirical aspects of integrated regional development at micro-level in 1975. The study on 'Growth Centres in Raichur' made by L.K. Sen and others (1975)[70] is the first district plan in India based on location-specific integrated area development criteria laid down by the Planning Commission as one of the recommendations of the Fifth Five Year Plan.

The role of some research institutes to develop a level of understanding among researchers and government authorities imparting special training programmes towards the aspects and methodology of the micro level planning has been quite encouraging. The key role in this connection is being played by the NICD Hyderabad and the Department of Architecture and Regional Planning, IIT, Kharagpur.[71] An attempt has been made to delineate a strategy for micro-level planning in 1976 by L.S. Bhat and others taking a case study of Karnal area of Haryana. In this work conceptual as well as empirical aspects have been dealt with based on simple and sound statistical methods.

Regarding the nature and the processes of district planning the contributions of S. Mundle (1977)[72] and K.N. Kabra (1977)[73] may be accepted as analytical guideline for understanding the problem of micro level integrated planning

for social welfare. As a result of one of the reports of the 'Pilot Project in Growth Centres' of India, a manual on block level planning of Talala block (Gujarat)[74] reveals the experience gained at the field level in locating potential growth centres which seems to be very useful for field officers and planners while planning for the socio-economic facilities at block or district level.

It may be submitted that numerous research projects and individual efforts including government plans in connection with the planning for an optimal spatial organisation are in action. However, the micro-level regional planning work in close collaboration of sectoral planning requires much more attention at each level of government administrative unit from below to top and the criteria for adjustment planning seems to be very lucrative for overcoming the planning gaps.

4.4.1 Concluding Statement

On assessing the available literature related to the problem of spatial planning for social facilities, about ten major trends may be discusged to the thematic development of the problem under review :

(i) the first and foremost trend seen is the inclusion of tourist industry as the main base for the development of the country-side. The H.M.S.O. Paris (1964) and J.B. Hillings (1968) evidently suggested through

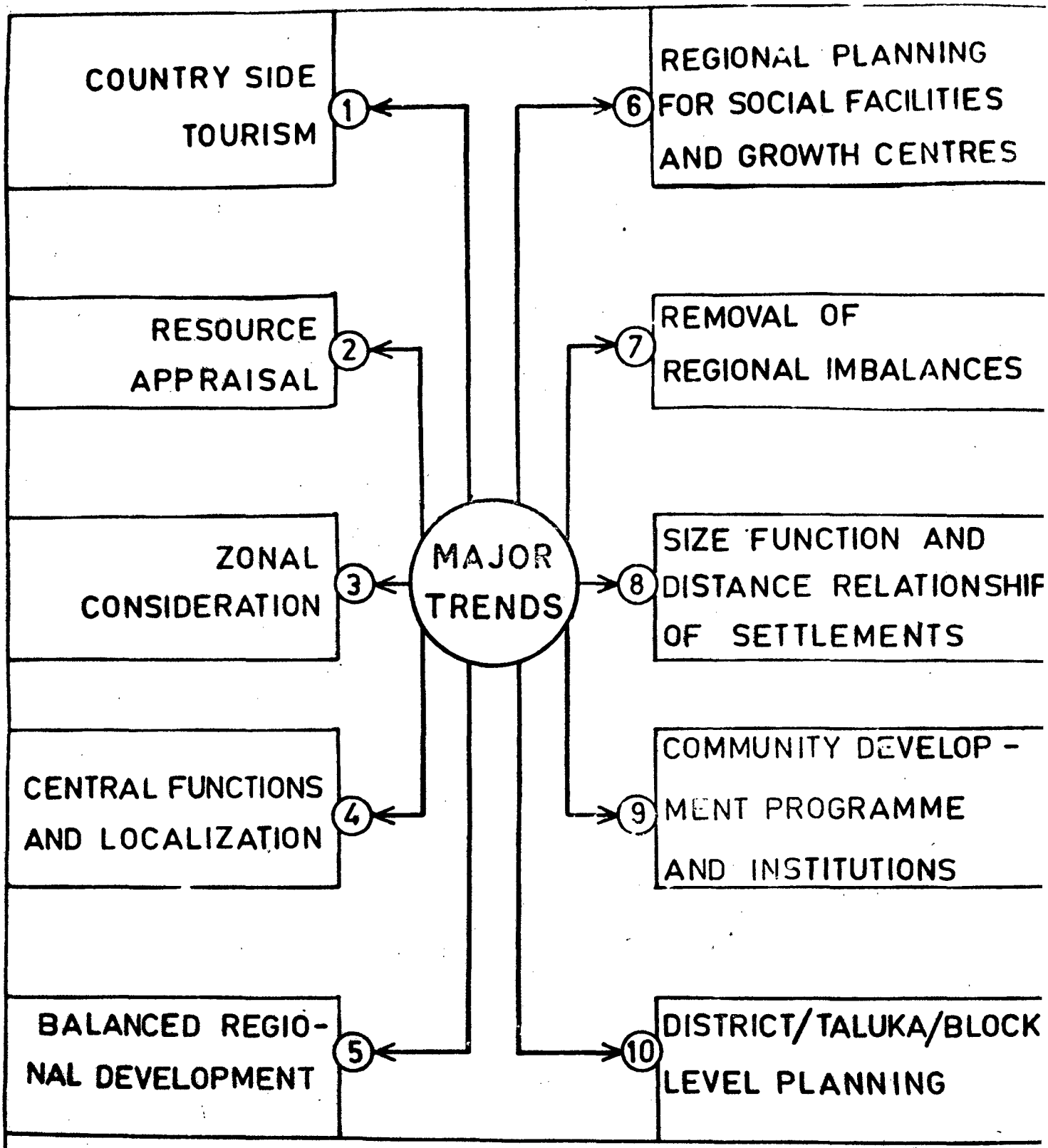


Fig.15A: Major trends in the development of processes of spatial organisation of social facilities.

empirical observations to establish the tourist centres for the proper aid and nourishment of the retarded economy of the rural areas in the European environment;

(ii) the second major trend could be seen in the work of Anderson (1965) and other social scientists who felt the need of resource appraisal (natural and human both) before going to frame development plan of the country-side;

(iii) the third major characteristic has been the adoption of zonal consideration. The work of H.O. Clout (1969) may be the true representation of this aspect. He stressed also to appraise the demographic trends and lines of action before going to plan an optimal spatial organisation;

(iv) the critical evaluation of central functions and localization aspects may be assumed as the fourth major trend in the evolutionary cycle of the concept of spatial planning for development. Hans Bösch (1952) and NCAER (India, 1965) have pointed out the importance of spatial planning for comprehensive development;

(v) the concept of balanced regional development may be discerned as the fifth major trend of the spatial planning for social welfare in the functioning specially for the economic development point of view. The works of R.S. Bhamri(1968), C.S. Chandrashekhar (1972) and M.L. Patel may be quoted as representative studies in

this direction;

(vi) the concept of growth centre and the regional planning for social facilities may be taken as the sixth major trend. In the Indian context most of the works brought out by the NICD, Hyderabad are the representative contributions in this connection. Micro level planning concept now could take solid background as for the planning of an optimal spatial organisation of social facilities;

(vii) the consideration for the removal of regional disparities may be considered as seventh major trend in the planning process to attain an optimal spatial organisation of socio-economic development on the lines of the works of Gunnar Myrdal (1969) and S.L. Shah (1973). This trend may be kept separately from the concept of balanced regional development, though this, in later stages has been applied into spatial analysis also;

(viii) the consideration of size, function and distance relationship of human settlements in the planning of rural urban development has been a very important trend. A considerable number of works have been produced on the basis of this trend from Wanmali (1971) to Prodipto Roy and B.R. Patil (1971) in the Indian context;

(ix) the concept of the community development programme may be taken as the ninth major trend in the process

of area development planning. This concept , however, came into being from the very beginning of the fifties but in an academic form it could take a proper momentum in the later half of the sixties. To study the spatial planning problems and to train the field workers and researchers for future, community development institutes were established in India at various places. The National Institute for Community Development (NICD) now as National Institute for Rural Development (NIRD) is playing a key role in fulfilling the aims and objectives of development planning programmes.

(x) in the present day situation the concept of district, taluk or block level planning for regional development irrespective of sectoral planning may be taken as the tenth major trend in the way of spatial planning for socio-economic development.

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CHAPTER 5

DISTRIBUTION OF SOCIAL FACILITIES

5.1 INTRODUCTORY STATEMENT

Man's basic needs are food, cloth and shelter, but to rise above the animal level of existence and to improve the quality of life he creates and aspires to fulfil certain higher needs. The story of such restless efforts of the man to improve the quality of his life since the day of his origin is the story of human civilization. Thus, the concept of spatial development may be taken to be the result of articulate functioning of human beings through ages based on the changing patterns of social interaction, organisation and normative dimensions. The nature of infrastructural facilities required for social well-being varies according to the level of general development of the region. The greater the number of social facilities and amenities available the higher the level of development.

5.2 A CLASSIFICATORY SCHEME OF SOCIAL FACILITIES

The nature of social facilities required in the urban areas is far different from that of its country-side. Therefore, before attempting any analysis of the spatial distribution of social facilities, it is necessary to present a classification of the social facilities and

amenities as they are available in the district of Bulandshahr. Cities, being the main commercial, administrative and industrial centres, require higher order of social facilities and civic amenities for their efficient functioning. The country-side, on the other hand, has mainly the agrarian in character and needs the agriculturally oriented basic infrastructural service facilities and cultural amenities. All these social facilities, of the urban and rural areas have been enlisted in detail (Appendix XV). The existing facilities may be classified as presented in Table 5.01. In the present study the hierarchy of settlements has been found out on the basis of the composite scores of facilities. Therefore, the major heads of the facilities are classified in such a manner that they may be applied for both the types of settlements, i.e., rural and urban.

In the given classificatory scheme all the existing 40 social facilities have been grouped into 12 categories under 7 major heads (Table 5.01) which consist of (i) educational, (ii) health, (iii) communication, (iv) market, (v) agro-economic, (vi) public administration and (vii) leisure time amenities. The spatial distribution of all the social facilities, mentioned above has been discussed in the following pages.

5.3 EDUCATIONAL FACILITIES

Education is a basic factor in development. It largely determines human occupation, which in turn, determines

TABLE 5.01

Classification of Social Facilities of the area under study (District Bulandshahr), 1971.

SOCIAL SERVICES/FACILITIES/AMENITIES							
MAJOR CATEGORY		CATEGORY			FACILITY		
SNo.	Name	Symbol	SNo.	Name	Symbol	SNo.	Symbol Name
1	Educational	E	1	Educational	E	1	P.S. Primary School
						2	J.H.S. Jr High School
						3	H.S.S. Hr Sec School
						4	C College
2	Health	H	2	Medical	Md	5	Disp. Dispensary
						6	Hosp. Hospital
						7	M.C.W. Maternity & Child Welfare Centre.
						8	FP.C. Family Planning Centre.
						9	H.C. Health Centre
			3	Sanitary	S	10	P.T. Pit Tank Sewage System
						11	O.S.D. Open Surface Sewage System
3	Communication	C	4	Postal	P	12	B.P.O. Branch Post Office
						13	P.T.O. Post & Telegraph Office.
						14	Phone Telephone
			5	Transport	T	15	K.R. Kachcha (unmetalled) Road.
						16	P.R. Pucca (metalled) Rd
						17	RLY. Railways
4	Market	M	6	Market	M	18	W.M. Weekly Market
						19	F.M. Fair's Market
						20	R.M. Regulated Market
5	Agro-Economic	A-E	7	Agricultural	Ag.	21	A.S.S. Agricultural Seed Store.
						22	C.S.S. Cooperative Seed Store.
						23	S.M.C. Stockman Centre
						24	V.H. Veterniary Hospital
						25	E.A.U. Electricity for Agril.usage.
			8	Credit	Cr.	26	A.C.S. Agril.Credit Soc.
						27	N.A.C.S. Non-Agril.Credit Society.
						28	L.S.S. Large Scale Service Society.
						29	Bnk. Bank
6	Public Administration	P.A.	9	Social Justice & Security	J	30	N.P.C. Nyai Panchayat Centre.
						31	P.S.O.P. Police Stn/CutPost
			10	Administrative Headquarters.	Q	32	B.H.Q. Block Headquarters
						33	P.H.Q. Pargana Head Quarters.
						34	T.H.Q. Tahsil HeadQuarters
						35	D.H.C. Distt Head Quarters
7	Leisure Time Amenities	LTA	11	Religicus Instns	I	36	Tmp. Temple
						37	Msq. Mosque
			12	Recreational Establishments	R	38	P.l. Public Library
						39	R.R. Reading Room
						40	Cinema Talkie

income. The levels of education, occupation and income together reflect the general economic status of a community. Where educational, occupational and income levels are generally low, substantial public health and welfare services are likely to be needed but the resources required to provide them may be inadequate.[1] 22.0 per cent literacy rate in the district indicates that there is a large gap to be filled-in. The educational facilities in the district include primary schools, junior high schools, higher secondary schools (high schools or intermediate colleges)[2] and degree/post-graduate colleges.

5.3.1 Primary Schools

The facility of primary schools is fairly widespread in the district. The total number of settlements having primary schools is 756 (54.58 per cent) out of 1385 settlements. But the total number of primary schools in the area is 932 out of which 140 schools are located in the 12 urban centres. The smallest village having a primary school is Bhagwanpur urf Harwanpur with a population of 270 persons in Siyana block. This shows that no settlements of the population size of less than 200 persons has primary school in the district. It is also found (Table 5.02, Fig. 16-1) that all the settlements falling in the population size category of more than 5000 persons have primary school. There are 111 settlements which have population of more than 1,000 persons but do not have primary school facility.

TABLE 5.02

Population Size-Groupwise Distribution of Settlements having Educational Facilities* During 1971.

Facility	P**	No. of Settlements By Pop.Size Group. Below 200	200 to 499	500 to 999	1000 to 1999	2000 to 4999	5000 to 9999	10000 And Above	Total	Rural	Urban
1	2	3	4	5	6	7	8	9	10	11	12
All Settlements.	T	72	217	461	442	170	13	10	1385	1373	12
	%	5.2	15.7	33.3	31.9	12.3	0.9	0.7	100.0	99.1	0.9
	Cf	5.2	20.9	54.2	86.1	98.4	99.3	100.0	-	-	-
P.S.	T	-	32	200	349	152	13	10	756	744	12
	%	00.0	4.2	26.5	46.2	20.1	1.3	1.7	100.0	98.4	1.6
	Cf	00.0	4.2	30.7	76.9	97.0	98.3	100.00	-	-	-
J.H.S.	T	-	1	5	43	61	13	10	133	122	12
	%	0.0	0.7	3.8	32.3	45.9	9.8	7.5	100.0	91.7	8.3
	Cf	0.0	0.7	4.5	36.8	82.7	92.5	100.0	-	-	-
H.S.S.	T	..	-	1	17	19	6	10	53	41	12
	%	0.0	0.0	1.9	32.1	38.8	11.3	18.9	100.0	77.4	22.6
	Cf	0.0	0.0	1.9	34.0	69.8	81.1	100.0	-	-	-
College	T	-	-	-	-	1	-	7	8	1	7
	%0	0.0	0.0	0.0	0.0	12.5	0.0	87.5	100.0	12.5	87.5
	Cf	0.0	0.0	0.0	0.0	12.5	12.5	100.0	-	-	-

* P=Particulars; T=Total; %=Percent and Cf=Cumulative frequency J.H.S.=J.H.S.+H.S.S; The abbreviations refer to the Text Table No.5.01

* The data is computed from the basic data given in the D.C.H., Bulandshahr, Part, X-A, 1971.

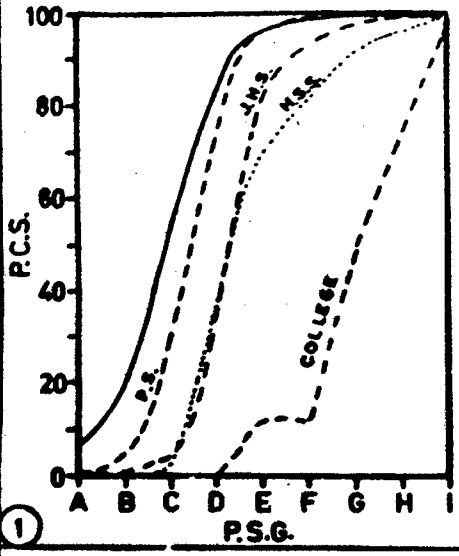
The highest percentage (46.2 per cent) of the settlements having primary school is observed in the population size group of 1,000-2,000 persons while the total number of settlements in this category accounts for 31.9 per cent of the total settlements of the district.

DISTRICT BULANDSHAHR

SOCIAL FACILITIES : 1971

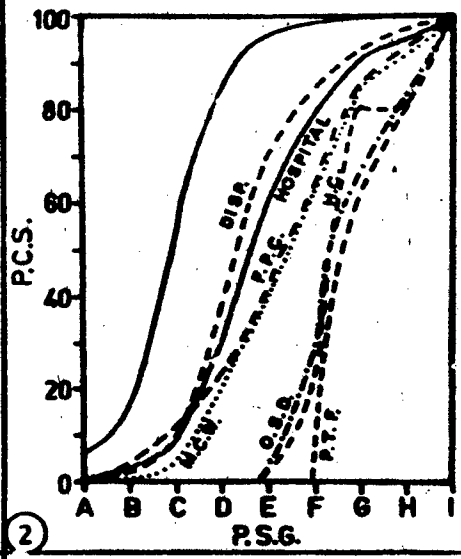
CUMULATIVE FREQUENCY CURVES OF THE ALL SETTLEMENTS AND THE SETTLEMENTS HAVING THE FUNCTION*

EDUCATIONAL



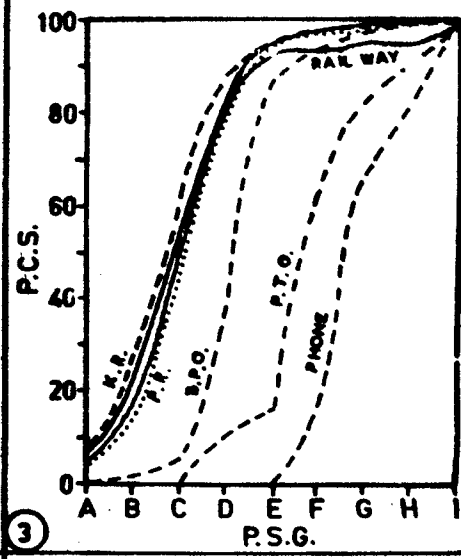
1

HEALTH



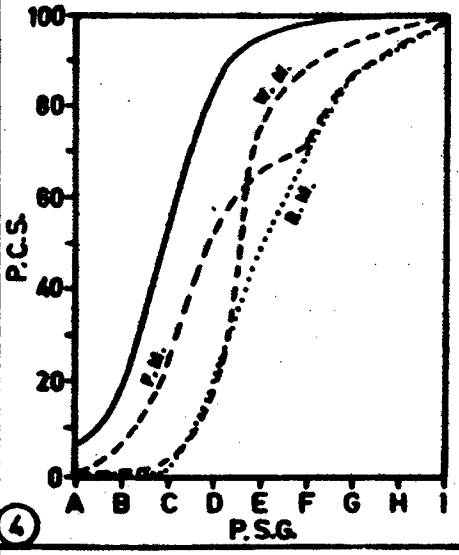
2

COMMUNICATION



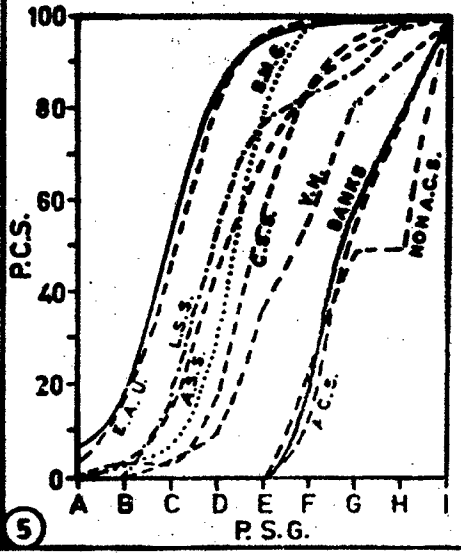
3

MARKET



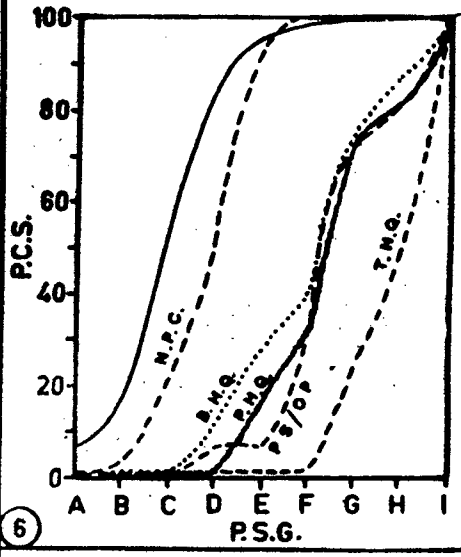
4

AGRO-ECONOMIC



5

PUBLIC ADMINISTRATION



6

REFERENCE

CUMULATIVE FREQUENCY CURVES (C.F.C.) OF THE ALL SETTLEMENTS

C.F.C. OF SETTLEMENTS HAVING THE FUNCTION (Sf)

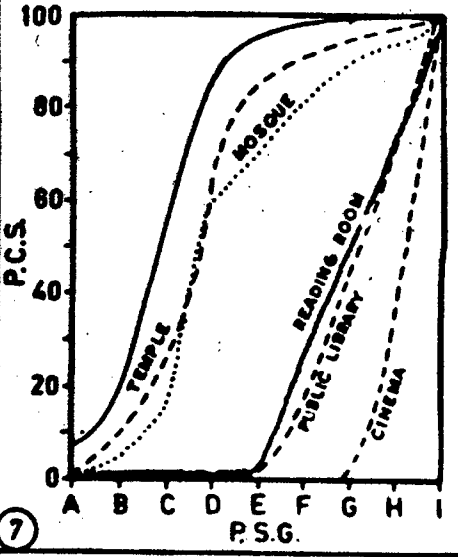
P. C. S. = PER CENT TO TOTAL Sf

P.S.G. = POPULATION SIZE GROUP (PERSONS)

A	< 200 PERSONS	F	5000 – 9999 PERSONS
B	200 – 499 "	G	10000 – 19999 "
C	500 – 999 "	H	20000 – 49999 "
D	1000 – 1999 "	I	50000 AND ABOVE
E	2000 – 4999 "		

* Abbreviations used for facilities (functions) refer to Text Table no. 5·01

LEISURE TIME AMENITIES



7

Generally, wherever there is a junior high school or higher secondary school, primary school would necessarily be there. But as the data reveals there are few exceptions in this district. The village Sihi (block Gulaothi), Pasoli (Lakhaoti) have no primary school but have junior high schools. Village Shekhupur of Danpur block has both junior high school and higher secondary school but does not have a primary school. The villages Manakpur (Bulandshahr block) and Bohich (Shikarpur) though have higher secondary schools but do not have primary schools. The main cause for this anomaly is that these villages are located very close to another village which has a primary school. About 55 settlements per 1000 settlements in the district have primary schools. The best pattern of spatial distribution of settlements having primary schools is found in Siyana block (Fig.15, Inset and Fig. 18A-1) and in the Khurja block condition is bad. The number of the settlements with primary schools per 100 settlements in these blocks is about about 97 and 47 respectively. In the blocks of Dankaur and Jewar the distribution of the primary schools (Fig. 17) is not widespread. Finally, it is evident from the illustration (Fig. 16-1) that the distribution pattern of the settlements having primary schools does not correspond to that of all the settlements of the district.

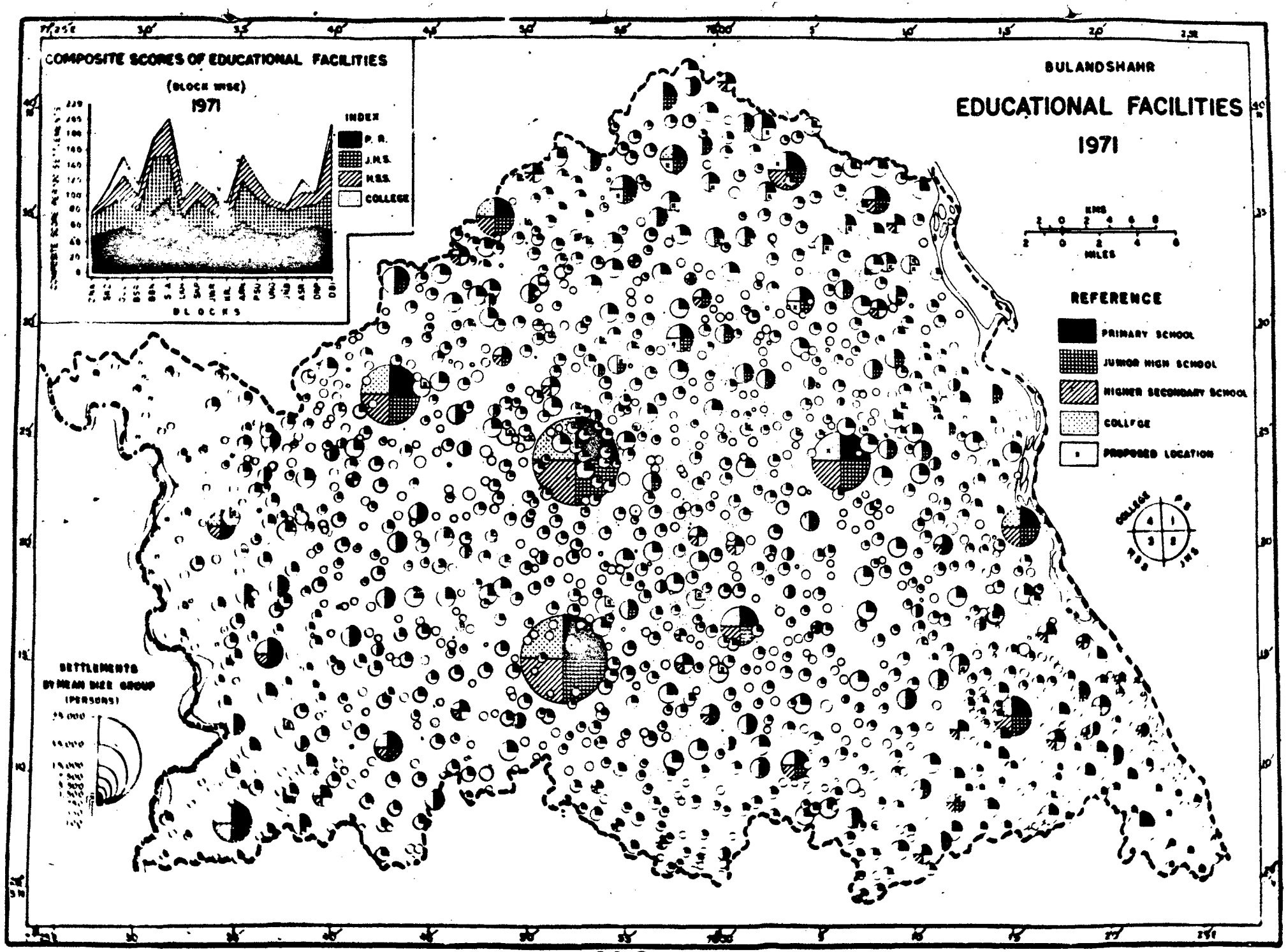

COMPOSITE SCORES OF EDUCATIONAL FACILITIES
(BLOCK WISE)
1971
INDEX
P. S.
J.H.S.
H.S.S.
COLLEGE
BLOCKS
BULANDSHAHR
EDUCATIONAL FACILITIES
1971
KMS
MILES
REFERENCE
PRIMARY SCHOOL
JUNIOR HIGH SCHOOL
HIGHER SECONDARY SCHOOL
COLLEGE
PROPOSED LOCATION
SETTLEMENTS
BY MEAN SIZE GROUP
(PERSONS)

FIG. 17

5.3.2 Junior High Schools

In Uttar Pradesh, in addition to separate junior high schools other high schools and intermediate colleges also impart the junior high school education. Therefore, all the higher secondary schools have also been included in the list of junior high schools for the purpose of seeing the distribution of this facility. 133 settlements, i.e., 9.6 per cent to the total settlements have junior high schools in the district and out of which 104 settlements (78.2 per cent) lie in the population size of 1,000-5,000 persons. In the size group of below 200 persons no settlement has junior high school while in the size group 200-500 persons there is only one settlement namely Dalegarh (381 persons) of Pahasu block which has a junior high school. All the settlements with the population of more than 5,000 persons have the junior high school facility (Table 5.02). It is also clear from the illustration (Fig. 16-1) that the frequency distribution of the size group wise settlements having junior high schools does not correspond to that of all the settlements of the district. It is also discerned that the settlements up to the population size of 1,000 persons have less facilities in terms of junior high schools. In the Ganga Khadar and the parts along the Yamuna river there are very few junior high schools. There are several major gaps showing absence of junior high schools in the district which can easily be seen from the map (Fig. 17).

BULANDSHAHR

LEVELS OF DEVELOPMENT
(BLOCK WISE)

BASED ON THE COMPOSITE SCORES OF SOCIAL FACILITIES

1971

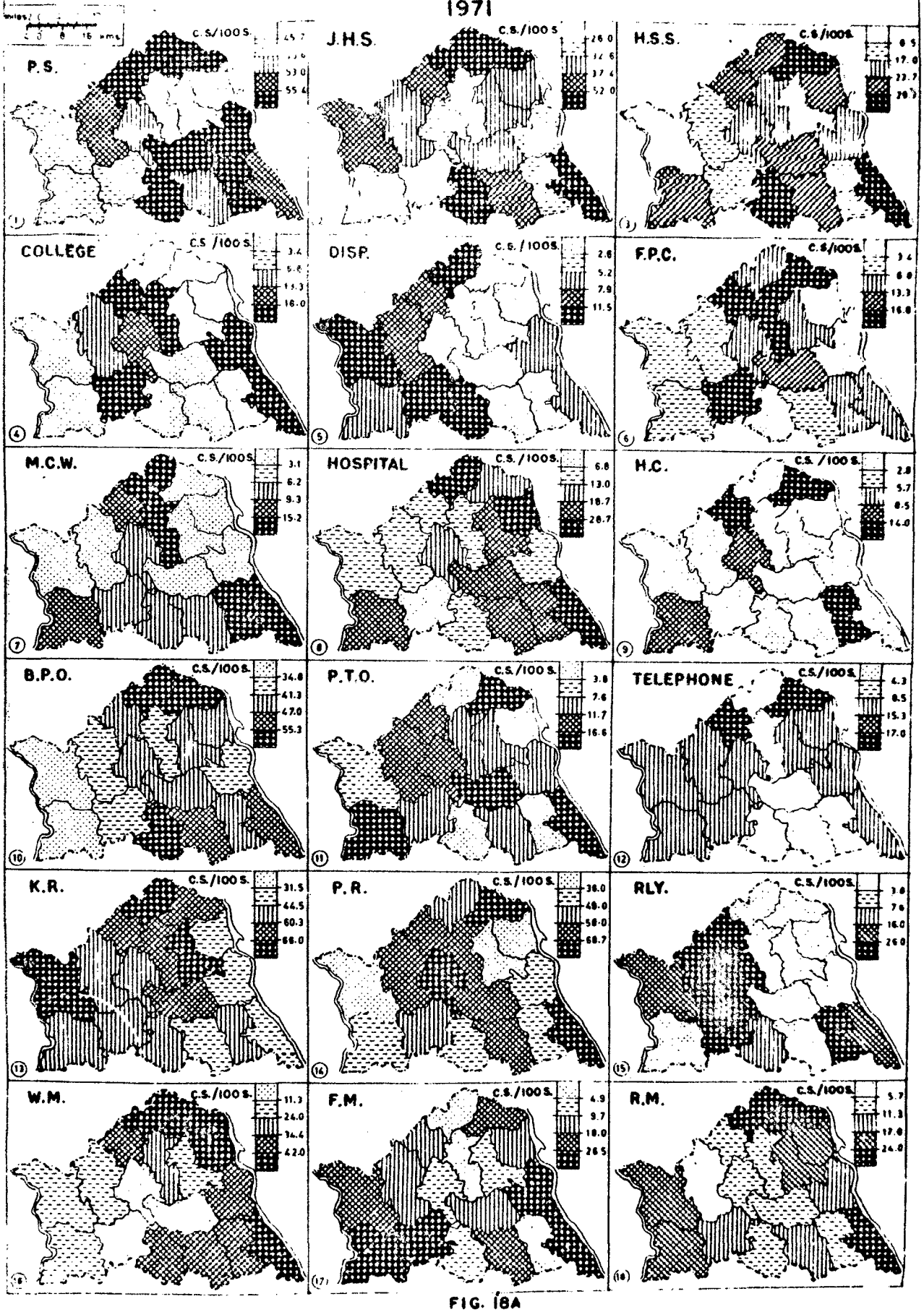
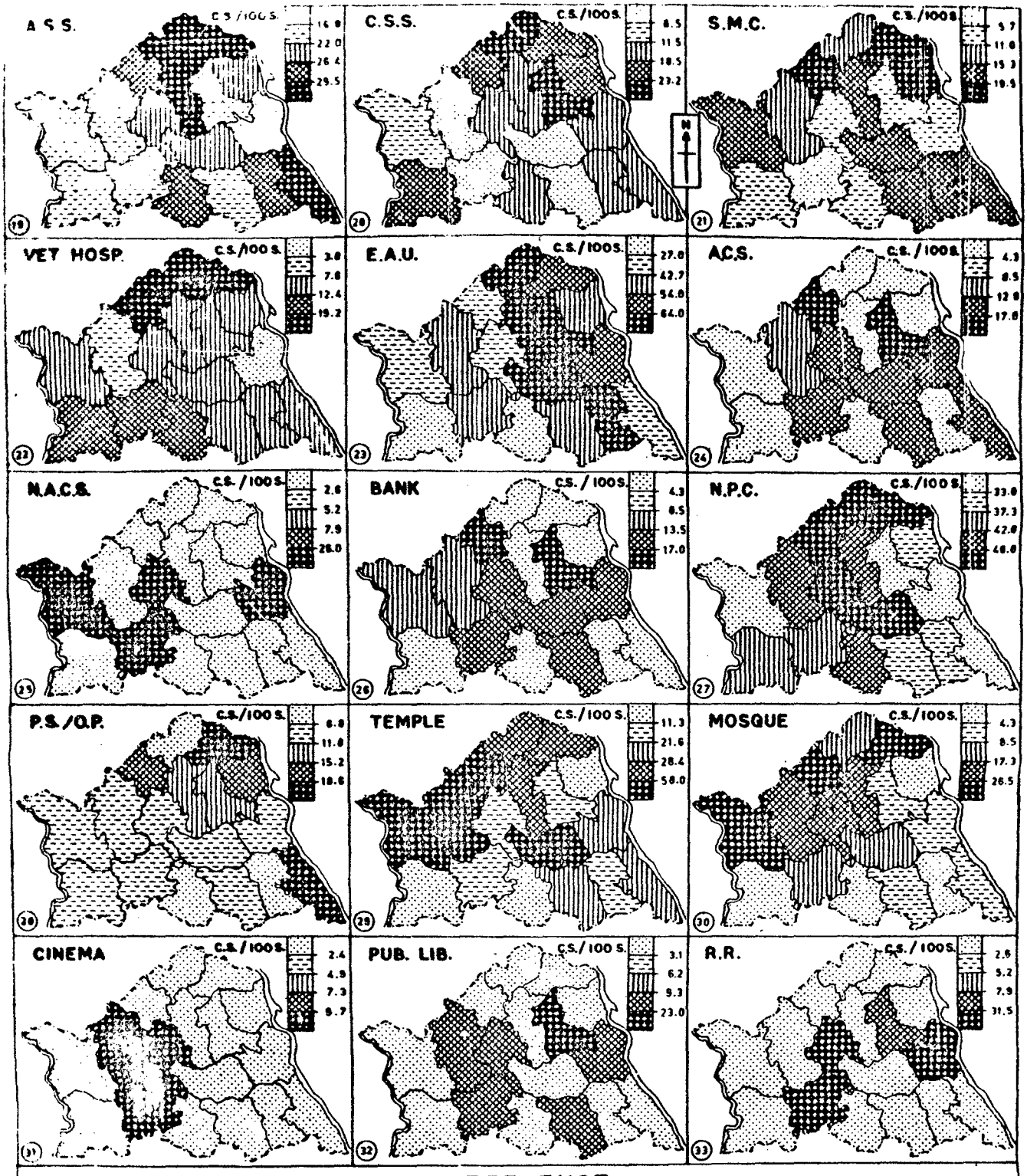


FIG. 18A



REFERENCE

C.S/100S.=COMPOSITE SCORE PER 100 SETTLEMENTS, P.S.=PRIMARY SCHOOL, J.H.S.=JUNIOR HIGH SCHOOL, H.S.S.=HIGHER SECONDARY SCHOOL, DISP.=DISPENSARY, F.P.C.=FAMILY PLANNING CENTRE, M.C.W.=MATERNITY & CHILD WELFARE CENTRE, H.C.=HEALTH CENTRE, B.P.O.=BRANCH POST OFFICE, P.T.O.=POST & TELEGRAPH OFFICE, K.R.=KACHCHA ROAD, P.R.=PUCCA ROAD, RLY.=RAILWAYS, W.M.=WEEKLY MARKET, F.M.=FAIR'S MARKET, R.M.=REGULATED MARKET, A.S.S.=AGRICULTURAL SEED STORE, C.S.S.=COOPERATIVE SEED STORE, S.M.C.=STOCK-MAN CENTRE, VET. HOSP.=VETERINARY HOSPITAL, E.A.U.=ELECTRICITY FOR AGRICULTURAL USAGE, A.C.S.=AGRICULTURAL CREDIT SOCIETY, N.A.C.S.=NON AGRICULTURAL CREDIT SOCIETY, N.P.C.=NYAI PANCHAYAT CENTRE, P.S./O.P.=POLICE STATION / OUT POST, PUB. LIB.=PUBLIC LIBRARY, R.R.=READING ROOM.

LEVELS

MOD. LOW
LOW
MEDIUM
HIGH
MOD. HIGH

0 KMS. 16

FIG. 18 B

The blocks of Bhawan Bahadur Nagar, Siyana, Arniya and Dibai have higher percentage of settlements with junior high schools while blocks of Lakhaoti and Khurja have less number of settlements with junior high schools per 100 settlements (Fig. 18A-2). Bulandshahr tahsil has better distribution of junior high schools and as many as 65 out of 190 junior high schools in the district are located here. Out of the total number of junior high schools as many as 56 (29.47 per cent) are located in urban settlements. The existing distribution of junior high schools indicates that more junior high schools will have to be opened to have a better distribution pattern.

5.3.3 Higher Secondary Schools

There are 77 higher secondary schools in Bulandshahr district which are located in 53 settlements. Out of these, 34 (44.15 per cent) are located in towns. Settlements having the population less than 500 persons do not have any higher secondary school. There is one settlement namely Manakpur in the size group of 500-1,000 persons which has a higher secondary school. In the settlements of population size group of 10,000 and above, all the settlements have higher secondary schools. The settlements in the size group of 2,000-5,000 persons have the highest percentage (35.8 per cent) of higher secondary schools in the district. About 67.9 per cent settlements having higher secondary schools fall in the population size group of 1,000-5,000 persons

(Table 5.02). It is clear from the illustration (Fig.16-1) that the frequency distribution of settlements having higher secondary schools by population size group except in a few cases corresponds almost to that of all the settlements.

In the Yamuna Khadar region the distribution of settlements having higher secondary school is very sparse while in the Ganga tract this distribution is dense. However, Dibai block experiences clustering of higher secondary schools showing 11 higher secondary schools per 100 settlements while the average proportion of settlements having higher secondary schools is 1.3 per cent to total settlements. Though, in the district, the over-all picture of the distribution of settlements with higher secondary schools is widespread there are some major locational gaps (Fig. 17) like Sikandrabad-Kasna-Dankaur triangle, Bulandshahr-Khurja-Sikandrabad triangle and Bulandshahr-Khanpur Gantu-Jahangirabad triangle etc.

5.3.4 Colleges and Other Higher Institutions

There are only 10 colleges in the district affiliated to Meerut University out of which only one is in the rural area located at Lakhaoti. No other settlement of the size of less than 10,000 persons has a college (Table 5.02) in the district. Out of 12 townships only six, viz., Sikandrabad, (ii) Gulaothi (1), Bulandshahr (2), Khurja (2), Anupshahr (1) and Dibai (1) have colleges (Fig. 17).

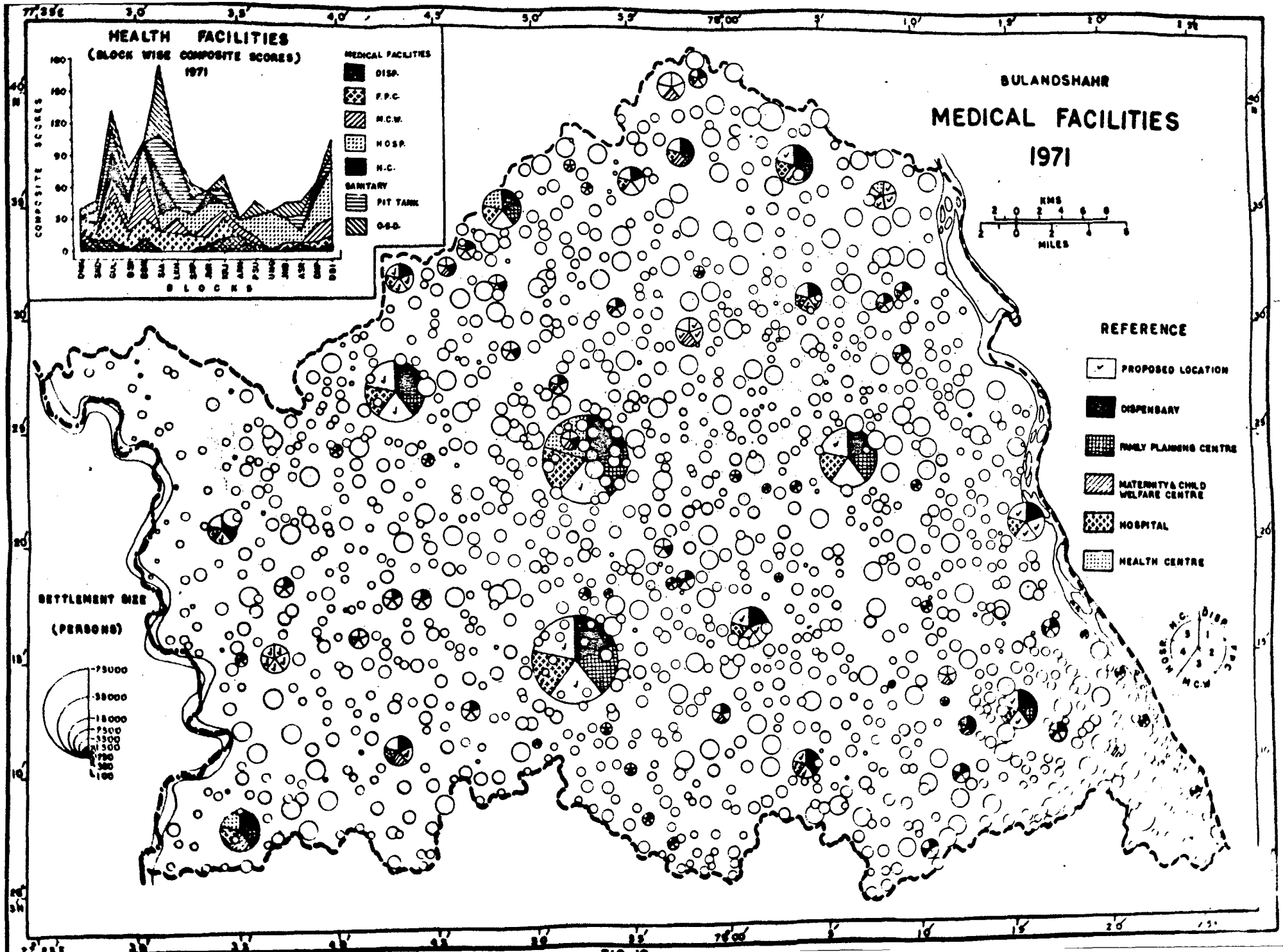
There is also one Government Diploma school in agriculture located at Bulandshahr. The district has one Government Polytechnic at Khurja and a few teacher's training schools and job training schools. However, an appraisal of the whole situation of the distribution of educational facilities it seems that there is need to extend more facilities in the district for providing proper opportunities to educate the people.

5.4 HEALTH FACILITIES

Health care is one of the most important indicators to measure the state of social well-being of a region. The medical care is no less important in development, because firstly it meets basic welfare need and secondly it greatly contributes to the efficiency of the regional labour force. Health facilities have been put under two heads to facilitate the analysis viz., (i) medical and (ii) sanitary facilities. In the present study the former includes dispensaries, hospitals, family welfare centres, family planning centres and health centres while the latter is related to the facility of garbage and sewage disposal which is confined to urban areas only.

5.4.1 Medical Facilities

According to the census records for 1971 there are about 113 medical care establishments in public sector,


HEALTH FACILITIES
(BLOCK WISE COMPOSITE SCORES)
1971
COMPOSITE SCORES
BLOCKS
MEDICAL FACILITIES
DISP.
F.P.C.
M.C.W.
HOSP.
H.C.
SANITARY
PIT TANK
O&D.
BULANDSHAHR
MEDICAL FACILITIES
1971
KMS
MILES
REFERENCE
PROPOSED LOCATION
DISPENSARY
FAMILY PLANNING CENTRE
MATERNITY & CHILD WELFARE CENTRE
HOSPITAL
HEALTH CENTRE
SETTLEMENT SIZE
(PERSONS)
75000
35000
18000
7500
3500
1500
750
350
100

out of which about 31.86 per cent are located in urban areas. Though the role of private practitioners in providing the medical aid specially to the rural population seems to be very crucial but this facility could not be included in the discussion because of the lack of data pertaining to registered medical practitioners.

5.4.1.1 Dispensaries

The total number of settlements having independent dispensary is 15 during 1971 census. Out of these 13 were located in rural settlements. But, since all the hospitals of the district include all those functions which are rendered by the dispensaries, the settlements with hospitals have also been included in the list of settlements having dispensary facilities. Thus, in the whole district 56 settlements have the facility of dispensaries, of which about 19.7 per cent are located at urban centres. The settlements belonging to the population size group below 200 persons do not have dispensary. The highest proportion of settlements having dispensary is recorded by (Table 5.03) those falling in the population size-class of 2,000-4,000 persons. It is observed that (Fig. 16-2) the frequency distribution pattern of the settlements having dispensary establishment to a greater extent, corresponds to that of all the settlements of the district.

The spatial pattern of distribution of settlements having dispansaries is not balanced. On an average settle-

TABLE 5.03

Distribution of Settlements by population size group having **Medical Facilities** during 1971.

Facility	P	No. of settlements by size group(persons) Below 200	200 to 499	500 to 999	1000 to 1999	2000 to 4999	5000 to 9999	10000 And Above	Total	RURAL	URBAN
1*	2	3	4	5	6	7	8	9	10	11	12
All Settlements	No.	72	217	461	442	170	13	10	1385	1373	12
	%	5.2	15.7	33.3	31.9	12.3	0.9	0.7	100.0	99.1	0.9
	Cf	5.2	20.9	54.2	86.1	98.4	99.3	100.0	-	-	-
Disp.	No.	-	1	3	16	19	8	9	56	45	11
	%	0.0	1.8	5.4	28.6	33.9	14.3	16.0	100.0	80.3	19.7
	Cf	0.0	1.8	7.2	35.8	69.7	84.0	100.0	-	-	-
F.P.C.	No.	0.0	1	2	3	5	6	10	27	15	12
	%	0.0	3.7	7.4	11.1	18.6	22.2	37.0	100.0	55.5	44.5
	Cf	0.0	3.7	11.1	22.2	40.8	62.0	100.0	-	-	-
M. C. W.	No.	-	-	1	5	5	7	10	28	16	12
	%	0.0	0.0	3.6	17.9	17.9	25.0	35.6	100.0	57.1	42.9
	Cf	0.0	0.0	3.6	21.5	39.4	64.4	100.0	-	-	-
Hosp.	No.	-	1	2	10	13	8	9	43	32	11
	%	0.0	2.3	4.7	23.3	3.3	18.6	20.8	100.0	74.4	23.6
	Cf	0.0	2.3	7.0	30.3	60.6	79.2	100.0	-	-	-
H.C.	No.	-	-	-	-	-	4	10	14	2	12
	%	0.0	0.0	0.0	0.0	0.0	28.6	71.4	100.0	14.3	85.7
	Cf	0.0	0.0	0.0	0.0	0.0	28.6	100.0	-	-	-

* Disp=Disp+Hosp., F.P.C.=F.P.C.+Town Hospitals, M.C.W.=M.C.W.+Town Hospitals; H.C.=H.C.+Towns Hospitals. Symbols refer to Test Table No.(5.01)

Data has been computed from the C.C.H. Bulletin 1971, Pt.A-A.

ments with a mean population of 5,260 persons possesses dispensary facility. Sikandrabad tahsil has 41 settlements per dispensary, while Bulandshahr tahsil has 217 settlements per dispensary. The blocks of Dankaur, Arniya, Siyana and Khurja (Fig. 18A-5) are better served than the blocks, lying in the upland tract of the Kali and the Chhoiya Nadi.

5.4.1.2 Family Planning Centres

The total number of independent Family Planning (F.P.) Centres in the district is 22 only. But in most of the towns, F.P. centres are not independently located but are attached with the hospitals. About 27 establishments render family planning service in the district, (Table 5.03) out of which 12 (44.5 per cent) are located in townships. Settlements falling in the size category of below 200 persons do not have any dispensary. About 77.8 per cent family planning centres are located in the villages of the size of above 1,000 persons. The percentage frequency distribution (Fig. 16-2) pattern of settlement in various size classes with family planning centre reveals that it does not correspond to the distribution of the pattern of all settlements in various size classes. It further indicates that the larger settlements need more family planning centres to be established to attain an optimal state of spatial organisation of family planning service facilities.

The smallest village having family planning centre is Mena Kalender Garhi in Khurja block with a population of 299 persons. But the mean population size settlement having a family planning centre is of 6,220 persons. The average number of settlements per health centre in the district is about 51. The locations of family planning centres (Fig.19) are not uniformly distributed and their number seems to be very inadequate. In tahsil Bulandshahr there is one family planning centre for 33 settlements followed by Khurja tahsil where 77 settlements are served by one family planning centre. The service rendered by each family planning centre in various blocks is as below : Gulaothi (15.15 settlements/F.P. centre), Khurja (30.765/F.P. centre), Siyana (345/F.P. centre) and Lakhaoti (375/F.P. centre). In the Upper Ganga Khadar tract (i.e., Unchagaon and Anupshahr blocks) and Arniya blocks (Fig. 18A-6) there is dearth of family planning centres. It can be seen that 27 family planning centres for the population of about 19 lakhs of persons are not sufficient to serve the cause of family planning for social well-being.

5.4.1.3 Maternity and Child Welfare Centres

There are 28 maternity and child welfare (MCW) Centres (Table 5.03) in the district according to 1971 census, out of which 16 establishments (Appendix XV) are independently located in rural areas. In the towns the M.C.W centres are attached with the hospitals. This distribution shows that one M.C.W centre covers on an average of 49.5 settlements.

No settlement of the district has a M.C.W. centre which has a population size of 1,000 persons. The smallest village having M.C.W centre is Dashehra Kherli (1,125 persons) of Arniya block. The average population size of settlement having M.C.W. centre facility is 5,980 persons. The maximum number of M.C.W. centres is found in the settlements of the population size group of 10,000 persons and above. The distribution pattern of settlements having M.C.W. centre does not correspond to that of the pattern of all the settlements (Fig. 16-2) in the area.

The spatial distribution of M.C.W. centres (Fig. 19) is not at all uniform. Sikandrabad tahsil is most poorly served while Bulandshahr tahsil is better served. Among the blocks, Bhawan Bahadur Nagar block has the largest number (Fig. 18A-7) of M.C.W. centres in which one centre, on an average, serves about 16 villages. Keeping in view the low literacy rate (22 per cent) of the population in the district it is suggested that this facility be more strengthened and more uniformly distributed to be within the reach of the people.

5.4.1.4 Hospitals

The total number of hospitals in the district is 43 out of which 19.7 per cent are located in towns serving about 14 per cent of population. The hospital service is a higher order service because it is a multi-functional

medical care unit. The villages having a population size of less than 1,000 persons do not have hospital except Daripur village of Pahasu block (Fig. 19) has a hospital though its total population is 319 persons only. The settlements belonging to the population size group of 1,000-2,000 and 2,000-3,000 persons have about 10 hospitals in all (Table 5.03). The frequency distribution pattern of the settlements having hospital corresponds (Fig. 16-2) to that of all the settlements of the district.

The spatial distribution of hospitals (Fig. 19) is also not uniform. The lowest number of hospitals serving an average of 51 settlements is recorded in Sikandrabad tahsil while Anupshahr has one hospital for 20 settlements. On an average, there is one hospital to serve about 32 settlements. Among the blocks the Dibai is in a better situation as it has one hospital for about 12 settlements i.e. for an average population of about 16,731 persons while Khurja has one hospital for 91 settlements i.e., for a population of 135,156 persons.

5.4.1.5 Health Centres

The total health centres in the district are 14. This low number is because the services of a health centre are partly rendered by the dispensary and other medical care centres also. About 85.7 per cent health centres are located in towns which are responsible for medical administration

also. No settlement with a population up to 5,000 persons has a health centre. Thus, it is quite clear that the population size group wise the pattern of frequency distribution of the settlements having health centre does not correspond to that of all settlements (Fig. 16.2).

Bulandshahr tahsil has the largest number of health centres. Among blocks the Siyana block has one health centre (Fig. 18A.9) to serve about 35 settlements.

Finally, it is concluded that the existing medical facilities in the district are quite inadequate and are not optimally located. More emphasis should be laid on establishing compact medical units at the optimal locations in the area and reduce their multiplicity.

5.4.2 Sanitary Facilities

Sanitary facilities have been the function of the urban health activities which mainly refers to the system of sewage and garbage disposal. Generally, in all the towns except Bulandshahr the disposal of night soil and garbage is still done through basket, handcart or head-load. In Bulandshahr town mechanical transport is used for this purpose. There are two systems for sewage disposal prevalent in the town, viz., (i) pit tank and (ii) open surface drainage (Appendix XV). Out of the 12 towns of the district only four towns, i.e., Dankaur, Burgrasi,

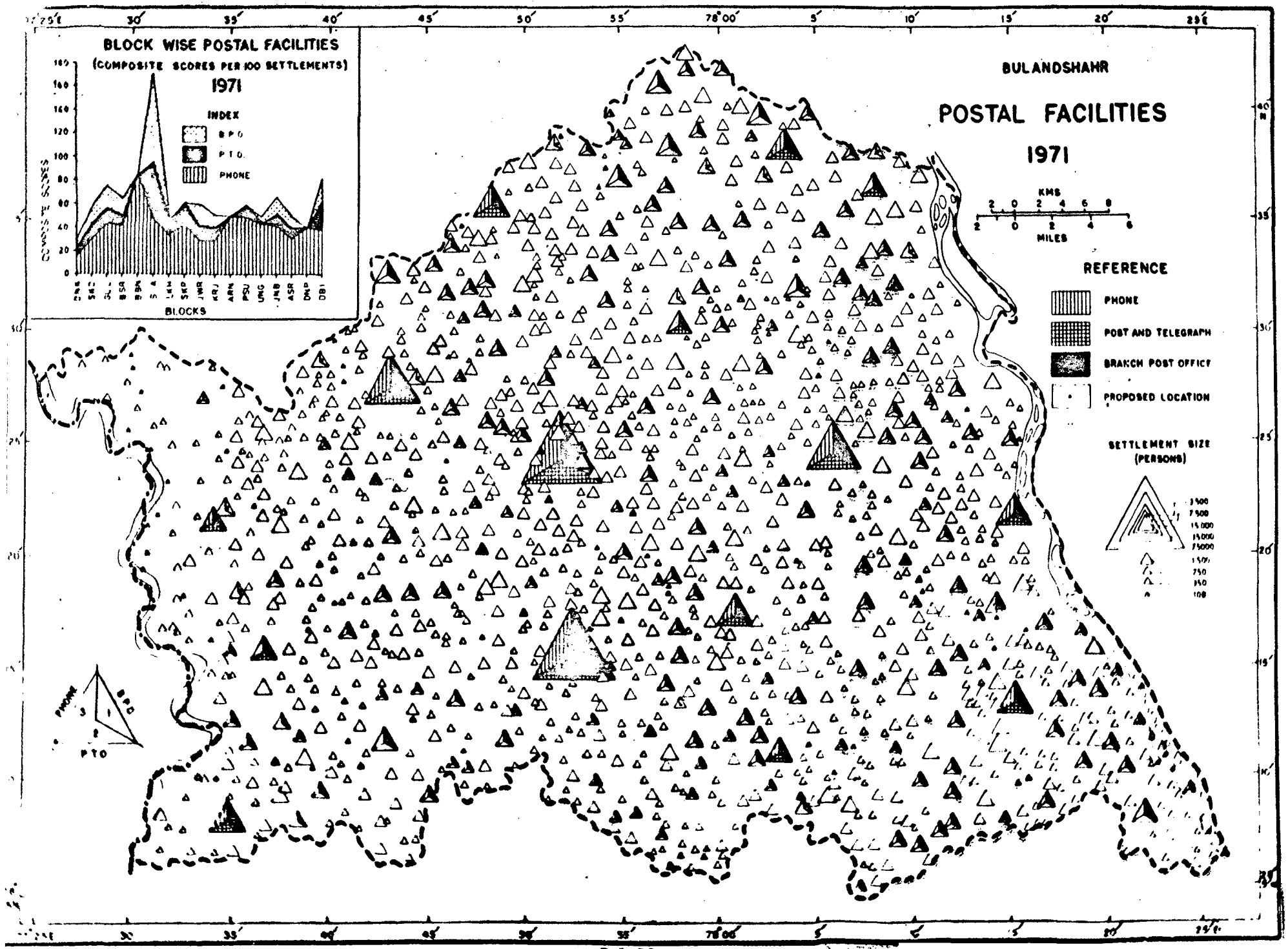

BLOCK WISE POSTAL FACILITIES
(COMPOSITE SCORES PER 100 SETTLEMENTS)
1971
INDEX
B.P.O.
P.T.O.
PHONE
COMPOSITE SCORES
BLOCKS
BULANDSHAHR
POSTAL FACILITIES
1971
KMS
MILES
REFERENCE
PHONE
POST AND TELEGRAPH
BRANCH POST OFFICE
PROPOSED LOCATION
SETTLEMENT SIZE
(PERSONS)
PHONE
B.P.O.
P.T.O.

FIG. 20

Jahangirabad and Pahasu do not have the facility of pit tank type of sewage disposal system. Rest all the eight towns have both the systems of pit tank and open surface drainage (Fig. 19 Inset). This shows that for providing the better sanitary conditions and to save the people from health hazards modern systems for the garbage and sewage disposal are actually acutely needed not only in the towns but also in the large size villages.

5.5 COMMUNICATION SERVICES

The introduction of communication services has revolutionized the patterns of human life. In fact, movements - economic and social, of ideas, goods and of people by means, ranging from walking to telecommunication - make possible the specialisation of location.[3] The communication services specially the transport network is most important factor in determining the location of markets and fairs.[4] The transport connectivity has also been found as one of the most significant factors determining the location and growth of the market centres with special reference to rural places of market and fairs.[5] On the basis of the movement of ideas, goods and man, the communication services can be classified into (a) postal and (b) transport facilities.

5.5.1 Postal Services

The postal service facilities can be classified into (i) branch post offices, (ii) post and telegraph offices

and (iii) public call offices (PCOs).

5.5.1.1 Branch Post Offices

The district has 203 such settlements (Table 5.04) that have branch post offices. The branch post office is the lowest order of postal service establishments. The places having post and telegraph offices have also been included in the list of branch post offices because they include the services provided by branch post offices. Every seventh settlement of the district has one branch post office. The maximum number of settlements having branch offices fall in the population size group of 2,000 to 5,000 persons and number 101 accounting for 49.7 per cent of the total such settlements. About 93.1 per cent settlements with branch post offices have more than 1,000 persons. The smallest village having post office with a population of 195 persons is Pali in Bhawan Bahadur Nagar block. The pattern of frequency distribution (Fig. 16-3) of settlements having branch post offices does not correspond to that of all the settlements specially in case of the villages with a population up to 2,000 persons. Villages in the population size of less than 2,000 persons require more branch post offices.

Except few spatial gaps in the locational pattern of branch post offices like Dankaur block, north-central Shikarpur block, and the area of the Kali river lying in the

TABLE 5.04

Distribution of Settlements by Population Size Group having communication facilities during 1971.**

Facility*	P	No. of settlements by Size-Group (persons)									
		Below 200	200 to 499	500 to 999	1000 to 1999	2000 to 4999	5000 to 9999	10000 and above	Total	Rural	Urban
1	2	3	4	5	6	7	8	9	10	11	12
POSTAL FACILITIES											
B.P.O.	No.	1	2	9	67	101	13	10	203	91	12
	%	0.5	1.0	4.4	33.0	49.7	6.4	3.0	100.0	94.1	5.9
P.T.O.	No.	-	-	-	2	1	5	10	18	6	12
	%	0.0	0.0	0.0	11.1	5.6	27.8	55.5	100.0	33.3	67.7
PHONE	No.	-	-	-	-	-	2	10	12	1	11
	%	0.0	0.0	0.0	0.0	0.0	16.7	83.3	100.0	8.3	91.7
TRANSPORT FACILITIES											
K.R.	No.	41	131	229	211	81	5	10	708	696	12
	%	5.8	18.5	22.3	29.8	11.5	0.7	1.4	100.0	98.3	1.7
P.R.	No.	22	60	171	189	86	10	10	548	536	12
	%	4.0	10.9	31.2	34.5	15.7	1.8	1.9	100.0	97.8	2.2
RLY.	No.	2	8	16	17	5	-	3	51	48	3
	%	3.9	15.7	31.4	33.3	9.8	0.0	5.9	100.0	94.1	5.9
All Settle-ments.	No.	72	217	461	442	170	13	10	1385	1373	12
	%	5.2	15.7	33.3	31.9	12.3	0.9	0.7	100.0	99.1	0.9

* B.P.O.=B.P.O.+P.T.O., K.R.=K.R.+Canal Road
Abbreviations used refer to Text Table No.(5.01)
Data has been computed from the D.C.H. Bulandshahr, Part X-A.1971.

blocks of Gulaothi and Bhawan Bahadur Nagar, the distribution of branch post offices (Fig. 20) seems to be uniform. The tahsil of Bulandshahr has the largest number of branch post offices, on an average, about 6 villages are served by one branch post office. These figures for Anupshahr, Khurja and

Sikandrabad tahsils are round about 7, 11 and 12 respectively. Among the blocks Siyana, Bhawan Bahadur Nagar and Arniya have 3, 3.5 and 5 settlements per branch post office though the average for the district is 7 settlements per branch post office. The Yamuna Khadar region consisting of blocks of Dankaur and Jewar (Fig. 18A-10) has low number of branch post offices because this whole region is thinly populated. It is suggested that in locating the branch post offices the centrality criteria should be kept in view by the authorities.

5.5.1.2 Post and Telegraph Offices

The district has 18 post and telegraph offices which shows that on an average each post and telegraph office serves about 77 settlements. No settlement with a population size of less than 1,000 persons has post and telegraph service. The pattern of frequency distribution of settlements with post and telegraph offices by size group does not correspond to that of all settlements having the population up to 5,000 persons (Fig. 16-3). The illustration further shows that there is much scope to increase the number of post and telegraph offices to an optimal stage. Among the tahsils, Bulandshahr tahsil and among the blocks the Siyana block (Fig. 18A-11) have the highest number of post and telegraph offices in the district.

5.5.1.3 Telephone Facility

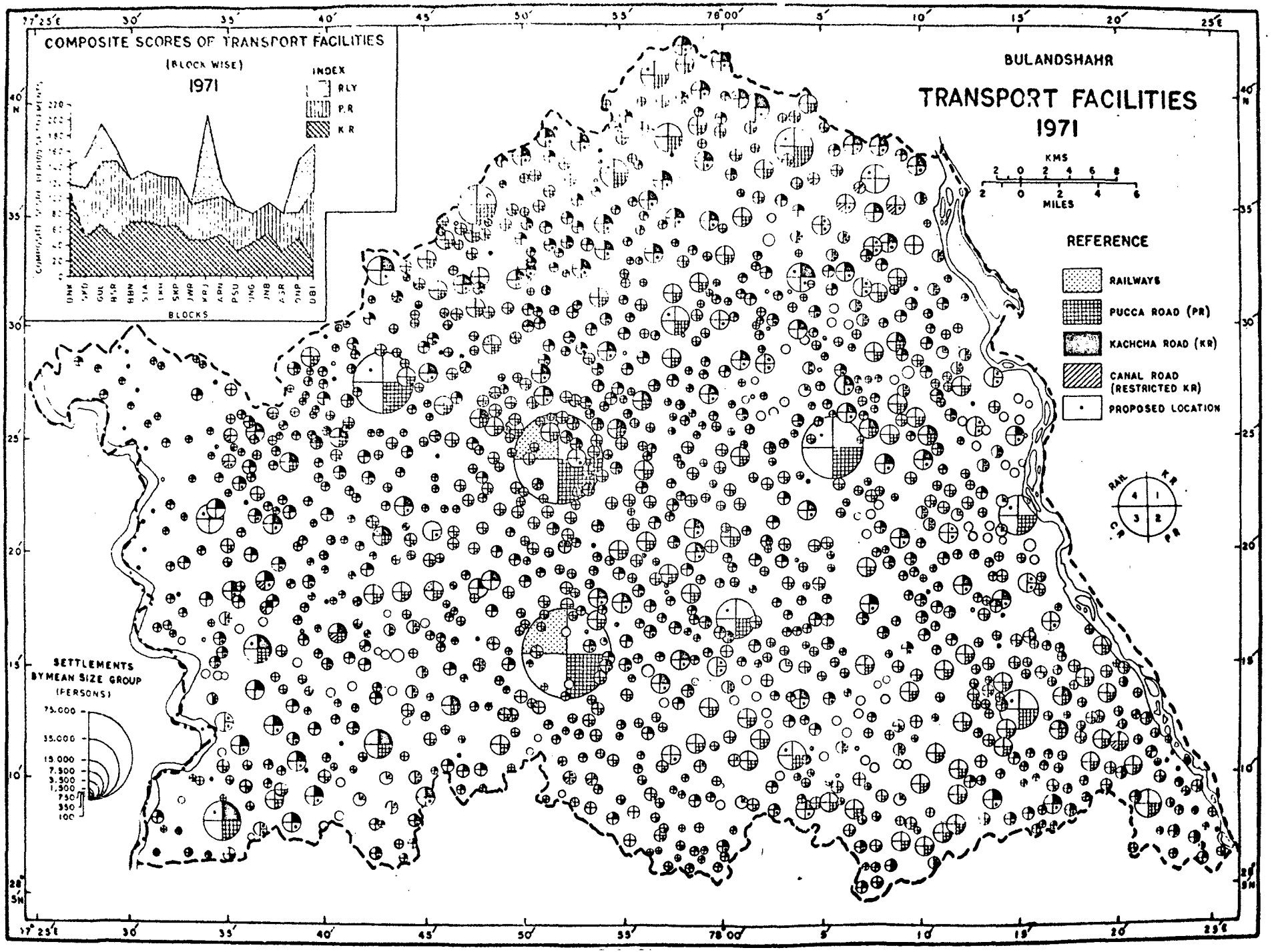
The telephone facility in the district is scanty. There are 10 settlements with telephone facility out of which nine are towns. The tenth settlement Jewar is a de-classified town of 1961. The frequency distribution pattern of phone facility (Fig. 16-3) shows that the phone facility should be extended in more settlements of large size rationally distributed and optimally located. The blocks of Bhawan Bahadur Nagar, Lakhaoti, Shikarpur, Arniya, Pahasu and Danpur do not have phone facility while the Bulandshahr tahsil (Fig. 18A-12) has the higher concentration of telephones as Bulandshahr town is the District Headquarters.

5.5.2 Transport Facilities

The development of an efficient transport system and provision of such facilities is of crucial importance for over all development of an area. The transport network in the district includes Kachcha (unmetalled) roads, Pucca (metalled) roads and railways. There are canal roads in the district but they are restricted routes for plying the carts and heavy vehicles by the general public.

5.5.2.1 Kachcha Roads

Out of the total 1385 settlements 708 (51.1 per cent) (Table 5.04) are connected with the Kachcha road. The


BULANDSHAHR
TRANSPORT FACILITIES
1971
KMS
MILES
REFERENCE
RAILWAYS
PUCCA ROAD (PR)
KACHCHA ROAD (KR)
CANAL ROAD (RESTRICTED KR)
PROPOSED LOCATION
RAIL
KR
CR
PR
COMPOSITE SCORES OF TRANSPORT FACILITIES
(BLOCK WISE)
1971
INDEX
RLY
P.R
K R
BLOCKS
SETTLEMENTS BY MEAN SIZE GROUP
(PERSONS)
75,000
35,000
15,000
7,500
3,500
1,500
750
350
100

highest percentage (29.8 per cent) of the settlements to the total settlements having Kachcha road in the district are found in the settlements of population size group of 1,000-2,000 persons. The settlements having kachcha road falling in the size group of 500-1,000 persons account for 22.3 per cent. It means that this group of settlements require roads. Although the frequency distribution pattern of settlements by population size groups having Kachcha road correspond to that of all the settlements of the district

Spatial distribution of the settlements having Kachcha road (Fig. 21) is uniform in the district except those in the Yamuna Khadar, the Ganga Khadar and some parts of Shikarpur, Danpur and Pahasu blocks. The maximum number of settlements with Kachcha road is found in Sikandrabad tahsil while the lowest number of settlements with Kachcha road is found in Khurja tahsil. Dankaur, Bhawan Bahadur Nagar and Lakhaoti (Fig. 18-13) blocks have more settlements with kachcha road. The blocks of Unchagaon, Anupshahr and Dibai that lie in the Ganga Khadar and Pahasu block in Khurja tahsil have less number of settlements with Kachcha road. There are 97 settlements with Kachcha road per 100 settlements showing the highest number of settlements in Dankaur block and 29 settlements with Kachcha road per 100 settlements i.e., the lowest in Pahasu block, while the district figures are 51 settlements with kachcha road per 100 settlements.

5.5.2.2 Pucca Roads

All the important towns, tahsils and block headquarters are accessible by roads. 70 kilometres of Grand Trunk road runs in the district. Other important roads are Meerut-Bulandshahr, Grahmukteswar-Bulandshahr, Bulandshahr-Anupshahr, Khurja-Jewar, Sikandrabad-Dankaur, Aligarh-Anupshahr, Dibai-Bulandshahr via Shikarpur and Bulandshahr Jhajhar road links etc. Various types of road lengths maintained by different organisations as painted roads (460 kms.), waterbound roads (150 kms.) and cement concrete roads (0.4 km.) were available in the district as on March 1971. The district thus, has 3.2 kms. of metalled roads per 10,000 of population[6] against the U.P. State's figure of 3.0 kilometres.[7] Out of the total settlements only 548 (39.56 per cent) have pucca road facility (Table 5.04). The frequency distribution of settlements having pucca road by population size group (Fig. 16-3) very nearly corresponds to that of the pattern of all the settlements. This shows that the size group wise distribution of settlements having pucca road in the district is rational.

The spatial pattern of distribution of the settlements having pucca road facility seems to be quite irregular. From the map (Fig. 21) a clear linear pattern of settlements lying along the pucca roads, can easily be seen. There are about 40 settlements with pucca road, out of every 100

settlements. The highest number of settlements with pucca road (50.3 settlements per 100 settlements) is recorded in the Bulandshahr tahsil. The lowest number is found in Khurja tahsil where 25.3 settlements per 100 settlements have pucca road. Amongst the blocks Bulandshahr is well served with pucca road while Dankaur is the least served block.

5.5.2.3 Railways

3.68 per cent settlements (51 settlements) (Table 5.04) have the easy access to avail the facility of railways. Three railway lines namely Howrah-Delhi main line, Aligarh-Chandausi branch line and Khurja-Meerut branch, pass through the district. A total network of 110 kilometres lies in the district on all these three sections.[8] It means the district has 2.51 kilometres of railways for per 100 square kilometres of its area.

The spatial distribution of the settlements having the railway facilities in the district is quite irregular. Bhawan Bahadur Nagar, Siyana, Lakhaoti, Shikarpur, Jewar, Pahasu, Unchagaon, Jahangirabad and Anupshahr blocks do not have any railway length. Khurja block has the maximum number of villages (16.3 per 100 settlements) having railway facility followed by the block of Gulaothi where 11.85 settlements per 100 settlements have railway facility.

5.5.2.4 Accessibility by Rail-Road

An analysis of the accessibility by rail and road reveals that no place is at the distance of more than 7 kilometres either by railway station or road in the district. The road service has no limitations like railway station because on all the roads except the Grand Trunk Road private buses are plied. Therefore, at any place, located at the road one can have a bus connection very easily.

57.54 per cent area (Table 5.05) of the district lies within a range of one kilometre distance by rail-road facility. In this range about 807 settlements (58.78 per cent) are covered. Within the range of 1 to 2 kilometres either from road or railway station there lies about 20.30 per cent area of the district covering the location of about 249 (18.13 per cent) settlements. Within the range from 2 to 4 kilometres about 75.87 per cent square kilometre (17.31 per cent) area is covered consisting of about 253 (18.44 per cent) settlements of the district. Beyond the distance of 4 kilometres there lie about 213.03 sq. km. (4.85 per cent) area comprising of 64 settlements (4.66 per cent) of the district.

The total length of pucca roads in the study area is about 466 kilometres (Fig. 22), as an average of one kilometre pucca road within about 6.5 square kilometre of area of the district. The network of kachcha roads totals

TABLE 5.05 Distribution of Settlements and Spatial Coverage Under Rail-Road Accessibility Zones in Bulandshahr During 1971*

Range of Accessibility (km.)	Area Coverage (sq.km.)	Per cent Area to Total Area	Per cent Cumulative frequency	No. of settlements falling per Range	Per cent to Total Settlements	Per cent Cumulative frequency
0 - 1	2523.27	57.54	57.54	807	58.78	58.78
1 - 2	890.05	20.30	77.84	249	18.13	76.91
2 - 3	549.73	12.54	90.38	180	13.11	90.02
3 - 4	209.14	4.77	95.15	73	5.32	95.34
4 - 5	156.05	3.56	98.71	52	3.79	99.13
5 - 6	38.85	0.88	99.59	7	0.51	99.64
6 & above	18.13	0.41	100.00	5	0.36	100.00
TOTAL	4385.22	100.00	-	1373	100.00	

* Statistics has been generated on the basis of measurement made from the map of rail-road accessibility of the area

about 678 kilometres in length which come to one kilometre of Kachcha road per 9.4 square kilometre area of the district. The total existing lenghts of roads of both the Kachcha and pucca roads (1144 kms.) shows that there is one kilometre of road for about 3.83 sq. km. of area. It means more intensive network of roads is required to achieve an optimal

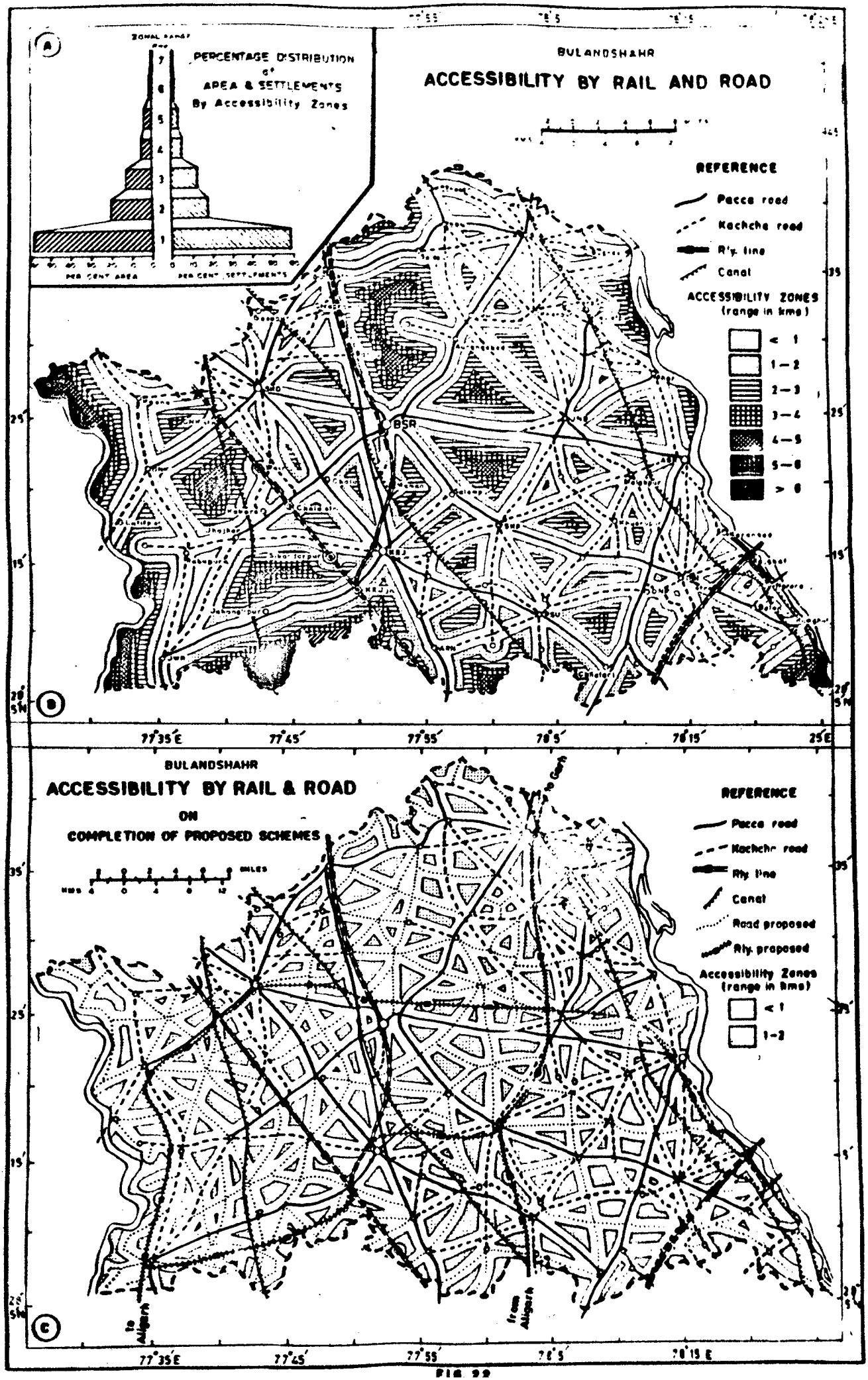

A
PERCENTAGE DISTRIBUTION
of
AREA & SETTLEMENTS
By Accessibility Zones
ZONAL RANGE
PER CENT AREA
PER CENT SETTLEMENTS
BULANDSHAHR
ACCESSIBILITY BY RAIL AND ROAD
REFERENCE
Pucca road
Kachcha road
R'y. line
Canal
ACCESSIBILITY ZONES
(range in kms)
< 1
1 – 2
2 – 3
3 – 4
4 – 5
5 – 6
> 6
BSR
B
77°35'E
77°45'
77°55'
78°5'
78°15'
25'
28°5'N
BULANDSHAHR
ACCESSIBILITY BY RAIL & ROAD
ON
COMPLETION OF PROPOSED SCHEMES
MILES
REFERENCE
Pucca road
Kachchi road
Rly line
Canal
Road proposed
Rly. proposed
Accessibility Zones
(range in Kms)
< 1
1–2
C
Aligarh
77°35'E
77°45'
77°55'
78°5'
78°15 E

FIG. 22

transportation facility. The proposed network (Fig. 22-B) in the first phase away indicates the fact that no settlement would be away beyond 2 kilometres either from pucca road or Kachcha road. In such a condition about 500 km. of more roads have to be constructed giving an average of about 0.37 kilometre road per one sq. kilometre, of area of the district.

5.6 MARKET FACILITIES

Market places are sites where there are a number of buyers and sellers, and where price offered and paid by each is effected by the decision of the others.[9] On the basis of the size and functional nature, the markets may mainly be of three types in Indian context, viz., (a) weekly markets, (b) fair markets and (c) regulated markets. For determining the location and evolution of markets the transport network and connectivity on the one hand, and the existence of national highways[10] and the places being nodes of best connectivity[11] on the other have been found to be the most important factors. Though the weekly markets and fair markets both are periodic markets, but they differ in their definition. A weekly market is primarily a weekly assemblage of local traders organised to facilitate retail operations. Such a market is considered to be the final need of all the economic activities of the area concerned. In this sense it is a replica of market; the difference is

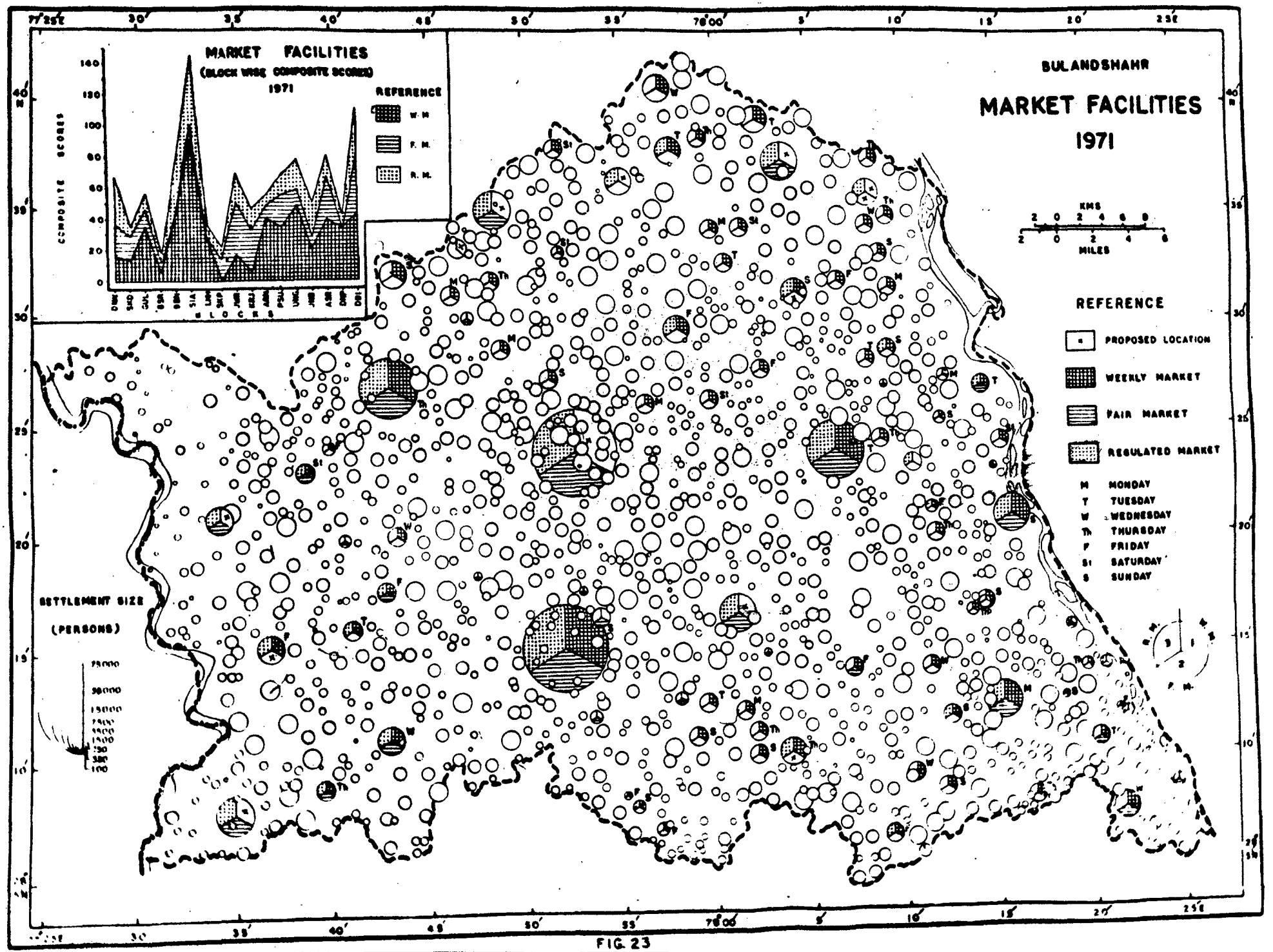

MARKET FACILITIES
(BLOCK WISE COMPOSITE SCORES)
1971
REFERENCE
W. M.
F. M.
R. M.
COMPOSITE SCORES
BLOCKS
BULANDSHAHR
MARKET FACILITIES
1971
KMS
MILES
REFERENCE
PROPOSED LOCATION
WEEKLY MARKET
FAIR MARKET
REGULATED MARKET
M MONDAY
T TUESDAY
W WEDNESDAY
Th THURSDAY
F FRIDAY
St SATURDAY
S SUNDAY
SETTLEMENT SIZE
(PERSONS)

FIG. 23

only of a degree not of kind.[12] Fairs, on the other hand, are held occasionally, may be once or twice a year. These fairs perform economic functions of exchange and are also important centres for religious and cultural activities. Fairs are life barometers for the entire region concerned faithfully measuring the multifacet activities of the people on a wider perspective.[13] Besides these two types of periodic markets third one known as 'regulated market' is generally found in the urban centres. The regulated markets are characterised with the functioning of retail and/or whole sale systems.

5.6.1 Weekly Markets

In the district, there are about 70 weekly markets, haat or penth out of which 6 are held in towns. The highest number of settlements (43) having weekly market facility lie in the population size group of 2,000-4,000 persons (Table 5.06) and the settlements falling in the size group of less than 500 persons do not have weekly markets. The size group wise, pattern of frequency distribution of settlements having weekly market does not correspond to that of the general distribution (Fig. 16-4) of the settlement of the district.

In the district as a whole the distribution of settlements with weekly markets is not uniform. In the Khadar tract of Ganga river the weekly market centres are

TABLE 5.06

Distribution of Settlements by Population Size Group having Market Facilities during 1971.

Facility	P*	Settlements By Population Size Group (Persons)									
		Below 200	200 to 499	500 to 999	1000 to 1999	2000 to 4999	5000 to 9999	10000 and above	T	R	U
1	2	3	4	5	6	7	8	9	10	11	12
All Settlements	No.	72	217	461	442	170	13	10	1385	1373	12
	%	5.2	15.7	33.3	31.9	12.3	0.9	0.7	100.0	99.0	0.9
	Cf	5.2	20.9	54.2	86.1	98.4	99.3	100.0	-	-	-
W.M.	No.	-	-	2	10	43	8	7	70	64	6
	%	-	-	2.0	14.3	61.4	11.4	10.0	100.0	91.4	8.6
	Cf	-	-	2.9	17.2	78.6	90.0	100.0	-	-	-
F.M.	No.	2	6	11	5	1	2	9	36	26	10
	%	5.6	16.6	30.5	13.9	2.8	5.6	25.0	100.0	72.2	37.8
	Cf	-	5.6	22.3	52.9	66.8	72.3	100.0	-	-	-
R.M.	No.	-	-	-	6	10	7	10	33	21	12
	%	0.0	0.0	0.0	18.2	30.3	21.1	30.4	100.0	63.6	36.4
	Cf	0.0	0.0	0.0	18.2	48.5	69.6	100.0	-	-	-

* P=Particulars; T=Total; R=Rural and U=Urban
Cf=Cumulative Frequency (Percent) and other symbols refer to Text Table No. (5.01).

Data has been computed from the basic statistics given in the D.C.H. of Bulandshahr District, 1961; and Pt.X-A 1971.

uniformly distributed while in the Yamuna Khadar weekly markets centres are few. It is because the area is flood striken and inaccessible too. The central part of the district has also only a few (Fig. 23) weekly market places because of the closer location of three towns namely Bulandshahr, Khurja and Sikandrabad and one medium size town of Shikarpur where facilities of regulated markets are available.

Each weekly market in its evolution has its own etymological relevance to be held on a particular day of the week. It is observed (Fig. 23) from the available data that almost all the weekly markets in the settlements with the majority of Muslim population are held on Fridays which provide convenient opportunity to Muslims to meet one another at the time of Friday-prayers. The places of Rubupura, Kakore, Aurangabad, Chhatari (Nagla Khushal), Ahmadgarh, Jadol and Umarpur may be quoted as examples. On the other hand most of the weekly markets in the settlements with a majority of Hindu population are held either on Tuesdays, Thursdays and Saturdays. These three days of the week have ritualistic importance in the Hindu religion. On an average seven weekly markets are held every day in the district. The Table 5.07 gives an idea of the weekly markets in the district.

Among tahsils, Anupshahr has the highest number of weekly markets i.e., about seven markets per 100 settlements as compared to the district average of about five weekly markets per hundred settlements. Among blocks (Fig. 18A-16) Dibai has the highest number of weekly markets.

5.6.2 Fair Markets

There are 36 places where fairs or exhibitions are held once or more than once during the year. The time pattern of fairs varies from place to place depending upon

TABLE 5.07 Number of Weekly Markets Held Per Day of the Week in Bulandshahr District, 1971

Week Day	Weekly Market	
	Number	Per cent
Monday	9	12.9
Tuesday	9	12.9
Wednesday	7	10.0
Thursday	12	17.1
Friday	12	17.1
Saturday	11	15.7
Sunday	10	14.3
TOTAL	70	100.0

Source : Data computed from the D.C.H. Bulandshahr, 1971, Part X-A.

the climate, growing season, festivals etc.[14] Almost all the fairs held in the district coincide with the festivals like Dussehra, Shivratri, Holi, Kartick Purnima and holy dip in Ganga etc. The total congregation among all the fairs in the district is estimated to be about more than 5 lakhs. Each year an industrial exhibition is held at Bulandshahr which attracts the population of more than 75,000 persons and proves to be a special market involving heavy amount of sales and purchases.[15]

The highest number of fairs, i.e., 30.5 per cent (Table 5.06) held in the settlements falling in the population category of 500-1,000 persons followed by the category of 1,000-2,000 persons having about 13.9 per cent of the fair markets. The size group wise distribution of fair market centres does not correspond (Fig. 16-4) to that of the general distribution of all the settlements of the district. It is because the fairs are not population based but they are always based on religious rituals and festivals.

The concentration of fair markets is found in the vicinity of the river Ganga (Fig. 23). Yamuna tract also has a few places of fairs (Fig. 18A-17).

5.6.3 Regulated Markets

All the towns of the district have regulated markets. Though the data in the D.C.H. Bulandshahr, 1971 regarding the regulated markets of rural settlements is not available but on the basis of the information personally collected it is found that there are 21 regulated markets in rural areas of the district. No settlement having less than 1,000 persons has regulated market (Table 5.06). The frequency distribution of regulated markets by the size group of the settlements corresponds to that of the distribution of all the settlements (Fig. 16-4) in the district.

The spatial distribution of the regulated markets is almost uniform. In the central part of the district specially within the radius of about 15 kms. around Bulandshahr town (Fig. 23) there is no regulated market because of four towns of Bulandshahr, Khurja, Sikandrabad and Shikarpur. In the vicinity of the Ganga owing to its religious significance and agrarian potential of the area a number of regulated markets have emerged. Dankaur block being the largest block of the district in area has the maximum number of regulated markets. In the Yamuna tract of Jewar block the two regulated markets of Rabupura and Jewar act as centres of the agricultural produce of a larger region hence are quite important. Two regulated markets of Mandi Shyam Nagar (Kherli Hafizpur) and Mina Maujpur (Khurja-Junction site) have emerged because of lying near the railway stations of Dankaur and Khurja respectively.

Almost each block has at least one regulated market within its administrative area. Except Lakhaoti block, each block has a regulated market centre at its headquarters. Among all the blocks, Siyana block (Fig. 18A-18) has the maximum number of regulated markets accounting for about 5.88 regulated markets per 100 settlements as compared to 2.3 settlements for 100 settlements in the district.

5.7 AGRO-ECONOMIC SERVICES

The farming society of the country is characterised

by the socio-economic complexes of functioning of a less developed economic system. It is generally felt that the development of the total economy of the country depends, to a major extent on the agricultural development.[16] The agricultural development can not be attained until the provision for appropriate infrastructural facilities is made in the rural areas. The infrastructural facilities like education, health, transport and communication, in general, play a catalytic role in the process of socio-economic development.[17] But in addition to the general infrastructural facilities the provision of agro-economic service facilities like agricultural inputs, irrigation and power, credit, collection and distribution centres for agricultural produce and inputs, warehousing and cold storage and extension services - through public sector investment is an essential pre-requisite for agricultural development. Mechanisation in agriculture plays a pivotal role in making the best use of agro-economic infrastructural facilities to lead a major change in the structure of social and economic values of the agrarian communities.[18] It has also been observed that technological changes in agriculture in addition to general infrastructural attributes can also be influenced by the geometry of network of personal communication.[19] The locational planning of agro-economic services has to be based upon the appraisal of existing frame. The following paragraphs have been devoted to such an appraisal. On the basis of the availa-

bility of data on agro-economic facilities at village level, these have been classified in (i) agricultural services, and (ii) credit facilities.

5.7.1 Agricultural Services

In the present study agricultural facilities include agricultural and co-operative seed stores, fertilisers, insecticides and pesticides, and minor agricultural implements on the one hand and stock man centres, veterinary hospitals and electricity for agricultural purposes on the other. The repair service centres for agricultural implements and machines could not be included in the list of the agricultural services in this study because of the non-availability of data. Though the nature of the services rendered by agricultural seed stores is more or less the same as those rendered by the co-operative seed stores but both the organisations are different in functioning. The former deals with cash sales and is organised by the Agriculture Department in public sector while the latter deals with sales on credit basis being organised by the Co-operative Department in semi private sector.

5.7.1.1 Agricultural Seed Stores

There are 59 settlements which have agricultural seed stores. Out of these, eleven settlements (Table 5.08) are urban centres. Settlements having a population of less than 200 persons do not have agricultural seed stores,

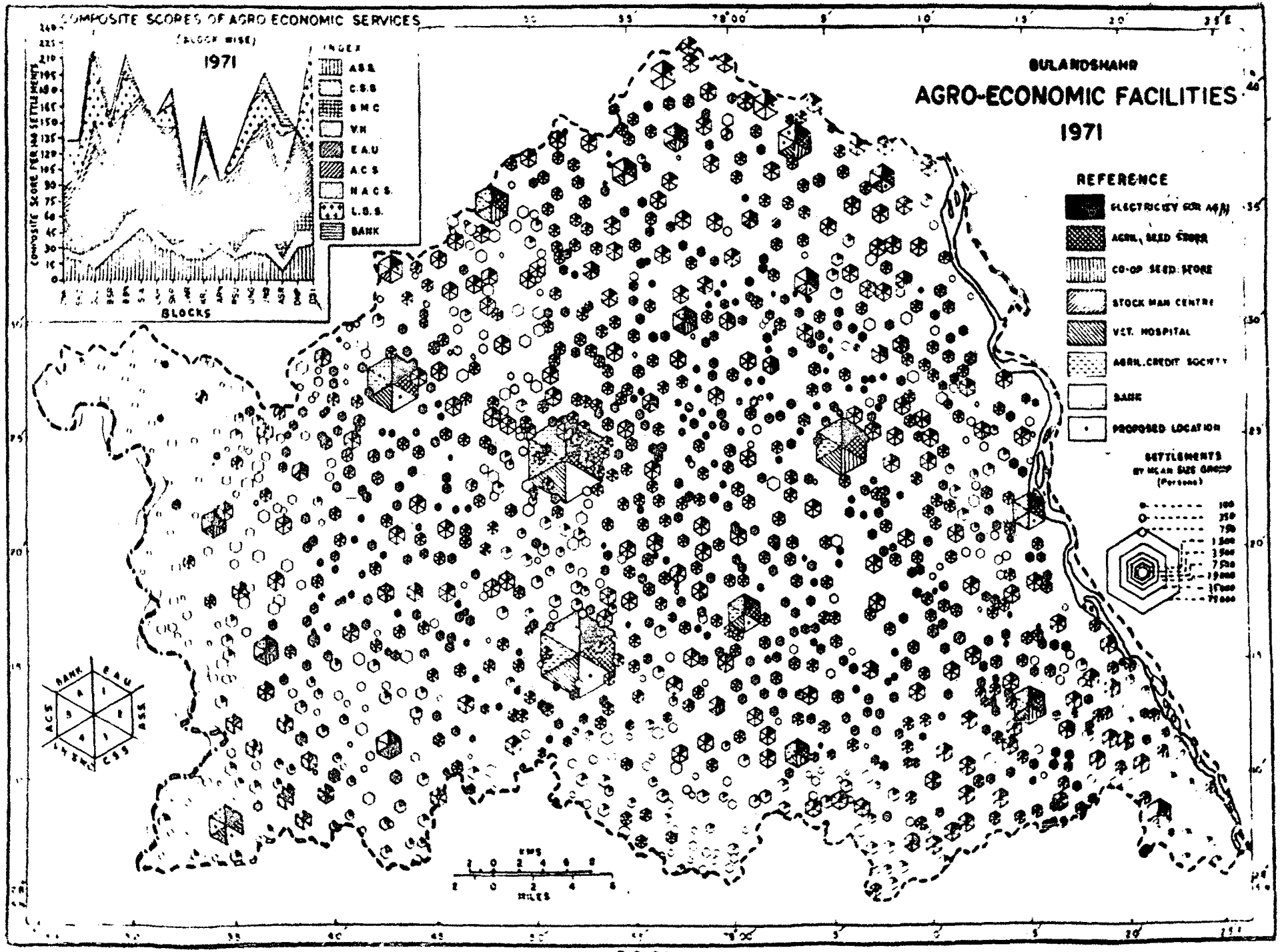

COMPOSITE SCORES OF AGRO ECONOMIC SERVICES
(BLOCK WISE)
1971
INDEX
A.S.S.
C.S.S.
S.M.C.
V.H.
E.A.U.
A.C.S.
N.A.C.S.
L.S.S.
BANK
BLOCKS
BULANDSHAHR
AGRO-ECONOMIC FACILITIES
1971
REFERENCE
ELECTRICITY FOR AGRI.
AGRIL. SEED STORE
CO-OP SEED STORE
STOCK MAN CENTRE
VET. HOSPITAL
AGRIL. CREDIT SOCIETY
BANK
PROPOSED LOCATION
SETTLEMENTS
BY MEAN SIZE GROUP
(Persons)
KMS
MILES

FIG. 24

accounting for 32.2 per cent of all the stores in the district are located in the settlements with a population size of 2,000-5,000 persons. The pattern of frequency distribution of settlements with agricultural seed stores by population size groups corresponds (Fig. 16-5) to that of the distribution of all the settlements of the district.

The spatial pattern of distribution (Fig. 24) of the settlements with agricultural seed store is uniform in the central plain of the district. The Ganga and the Yamuna Khadar have very few settlements with agricultural seed store.

5.7.1.2 Co-operative Seed Stores

The total number of settlements with co-operative seed stores in the district (Table 5.08) is only 31 (2.24 per cent) out of which six settlements are towns. The settlement with a population size of less than 1,000 persons do not have co-operative seed store except Maharajput village in Lakhaoti block. The pattern of frequency distribution of settlements having co-operative seed store (Fig. 16-5) corresponds to that of the distribution of all settlements in the district.

The spatial distribution of the settlements (Fig. 24) having co-operative seed stores with a very few exceptions is quite uniform. Anupshahr tahsil has maximum settlements having co-operative seed stores.

TABLE 5.08

Distribution of Settlements By size group having Agro Economic Facilities, during 1971.

Facility	No. & %	Settlements by Population Size Group (Persons) Below 200	200 to 499	500 to 999	1000 to 1999	2000 to 4999	5000 to 9999	10000 and above	T	R	U
1	2	3	4	5	6	7	8	9	10	11	12
AGRICULTURAL SERVICES											
A.S.S.	No.	--	2	6	13	19	9	10	59	48	11
	%	--	3.4	10.2	22.0	32.2	15.2	17.0	100.0	81.3	18.7
C.S.S.	No.	--	1	--	5	13	8	4	31	25	6
	%	--	3.3	--	16.1	41.9	25.8	13.9	100.0	80.6	19.4
S.M.C.	No.	--	1	1	7	13	5	--	27	26	1
	%	0.0	3.7	3.7	25.9	48.2	18.5	0.0	100.0	96.3	3.7
V.H.	No.	--	--	1	1	6	4	10	22	12	10
	%	0.0	0.0	4.6	4.6	27.2	18.2	45.4	100.0	54.5	45.5
E.A.U.	No.	28	124	281	292	133	12	10	880	868	12
	%	3.1	14.1	31.9	33.2	15.1	1.4	1.1	100.0	98.6	1.4
CREDIT FACILITIES											
A.C.S.	No.	--	--	--	--	--	1	8	9	--	9
	%	0.0	0.0	0.0	0.0	0.0	11.1	88.9	100.0	0.0	100.0
N.A.C.S.	No.	--	--	--	--	--	1	3	4	--	4
	%	0.0	0.0	0.0	0.0	0.0	25.0	75.0	100.0	0.0	100.0
L.S.S.	No.	--	--	3	7	4	1	3	18	15	3
	%	0.0	0.0	16.6	38.9	22.2	5.6	16.7	100.0	83.3	16.7
Bank	No.	--	--	--	--	--	2	8	10	--	10
	%	0.0	0.0	0.0	0.0	0.0	20.0	80.0	100.0	0.0	100.0
All Settlements.	No.	72	217	461	442	170	13	10	1385	1373	12
	%	5.2	15.7	33.3	31.9	12.3	0.9	0.7	100.0	99.1	0.9

* T= Total, R=Rural and U=Urban and other symbols refer to Text Table No.(5.01). Data is computed partly from the D.CH. Bulandshahr Pt.X-A 1971 and Partly from the district level offices of the departments concerned.

5.7.1.3 Stockman Centres

In addition to crop raising animal husbandry is very important activity in the rural areas. Therefore, dairy development is basically dependent upon the availability of better veterinary services. Stockman centres provide elementary services to the rural areas for animal raising. There are 27 stockman centres (1971 census) in

the district each centre covering 51 settlements on the average settlements falling either in the population size group of more than 10,000 or below 200 persons (Table 5.08) do not have stockman centres. The overall pattern of frequency distribution (Fig. 14-6) of settlements having stockman centre by population size group does not fully correspond to that of the distribution of all settlements of the district.

The spatial distribution (Fig. 24) of stockman centres is highly irregular. In Khurja tahsil there are 89 settlements per stockman centre, which is most poorly served (Fig. 18B-21). Gulaothi block has the maximum coverage by stockman centre as there is one such centre for every 30 settlements.

5.7.1.4 Veterinary Hospitals

There are 22 settlements (1.59 per cent) having veterinary hospitals (Table 5.08) in the district. Almost all the urban settlements have this facility. In the villages of the population size upto 1,000 persons there are only two veterinary hospitals. The pattern of frequency distribution of settlements with veterinary hospital (Fig. 16-5) by their size group of population more or less corresponds to that of the general distribution of all settlements in the district.

The pattern of spatial distribution of veterinary hospitals is nearly uniform. Bulandshahr and Khurja tahsils

have higher number of veterinary hospitals (Fig. 24) where each veterinary hospital serves 49 settlements as against the district average of 63 settlements. Amongst the blocks (Fig. 18B-22) Bhawan Bahadur Nagar block has one veterinary hospital for every 23 settlements.

5.7.1.5 Electricity for Agricultural Usage

Electric power is the most important item of modern infrastructure and the consumption of power is often suggested as an indicator of general economic development.[20] In agriculture the operations of pumping out of water for irrigation threshing and winnowing of harvested crops, can very easily and efficiently be performed by making use of electricity. 880 settlements in Bulandshahr (Fig. 24) have the electricity available for agricultural uses. The pattern of frequency distribution of settlements by their population size group having electricity for agricultural purposes very nearly corresponds (Fig. 16-5) to that of the general distribution of all the settlements.

The salient features of the distribution of settlements having electricity are :

(i) the areas, not having canal irrigation, have a large number of settlements with electricity, e.g., the whole central tract (The Chhoiya-Kali Nadi interfluve) of the district;

(ii) the Ganga Khadar has a moderate number of such settlements;

(iii) the Yamuna Khadar region has very few settlements having electricity;

(iv) the southern fringe of the district stretching in east-west direction has also many settlements with electricity connections.

Among all the 4 tahsils of the district, Anupshahr and Bulandshahr both have large number of settlements with electricity where about 77 per cent settlements are electrified. The average for Bulandshahr is 63 settlements electrified for every 100 settlements.

Amongst the blocks Shikarpur block is very well served as all its settlements are electrified while in Jewar and Arniya blocks 18 and 26 per cent settlements respectively have electricity available for agriculture.

5.7.2 Credit Facilities

The process of modernization plays a crucial role in the agricultural development of the developing countries. Mechanisation constitutes an essential ingradient of modern agriculture.[21] Though, mechanisation reduces the cost of agricultural production and raises the incomes of the farmers but for making initial investments in the process of modernizing agriculture large amount of credit is needed. The major

credit facilities can, thus, be said to be the pivot around which the modern agriculture, industry and commerce revolve. The study area is primarily an agricultural area. Therefore, an endeavour has been made to analyse the existing and desirable distribution of credit facilities in the area. The existing credit facilities of the district are classified into four types of credit establishments as (i) agricultural credit societies, (ii) non-agricultural credit societies, and (iii) large scale service societies and (iv) banks.

5.7.2.1 Agricultural Credit Societies

These major agricultural credit societies are located only in towns. The total number of such societies is nine in the district (Table 5.08) which reveals that about 154 villages, on an average, are being served by one society. Though, there are co-operative credit societies at village level known as 'service co-operatives' (Sadhan Samitiyan), but they cannot provide credit for heavy investment. The pattern of frequency distribution of settlements by size (Fig. 16-5) having agricultural societies does not correspond to that of the general distribution of all the settlements.

The spatial distribution of settlements having agricultural credit society is irregular and the more such establishments are required. Eight out of 17 blocks do not have any settlements having agricultural credit society

(Fig. 24 Inset) and Gulaothi block has the highest (Fig. 18B-24) number of settlements having agricultural credit society among all the blocks of the district.

5.7.2.2 Non-Agricultural Credit Societies

The total non-agricultural credit societies are eleven which are located only in four towns of the district (Fig. 24). Bulandshahr and Anupshahr have 3 and 2 such societies each respectively. This distribution shows that in the towns commercial banks and other institutions cater to the financial needs of the people of the urban centres.

5.7.2.3 Large Scale Service Societies

Now these large scale service societies are known as farmers service societies after the year 1977-78. These societies not only deal with the financial matters but cater to the needs of the people in kind regarding the commodities of the day to day requirements. There are 18 settlements (Table 5.08) with large scale service societies in the district out of which only 3 are in the towns, i.e., Sikandrabad, Jahangirabad and Gulaothi. The frequency distribution of settlements (Fig. 16-5) with large scale service centre society by size group does not correspond to that of the distribution of all the settlements. The spatial distribution of the settlements with large scale service society shows (Fig. 24) that almost southern half of the district has no settlement with large scale service societies and

this facility is mostly concentrated in Bulandshahr tahsil. It shows that the distribution might be based on political decisions and not on the regional criteria.

5.7.2.4 Banks

There are no banks in any settlement having a population size below 2,000 persons. According to the 1971 census there were only 10 such settlements (Table 5.08) where the banks were located. The distribution pattern of settlements (Fig. 16-5) by size having bank establishments does not correspond to that of the distribution of all settlements. The spatial distribution of the settlements having bank is not uniform. Sikandrabad amongst the tahsils and Gulaothi amongst the blocks have largest number of settlements (Fig. 18B-26) having banks. Bulandshahr has highest number of banking units. This distribution is quite inadequate for the proper disbursement of credit in the district. But in the later seventies there has been a considerable increase in the number of banking establishments reaching about 8 folds in 1978 to that of the year 1971.

5.8 PUBLIC ADMINISTRATION SERVICES

Decentralisation of administrative services is indicative of higher level of development of a region. Therefore, micro administrative areal units are essential

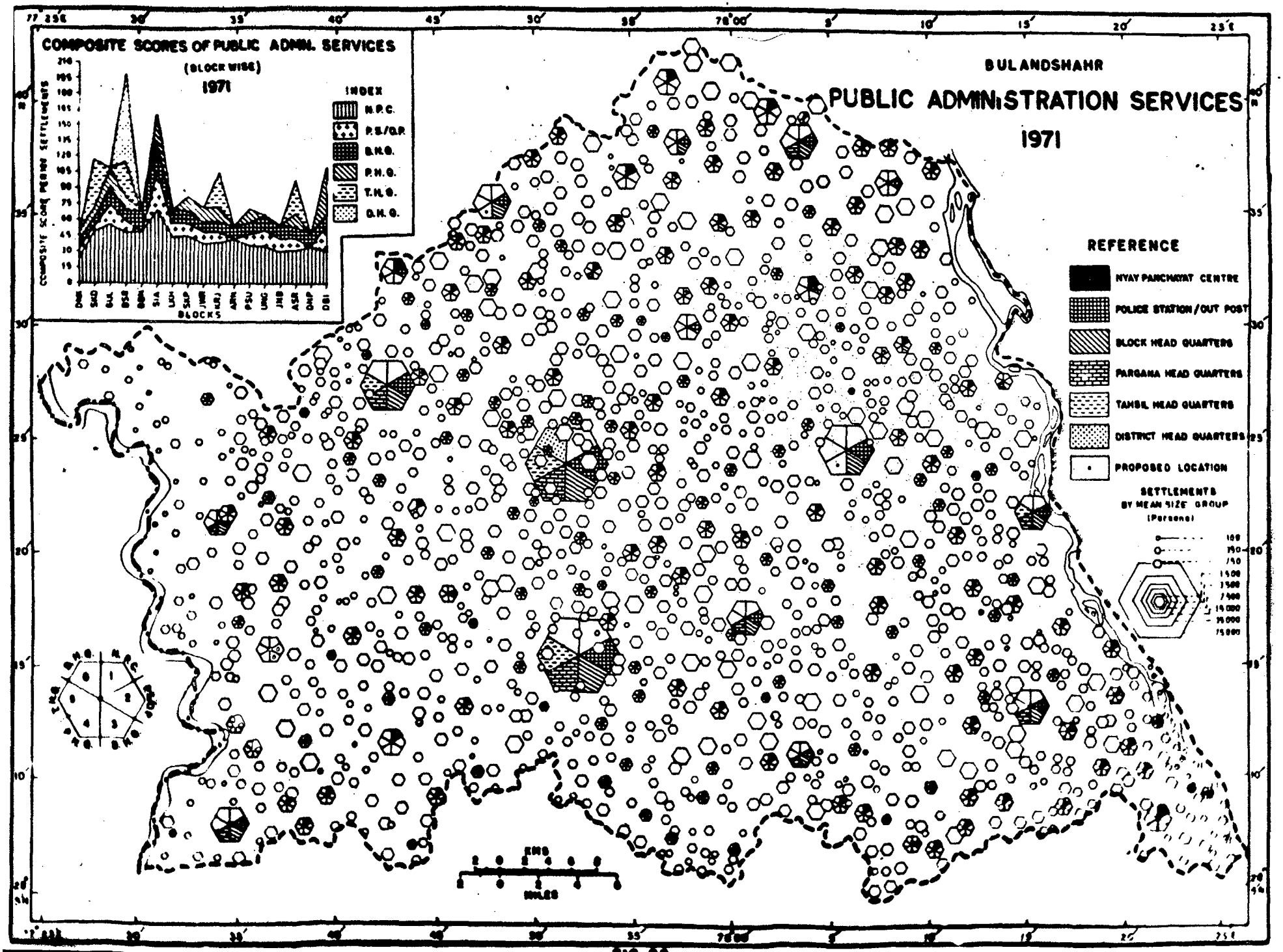

COMPOSITE SCORES OF PUBLIC ADMN. SERVICES
(BLOCK WISE)
1971
INDEX
N.P.C.
P.S./O.P.
B.H.Q.
P.H.Q.
T.H.Q.
D.H.Q.
BLOCKS
BULANDSHAHR
PUBLIC ADMINISTRATION SERVICES
1971
REFERENCE
NYAY PANCHAYAT CENTRE
POLICE STATION / OUT POST
BLOCK HEAD QUARTERS
PARGANA HEAD QUARTERS
TAHSIL HEAD QUARTERS
DISTRICT HEAD QUARTERS
PROPOSED LOCATION
SETTLEMENTS
BY MEAN SIZE GROUP
(Persons)
KMS
MILES

FIG. 2.8

in order to have an efficient administrative arrangement. Community Development Blocks are the result of the idea of the decentralisation of administrative services. The public administration service facilities may be classified in two types as (i) social justice and security and (ii) administrative headquarters.

5.8.1 Social Justice and Security

The social justice machinery provides facility for the solution of the legal disputes of the people by civil or village courts. There are civil courts in the towns but in the villages there are nyay panchayat centres. There are police stations and outposts for the security of the public.

5.8.1.1 Nyay Panchayat Centres

Nyay Panchayat is a village court comprising of 5 to 10 villages as its jurisdiction on the basis of a population. The Chairman of the nyay panchayat is called as sarpanch and minor legal disputes (as defined under Nyay Panchayat Act) are settled. There are 168 Nyay Panchayats to serve 1373 villages of the district (Table 5.08). The distribution of settlements by population size group having nyay panchayat centres does not correspond (Fig. 16-6) to that of the distribution of all settlements because settlements having nyay panchayat are bigger villages in population size. Maximum number of nyay panchayats

lie in the settlements that fall in the size group of 2,000-5,000 persons. The average number of settlements is about 8 per nyay panchayat centre.

The spatial distribution (Fig. 25) of nyay panchayat centres in the district, except in Khadar belt of the Yamuna, is quite uniform. Bulandshahr tahsil has largest number of nyay panchayat centres as an average of about 6 settlements per nyay panchayat centre. Amongst the blocks Siyana and Dankaur have the highest and the lowest number of nyay panchayat centres at the average of about 4 and 13 settlements per nyay panchayat centre respectively.

5.8.1.2 Police Station/Outpost

The total number of police stations and outposts is 14 and 2 respectively which are located in 15 settlements. Out of these 15 settlements 4 settlements (Table 5.09) are rural. No police station/outpost is located in the settlements having population of less than 5,000 except one village of Rajghat Bangar of Dibai block, which has a population of 1,477 persons. The spatial pattern of distribution (Fig. 25) of settlements having police station/outpost in the district is more or less uniform. Siyana and Dibai blocks (Fig. 18B-28) have at the average of about 34 and 42 settlements per police station/outpost. The tahsils of Sikandrabad and Khurja each has one police station/outpost per 100 settlements. The average number

TABLE 5.09

Distribution of Settlements By Size Group having Public Administration Establishments* during 1971.

Facility	No. & %	Settlements by Population Size Group (Persons)									
		Below 200	200 to 499	500 to 999	1000 to 1999	2000 to 4999	5000 to 9999	10000 and above	T	R	U
SOCIAL JUSTICE AND SECURITY											
N.P.C.	No.	..	2	19	69	71	7	..	168	168	..
	%	0.0	1.2	11.3	41.1	42.2	4.2	0.0	100.0	100.0	..
P.S.O.P.	No.	..	..	..	1	..	4	10	15	4	11
	%	0.0	0.0	0.0	6.7	0.0	26.7	66.6	100.0	26.6	73.4
T.A.**	No.	..	..	..	..	2	2	1	5	5	..
	%	0.0	0.0	0.0	0.0	40.0	40.0	20.0	100.0	100.0	0.0
T.C.**	No.	..	..	..	..	..	3	3	6	0	6
	%	0.0	0.0	0.0	0.0	0.0	50.0	50.0	100.0	0.0	100.0
M.B.**	No.	..	..	..	..	..	..	6	6	..	6
	%	0.0	0.0	0.0	0.0	0.0	0.0	100.0	100.0	0.0	100.0
ADMINISTRATIVE SERVICE ESTABLISHMENTS											
B.H.Q.	No.	..	..	..	2	3	2	10	17	6	11
	%	0.0	0.0	0.0	11.8	17.6	11.8	58.8	100.0	35.3	64.7
P.H.C.	No.	..	..	..	..	2	2	8	12	3	9
	%	0.0	0.0	0.0	0.0	16.7	16.7	66.6	100.0	25.0	75.0
T.H.Q.	No.	..	..	..	..	..	..	4	4	..	4
	%	0.0	0.0	0.0	0.0	0.0	0.0	100.0	100.0	0.0	100.0
D.H.Q.	No.	..	..	..	..	..	..	1	1	..	1
All Settlements.	No.	72	217	461	442	170	13	10	1385	1373	12
	%	5.2	15.7	33.3	31.9	12.3	0.9	0.7	100.0	99.1	0.9

* The data is computed partly from the D.C.H. Bulandshahr and partly from the A.D.M.(Planning) and S.P.Offices of Bulandshahr.

** T.A.= Town Area; T.C.= Town Committee; M.B.= Municipal Board
Other symbols refer to Text Table No.5.01

of settlements covered by each police station/outpost is about 87 settlements in the district as a whole.

5.8.2 Administrative Service Establishments

In the district there is a hierarchic order of the administrative areal units in ascending order as block, pargana, tahsil and district. There are 17 blocks in the area (Table 5.08) out of which six blocks of Bhawan Bahadur Nagar, Lakhaoti, Jewar, Arniya, Unchagaon and Danpur do not have towns. The block headquarters, except Dankaur, Bulandshahr, Siyana and Danpur blocks, are not centrally located (Fig. 22) in their respective areal units.

There are 12 parganas in the district. The Agauta (tahsil Bulandshahr), Jewar (tahsil Khurja) and Ahar (tahsil Anupshahr) parganas are non-town settlements having the location of pargana headquarters. There are four tahsils in the district namely Sikandrabad, Bulandshahr, Khurja and Anupshahr. All these towns of tahsil headquarters have population of more than 20,000 persons. The location of Sikandrabad tahsil headquarters is not central in its areal unit. The Bulandshahr town with a population of 59,505 persons is the headquarters of the district.

5.9 LEISURE TIME AMENITIES

Man is a social animal, banding with his fellows

for mutual security, work and pleasure.[23] To enhance man's efficiency of work, provision of food, cloth and shelter is necessary on one hand and the creation of amenities for his recreation and higher needs is no less important on the other. The leisure time amenities in rural areas are quite meagre and of traditional type as compared to those in urban centres. The centres of leisure time amenities in the district of Bulandshahr can be grouped as (i) religious institutions and (ii) recreational establishments. The former are located in rural and urban settlements both but the latter are confined only to big towns of the district.

5.9.1 Religious Institutions

In the district the major proportion of population is of Hindus followed by Muslims. Therefore, temples and mosques are the only important religious institutions in the area under study.

5.9.1.1 Temples

There are 99 temples out of which 87.88 per cent (Table 5.10) are located in the rural settlements. About 41.4 per cent (41 temples) settlements of the district with temples fall in the population size group of 1,000-2,000 persons. The percentage frequency distribution of settlements with temples by size, nearly corresponds (Fig. 16-7) to that of the distribution of all the settlements of the district.

TABLE 5.10 Distribution of Settlement by Size-group Having Leisure Time Amenities During 1971

Facility	Settlements By Size Group of Population (Persons)								
	500 & below	500 to 999	1000 to 1999	2000 to 4999	5000 to 9999	10,000 & above	Total	Rural	Urban
Temple									
No.	9	16	41	19	5	9	99	87	12
%age	9.1	16.2	41.4	19.2	5.1	9.0	100.0	87.9	12.1
C.f	9.1	25.3	66.7	85.9	91.0	100.0	-	-	-
Mosque									
No.	2	5	20	5	5	8	45	33	12
%age	4.5	11.1	45.5	11.1	11.1	17.7	100.0	73.3	26.7
C.f	4.5	15.6	60.1	71.2	82.3	100.0	-	-	-
Public Library									
No.	-	-	-	-	1	6	7	-	7
%age	-	-	-	-	12.5	87.5	100.0	-	100.0
Reading Room									
No.	-	-	-	-	-	4	4	-	4
%age	-	-	-	-	-	100.0	100.0		100.0
Cinema									
No.	-	-	-	-	-	3	3	-	3
%age	-	-	-	-	-	100.0	100.0		100.0
Stadium (No.)	-	-	-	-	-	1			1
%age	-	-	-	-	-	100.0	-	-	100.0
Auditorium (No)	-	-	-	-	1	-	1	-	1
%age	-	-	-	-	100.0	-	100.0	-	100.0
All Settlements									
No.	289	461	442	170	13	10	1385	1373	12
%age	20.9	33.3	31.9	12.3	0.9	0.7	100.0	99.1	0.9

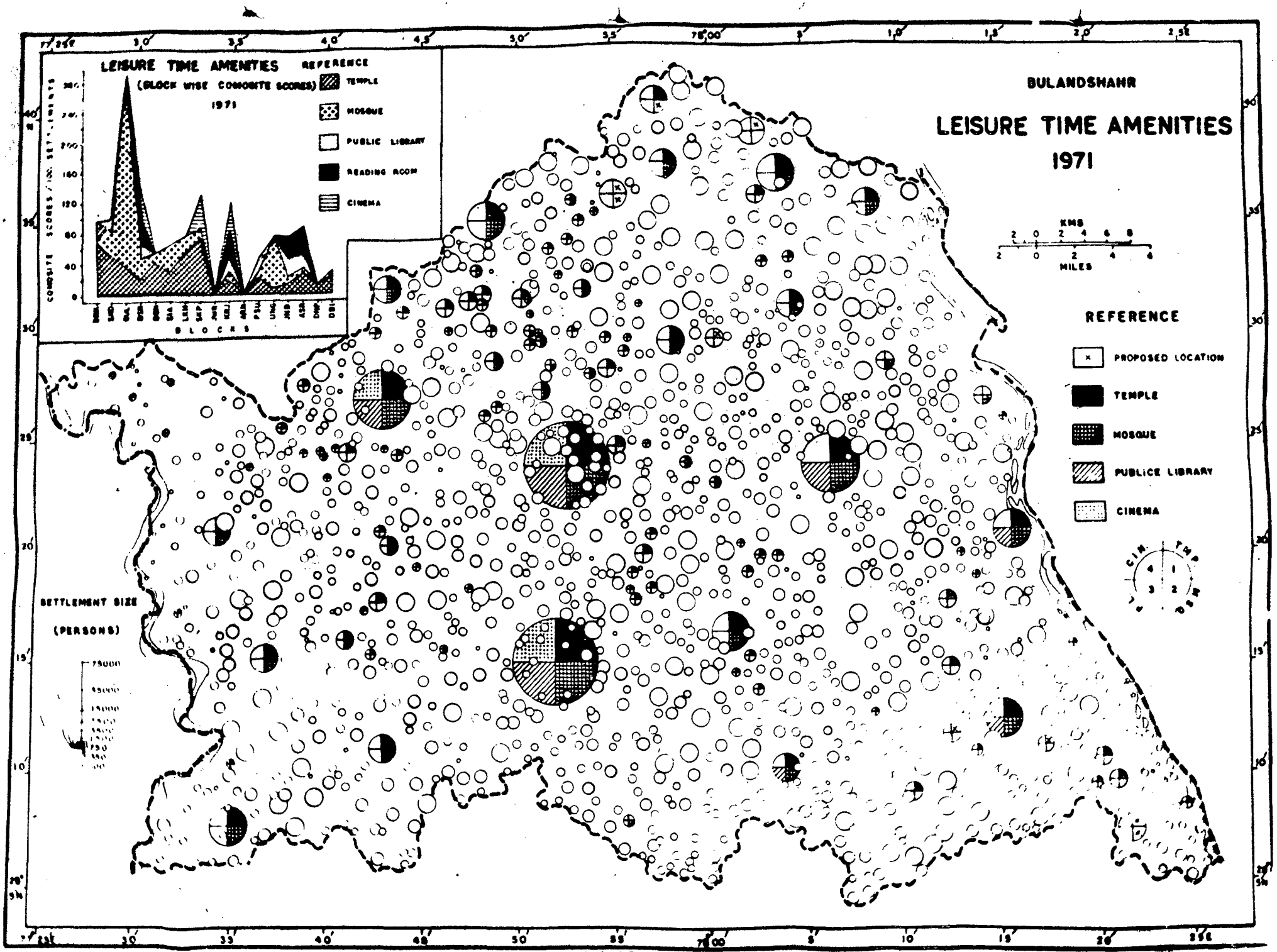

LEISURE TIME AMENITIES
(BLOCK WISE COMOSITE SCORES)
1971
REFERENCE
TEMPLE
MOSQUE
PUBLIC LIBRARY
READING ROOM
CINEMA
COMPOSITE SCORES
BLOCKS
BULANDSHAHR
LEISURE TIME AMENITIES
1971
KMS
MILES
REFERENCE
PROPOSED LOCATION
TEMPLE
MOSQUE
PUBLICE LIBRARY
CINEMA
SETTLEMENT SIZE
(PERSONS)
75000

FIG. 26

The spatial distribution of settlements with temple (Fig. 26) shows a very peculiar pattern indicating concentration of temples in Bulandshahr and Sikandrabad and the southern half of Anupshahr tahsil. The blocks of Jewar and Arniya have no temple site, but this distribution seems to be far away from the reality. The data given out by the 1971 census records[23] seems to be inadequate and shows gaps. Gulaothi block has higher concentration of temples where there is one temple (Fig. 18B-29) for 4 settlements against the district average of 14 settlements.

5.9.1.2 Mosques

The total number of settlements having mosques in the area is 45 (Table 5.10), out of which about 73.3 per cent are rural settlements. The pattern of distribution of the settlements having mosque by population size group does not correspond (Fig. 16-7) to that of the distribution of all the settlements of the area.

The spatial pattern of distribution of the settlements having mosques is not uniform in the district. The concentration of such settlements is found (Fig. 26) in Gulaothi block followed by Siyana and Dankaur blocks. The illustration (Fig. 18B-30) shows that the north-west part of the district stretching from Siyana to Dankaur seems to be the area of major concentration of Muslim population of the area.

5.9.2 Recreational Establishments

The recreational facilities in the district are very limited. All the major recreational facilities are confined to townships. The main establishments of recreational facilities available in the district are, cinema, stadium, clubs, auditorium, public libraries and reading rooms etc. There are only 7 public libraries (Table 5.10) all located in the towns (Fig. 26) except Dankaur, Burgrasi, Gulaothi, Siyana and Shikarpur. The average number of settlements is about 198 per public library in the district. In Jahangirabad there is one library for 77 settlements.

The total number of reading rooms in the area is four (Table 5.10) which are located at Bulandshahr, Khurja, Jahangirabad and Anupshahr. It shows that neither the facility of public library nor the reading room facility is sufficient to fulfil the need of the urban population. The average number of settlements per reading room is about 346 in the district. Bulandshahr block has the highest level of distribution (18B-33) of reading rooms with about 95 settlements per reading room.

The total number of settlements in the district having cinema houses are 3 (Fig. 26) located in Bulandshahr, Khurja and Sikandrabad (Fig. 26). There is only one stadium located in Bulandshahr town. Dankaur town has an ancient site known as Droncharya-Auditoria of the period

of Mahabharat built up by Guru Dronacharya. There are few clubs in the 4 big towns of the district namely Bulandshahr, Khurja, Sikandrabad and Anupshahr.

5.10 CLUSTERING OF SOCIAL FACILITIES

The patterns of quantical as well as spatial distribution of social facilities can also be assessed by the clustering of the facilities in the settlements by their size group of population. The pattern of clustering of services and facilities in the area (Table 5.11 and Figs. 17, and 20 to 26) brings out the following traits of the emergence of central places and their spatial pattern of distribution.

In the district a cluster of less than 5 facilities (Table 5.11) is obtained in 1135 (82.0 per cent) settlements out of which 449 settlements have a cluster of 2 facilities each. About 137 settlements (9.9 per cent) of the district possess a cluster of facilities ranging from 5 to 7 each. There are 53 such villages that have no facility located in them.

No settlement with a population of less than 200 persons has a cluster of more than 3 facilities together. The functions like electricity for agriculture usage, primary school or kachcha road are the only facilities existing in such settlements. Seven villages of this category has no facility at all. Out of 72 settlements

TABLE 5.11 Variations in the Availability of Different Types of Services and Facilities in Settlements

Size Class of Settlements (Persons)	Total no. of settlements	Settlements According to the Number of Facilities: Total no. of facilities available in individual settlements												Facility that begin to exist in the settlements of the given range of Population
		10	10	9	8	7	6	5	4	3	2	1	Nil	
10,000 and above	10	10	-	-	-	-	-	-	-	-	-	-	-	College, HC, PT, OSD, Phone, ACS, PHQ, THQ, DHQ, PL, RR, Cinema
5,000 - 9,999	13	8	3	1	-	-	1	-	-	-	-	-	-	HSS, DISP, FPC, MCW, Hosp, PTO, RLY, PM, RM, ASS, CSS, SHC, VH, LSS, PSOP, BHQ, MSC
2,000 - 4,999	170	9	5	9	6	10	23	34	30	30	11	2	1	JHS, BPO, WM, NPC, Temple
1,000 - 1,999	442	3	3	1	2	11	18	31	67	136	115	45	10	KR, PR
500 - 999	461	-	-	-	-	1	1	6	25	115	199	94	20	PS, EAU
200 - 499	217	-	-	-	-	-	-	1	8	27	101	65	15	- - -
Less than 200	72	-	-	-	-	-	-	-	-	3	23	39	7	- - -
TOTAL	1385	30	11	11	8	22	43	72	130	311	449	245	53	
Per cent	100.0	2.1	0.8	0.8	0.6	1.6	3.1	5.2	9.4	22.4	32.5	17.7	3.8	

* The total num-ber of social facilities taken into account are forty grouped into 7 major categories. For abbreviations see Text Table 5.01.

of the category 54 per cent have one facility each, 32 per cent have two facilities each and remaining 3 settlements have a cluster of 3 facilities each.

In the settlements of the size group of 200-499 persons no settlement has a cluster of more than seven facilities. Out of 217 settlements of the district falling in this size group 15 have no facility at all. About 76 per cent settlements of the category possess a cluster of more than two facilities each. The common facilities with few exceptions found located in such settlements are primary school, electricity and unmetalled road etc.

Out of total 461 settlements of the size 500-999 persons 20 villages have no facility at all. About 89 per cent (408) settlements of this category do not have a cluster of more than 3 facilities each. There are only 6, 1 and 1 settlements that possess a cluster of 5, 6 and 7 facilities each respectively. Pucca road, branch post office, temple etc., in addition to common facilities mentioned above are some exceptional facilities in this size group of settlements.

In the settlements of the size group 1,000-2,000 persons the common facilities are electricity, primary school, unmetalled and metalled roads but mostly junior high school, branch post office, weekly market, dispensary

and temple etc. are exceptionally found. No settlement of the category possesses a cluster of more than 14 facilities and only 9 settlements have a cluster of more than 7 facilities each. Out of the 442 total settlements of the category 136 (30.8 per cent) settlements have a cluster of 3 facilities. About 363 settlements (82.1 per cent) have a cluster of facilities ranging between 1 and 4 each.

In the settlements with the size-group of 2000-5000 persons only 23 (13.5 per cent) out of the total 170 settlements possess a cluster of more than 8 facilities each. About 69 per cent (117) settlements of the size have 3 to 6 functions each. The facilities like junior high school, branch post office, weekly market, nyay panchayat, temple etc. are generally found in the settlements of this category.

In the size group of settlements with 5,000-9,999 persons there are 3 towns namely Dankaur, Bugrasi and Pahasu all having a cluster of more than 16 facilities each. Out of all the 13 settlements of the category except one namely Waira-Ferozepur (Siyana block) no settlement has a cluster of less than 9 facilities. About 17 out of the total 40 facilities (Table 5.11) seem to be generally starting to exist in this category, of settlements.

Out of the total 10 settlements with a population size of more than 10,000 persons in the district, only one settlement namely Jewar is a village. All these settlements possess a cluster of more than 16 facilities each. The facilities like college, health centre, telephone, agricultural credit societies, bank, pargana headquarters and public library begin to exist from the level of population of this category of settlements. The facilities like non-agricultural society, reading room and cinema begin to exist in the settlements with a population of 20,000 to 50,000 persons. Finally, it may be submitted that the clustering of facilities in central places is not very homogenous in nature and therefore, a study of these facilities should take their difference in levels among different settlements into account.

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CHAPTER 6

COMPOSITE SCORE ON SOCIAL FACILITIES AND HIERARCHY OF SETTLEMENTS

6.1 INTRODUCTORY STATEMENT

Interaction across distance is one of the ways in which man organizes geographical space. Some territories focus on one dominant node as the central point of the communication system and of the movement of goods, while other territories look in a variety of different directions.[1]

To understand the state of differential patterns of settlement hierarchies and their space relationships in the study area the whole account of this chapter has been divided into three main sections of considerations viz., hierarchic orders of settlements, hinterlands of service centres and the levels of development followed by some applied issues regarding the planning for attaining an optimal state of spatial organisation of social facilities. The systematic explanation and description of the above-mentioned sections has been endeavoured in the following text of the present chapter.

6.2 HIERARCHIC ORDERS OF SETTLEMENTS

The concept of hierarchy deals with the main features of dynamic spatial organisation as well as the certain

patterns of human interaction within such a system. There exist certain regularities between the size of settlement and the number of functions it performs. Since the distribution of functions is very closely related to the distribution of population, there emerges, therefore, a further regularity in the location of retail and service outlets, and it is this regularity of functions which is known as 'urban hierarchy'.

The studies on the theme of the functional hierarchy of settlements may be grouped into two viz., (i) studies abroad and (ii) studies in India. The work by foreign scholars use really specific in objectivity and help in explaining the urban hierarchy of the regions. Such works by the Indian scholars are mainly based on western models.

Most of the works on the theme of 'hierarchy of settlements' in the Indian context are related either to the identification of service centres or central places. The growth pole concept, borrowed from the western works has created a lot of confusion in distinguishing it from the service centre and central place concepts.

6.2.1 Classificatory System of Settlement Hierarchies

A general classification of hierarchic orders of settlements based on various criteria may be attempted here. Each country has its own distintive physical as well as

cultural setting, therefore, the classification of settlements in each country presents different strata of the hierarchies. Taking this viewpoint into consideration and also on the basis of the studies done so far on the theme of hierarchic orders of settlements, an endeavour has been made to present a systematic classification of settlements in Table 6.01.

6.2.2 Concept of Service Hierarchy

A settlement may be termed as a service centre which caters to the needs of the population of its tributary area for providing necessary goods and services and making provision for essential public amenities and utilities. The concept of service centre is taken and adapted from various theories of Perroux[2] and Boudeville[3] about the formation and growth of development poles, Christaller[4] and Lösch[5] about size, location distribution and clustering of economic activities, Myrdal[6] and Hirschman[7] about the geographical incidence and spread of economic growth, Hagerstrand[8] and Pottier[9] about the geographical diffusion of innovations and axes of development, and Galpin and Colb about the social anatomy of agricultural communities.

The above studies reveal that (i) people are distributed in various settlements of various sizes in space; (b) they have bio-physical as well as socio-economic needs;

TABLE 6.01 Classification of Hierarchic Orders of Settlements Based on different criteria in the Context of World-wide and Indian conditions respectively

Classificatory Criteria	Hierarchic orders in Global context	Hierarchic orders in Indian content
General Hierarchic of settlements	1.Hamlet, 2. Village 2.Town and large villages 3.City and Large towns, 5.Metropolis, 6.Greater Metropolis and 7.World Metropolitan Centre.	1.Hamlt,2.Villages, 3.Large Villages, 4.Small town, 5.Large town, 6.City, 7.Metropolis,8.Greater Metropolis
Hierarchy of Central Places	1.Lowest order,2. Low order, 3.Middle order, 4. High order, 5. Higher order, 6. Highest order, 7. World wide order	1.Lowest order, 2.Lower order, 3. Low order, 4.Intermediate order, 5. High order, 6. Higher order and 7. Highest order.
Hierarchy of service centres	1. Local centres, 2. Major level centres, 3. Sub-regional/community centres, 4. Metropolis, 5. Greater Metropolis	1. Market village, 2.Rurban centres, 3. Local Towns, 4. Taluka/Tahsil or sub-district centre, 5. sub-regional centre District level town Centre, 6.Regional centre/commissionary town centre, 7.Major regional centre/state capital town centre and national level service centre/national capital centre.
Hierarchy of Growth centres	1. Local service centres, 2. sub-regional growth points, 3. Regional growth centres, 4. National growth pole and 5. International growth pole	1. Primary growth/ local growth centre, 2.local growth centre, 3.sub-regional growth centre, 4.regional growth centre,sub-growth pole/state level growth pole and growth pole/National level growth pole

(c) they utilise physical and human resource endowments (i.e., goods and services) to satisfy their needs; (d) they establish settlements of different forms in space; and (e) they migrate to other centres in search of goods and services which are not available in their own settlements.

As the range of goods and services and the threshold of population increases, service centres at different levels in the hierarchy become manifest. The existing pattern of service centres is an outcome of the forces of history and culture, on the one hand, and economic and political exigencies on the other. There is a symbiotic relationship between the development of service centres and the development of service areas around them. It shows that the development of service centres is the creation of infrastructural facilities which is any physical, institutional and organisational structure that facilitates the production and distribution of goods, services, amenities and utilities.[10]

6.2.3 Identification of Service Centres : Methodology

Identification of service centres implies the determination of the quantifiable personality of each centre. The hierarchy of service centres is defined as a functional classification of settlements (Fig. 28) in vertical succession. In an optimal state of spatial organisation it is expected that the service centres and their zones of influence should be economically viable and politically manageable.

There are various methods for identifying the hierarchic orders of service centres. The Sealogram method based on the weighted composite score of functions has been one of the most important methods in vogue. But in the present study Sealogram method has been applied to identify the hierarchy of settlements based on the composite score of social facilities computed through the non-arbitrary values of their median population thresholds, the account of which is submitted in the foregoing text systematically.

6.2.3.1 Concept of Composite Scores

It is seen from the review of the methods that the type and volume of functions can be measured in several ways. For example, one can simply count the existing functions in a settlement without weighting them. The counting can be done by weighting the functions also. But, one cannot assess the relative importance of the variety of functions. For example, whether a hospital or a post office is more important in a settlement, though empirically, both are equally important , to a settlement of a particular rank.[11] In some of the studies ranking is given to the sub-functions rather than the parent functions as different parent functions may not differ in their importance to warrant such a ranking.[12] Therefore, to overcome the theoretical difficulty of measuring the relative value of the variety of functions an endeavour

has been made to apply the median population threshold(MPT) indices in the present study. These MPT indices cover almost all those factors which have, so far, been included as a measure of centrality, like population of the centre, degree of functional complexity of each centre and the population served by each centre.[13] This method is very suitable for empirical studies as well as to the studies based on the secondary statistics. M.P.T.I. composite score Gravity's method will be explained in the following paragraphs.

6.2.3.2 Concept of MPT

The logic of central place theory[14] and the high correlation values between the size and functional range of settlements in empirical studies[15] has helped in defining the concept of population threshold. Generally speaking the minimum population which is necessary for the establishment of a particular service is known as the threshold size of that service. There is a general increase in the number of functions with the increase in the size of a settlement.

The exact form of the relationship between size of settlement and the number of establishments of each function differs from region to region.[16] In the study of threshold size of service functions made by Berry and Garrison it was found that some services require a larger population

for their support than the others, and for the first time it was known rather more precisely just how many people were, on average, required before a particular service could be provided in a settlement.[17]

The concept of 'population threshold', 'entry level' or 'entry zone' is complementary to the concept of the range of good. This concept states that there is a range of population size for each function, at the lower limits of which all settlements lack that function, while at the upper limits all settlements possess it. The median point of the range of population threshold is taken into account and this point known as the median population threshold (MPT).

Apart from various methods of estimating the threshold size of different functions Haggett and Gunawardena have tried to find a more refined method using a modified 'Reed Muench Technique' (Appendix XVI) to calculate the median population threshold[18] for settlement function.

The concept of MPT help not only in knowing the number of people required to sustain any particular function and/or a sub function but strengthens the system model.

6.2.3.3 Determination of MPTs and MPT Indices of Social Facilities

According to the modified Reed-Muench method as developed by Haggett and Gunawardena (Appendix XVI) the value

of median population threshold (MPT or PT50) for each of the 40 social facilities found in case of Bulandshahr district is worked out as mentioned in Table 6.02 for the function e.g., primary school, the value of median population threshold (PT_{50}) is worked out to be as 938 persons. It shows that in the existing conditions, on an average, a settlement with a population of 938 inhabitants is being served by a primary school. The computed values of median population thresholds for all the facilities are enlisted in Table 6.02.

(A) 'P' Value Computation Rule :

$$P = \frac{Ps \cdot 100}{Ps \quad Ag}$$

P, Ps and Ag are explained in Table 6.02

(B) MPT (or PT_{50}) Value Computation Rule :

$$M.P.T. \text{ or } PT_{50} = MR_1 \left\{\frac{50 - A}{B - A}\right\} (MR_2 - MR_1)$$

where MR_1 = Mid-point of the class (Range) preceding 50 per cent (PT_{50}) Ps to the value of

Ps Ag.

MR_2 = Mid point of the class (Range) succeeding the class of MR_1

A = P value of the class preceding the PT_{50} value

B = P value of the class succeeding the PT_{50} value

TABLE 6.02 Computation of Median Population Threshold (MPT or PT_{50}) for Primary School Facility

(Method - Modified Reed-Muench Method)

S.No.	Particulars	0 to 199	200 to 499	500 to 999	1000 to 1999	2000 to 4999	5000 to 9999	10000 to 19999	20000 to 49999	50000 and above
1.	Total No. of Settlements	72	217	461	442	170	13	6	2	2
2.	With Function Primary School	-	32	200	349	152	13	6	2	2
3.	Without Function Fi	72	185	261	93	18	0	0	0	0
4.	With Function Fi absent at this and Greater Levels (Ag)	629	557	372	111	18	0	0	0	0
5.	This Function Fi present at this and smaller Levels (Ps)	0	32	232	581	733	746	752	754	756
6.	Proportion of settlemetns with function Fi Present (P)	0	5.4	38.4	83.9	97.6	100.0	100.0	100.0	100.0

Here MPT for Primary School $= 750 \left\{\frac{50-38.4}{83.96-38.4}\right\} (1500-750)$

$= 750 \left\{\frac{11.6}{45.5}\right\} (750)$

$= 750 \quad (02.5) \; (750)$

$= 750 \quad 187.50 = 937.50$

$= 938$ persons

On the basis of MPT of primary school as the unit of measure, the relative value of MPT of each facility has been worked out and is termed as 'Median Population Threshold Index' (MPTI) or the 'Coefficient of Median Population Threshold'(CMPT), of a social facility. Since these indices are represented in the forms of population, therefore, these can be considered as relative weights to compare the relative importance of all the social facilities with each other.

6.2.3.3 Determination of Composite Scores of MPT Indices of Social Facilities

On the basis of the values of MPT indices of all the social facilities found in a settlement are added together and the composite score thus obtained is termed as the 'Total Mass' or the 'Total Functional Gravity' (TFG) or 'Composite Score of Median Population Threshold Indices' (CSMPTI) of that settlement. On this criterion total mass value for each of the settlements of Bulandshahr district has been worked out.

Table 6.03 brings out the salient facts regarding the relative importance of the social facilities of the area under study. The lowest median population threshold is 694 for this facility of electricity meant for agriculture. This is so because about 63.5 (880 settlements) per cent settlements of the district have this facility.

The classification of facilities on the basis of their composite score is being given in Table 6.04.

It is clear from Table 6.04 that five out of all the 40 facilities in the district are of the lowest level, i.e., of the 6th order. These facilities are primary school, branch post office, metalled and unmetalled road, and electricity meant for agricultural uses. On the other hand the non-agricultural credit societies, tahsil and district headquarters, public library, reading room and cinema facilities are recorded as the first order facilities.

6.2.4 Classification of Settlements By Hierarchic Orders in the Study Area

The classification of settlements of Bulandshahr district is based on the composite scores of median population threshold indices of social facilities. The accompanying illustrations (Figs. 28 and 29) and the Table 6.05 bring out the salient features of the arrangement of settlements. The limit of each of the seven classes is based on the gaps

TABLE 6.03

Computed Values of Median Population Thresholds (MPTs) and MPT Indices for Settlement Functions (Social Facilities) in Bulandshahr District, 1971

S.No.	Function (Social Facility)	MPT	MPT Index	S.No.	Function (Social Facility)	MPT	MPT Index
	1. EDUCATION				5. AGRO-ECONOMIC SERVICES (A) AGRICULTURAL		
1.	P.S.	938	1.0	21.	A.S.S.	5140	5.5
2.	J.H.S.	3489	3.7	22.	C.S.S.	6100	6.5
3.	H.S.S.	5340	5.7	23.	S.M.C.	6700	7.1
4.	College	13950	14.9	24.	V.H.	6940	7.4
	2. HEALTH			25.	E.A.U.	694	0.7
	(A) MEDICAL				(B) CREDIT		
5.	Disp.	5260	5.6	26.	A.C.S.	12525	13.3
6.	F.P.C.	6220	6.0	27.	N.A.C.S.	35000	37.3
7.	M.C.W.	5980	6.4	28.	L.S.S.	9150	9.8
8.	Hosp.	5540	5.9	29.	Bank	12825	13.7
9.	H.C.	11100	11.8		6. PUBLIC ADMINISTRATION		
	(B) SANITARY				(A) SOCIAL JUSTICE & SECURITY		
10.	P.T.	12750	13.6	30.	N.P.C.	3120	3.3
11.	O.S.D.	10650	11.3	31.	P.S./O.P.	9150	9.8
	3. COMMUNICATION (A) POSTAL				(B) ADMINISTRATIVE H.QRS.		
12.	B.P.O.	2720	2.9	32.	B.H.Q.	8850	9.4
13.	P.T.O.	7500	8.0	33.	P.H.Q.	11950	12.7
14.	Phone	10575	11.3	34.	T.H.Q.	28600	30.5
1	(B) TRANSPORT			35	D.H.Q.	75000	80.0
					7. [illegible] TIME ACTIVITIES (A) [illegible]		
15.	K.R.	1013	1.1	36.	Temple	4580	4.9
16.	P.R.	1328	1.4	37.	Mosque	5700	6.1
17.	Rly.	5860	6.2				
	4. MARKET				(B) [illegible]		
18.	[illegible]	4900	5.2	38.	P.[illegible]	17500	18.7
19.	[illegible]	[illegible]40	6.3	39	R.[illegible]	[illegible]	[illegible]
20.	R.[illegible]	5820	6.2	40.	Cinema	35000	37.3

N.B. 1. Abbreviations [illegible] for social facilities refer to [illegible] 5.01

2. [illegible] median population thresholds [illegible] computed by the [illegible] based on [illegible] technique.

TABLE 6.04 Classification of Functions by Their Relative Importance Based on Their Composite Scores of MPT Indices in Bulandshahr District, 1971

Functional Order No.	CSMPT Indices*	No. of Functions	Per cent to Total	Functions(Facilities)**
6th	0-3	5	12.5	PS,BPO,KR,EAU
5th	3-6	8	20.0	JHS,HSS,Disp., Hosp., WM, ASS, NPC,TMP
4th	6-9	10	25.0	FPC,MCW,PTO,RLY, FM,RM,CSS,SMC, VH,MSQ
3rd	9-12	6	15.0	HC,CSD,Phone,LSS, PS/OP, BHQ
2nd	12-15	5	12.5	College, PT,ACSm Bank, PHQ
Ist	15 & above	6	15.0	NACS,THQ,DHQ,PL, RR,Cinema
	TOTAL	40	100.0	

* CSMPT - Composite Score of Median Population Threshold Indices of Social Facilities

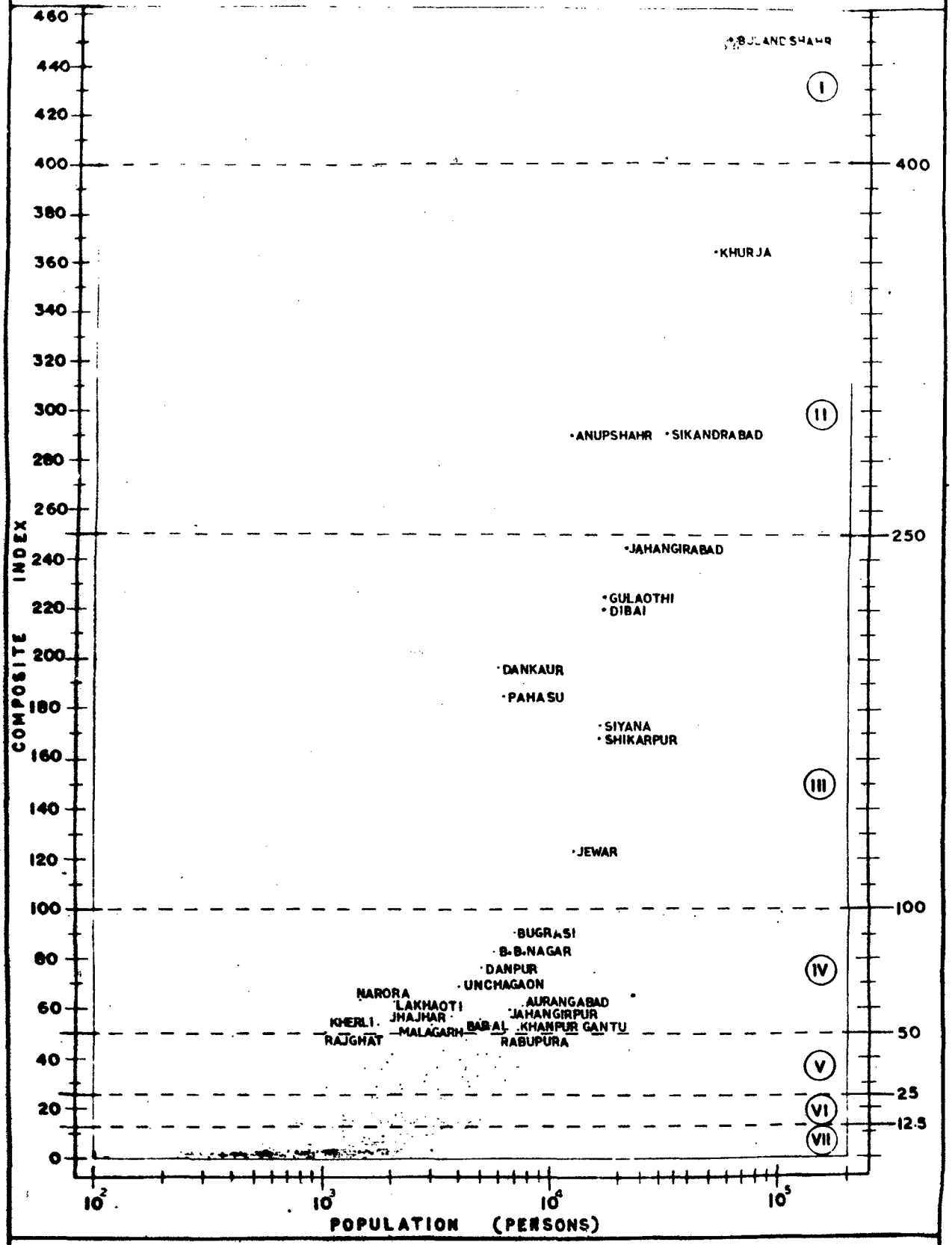
** Abbreviations for functions have been used on the basis of functions given in Table 5.01

in composite score. The frequency distribution of settlements also determines the underlying patterns of relationship between population size of the settlements and their composite rank.

DISTRICT BULANDSHAHR : 1971

CLASSIFICATION OF SETTLEMENTS BASED ON COMPOSITE INDEX

(40 VARIABLES OF SOCIAL FACILITIES)



NUMBER OF SETTLEMENTS BY RANK GROUP

RANK	I	II	III	IV	V	VI	VII
NUMBER	1	3	8	15	29	112	1217

FIG. 28

TABLE 6.05 Number of Settlements Classified By Hierarchic Orders Based on the Composite Scores of Their Functions in District Bulandshahr, 1971

Hierarchic Orders	Range of the level of Composite Score	No. of Settlements	Per cent to total settlements	Name of the Settlements* of the first three orders
VII B	zero	53	3.8	
VII A	0.1 - 12.5	1164	84.0	
VII	0.0 - 12.5	1217	87.8	
VI	12.5 - 25.0	112	8.1	
V	25.0 - 50.0	29	2.1	
IV	50.0 -100.0	15	1.1	
III	100.0-250.0	8	0.6	JNB,Gul,DBI,DNK PSU,SIA,SKP,JWR
II	250.0 -400.0	3	0.2	KRJ, SKD, ASR
I	400.0 - above	1	0.1	BSR
	TOTAL	1385	100.0	

* The names of the settlements refer to the list of Abbreviations given in this thesis

It is clear from Table 6.05 that no facility is available in 53 settlements of the district. There are 1217 (87.8 per cent) settlements including 53 settlements without any facilities which have a composite score ranging between zero and 12.5. It means such villages are lacking

in most of the essential social facilities, primary school, kachcha road and electricity for agricultural uses. The vertical classification of settlements in relation to their spatial distribution in the district the following orders can be found.

6.2.4.1 First Order Settlements

Bulandshahr, a II class town stands out as the first ranking settlement and the functional gap (Fig. 28) between Bulandshahr and the second order settlements is very wide.

6.2.4.2 Second Order Settlements

There are three towns namely Khurja (50,245 persons), Sikandrabad (32,031 persons) and Anupshahr (12,253 persons) in the second order of functional hierarchy of settlements. All these three towns are functioning as tahsil headquarters and are second, third and fourth class towns (1971 census)[19] respectively. Khurja is a better developed town because it is prominent commercial, educational and industrial town of the district, well connected by rail and road. Anupshahr town is comparatively very small and not well connected with its neighbouring towns than Sikandrabad but being prominent religious centre located along the holy river Ganga it obtains the composite score of facilities at par with Sikandrabad town.

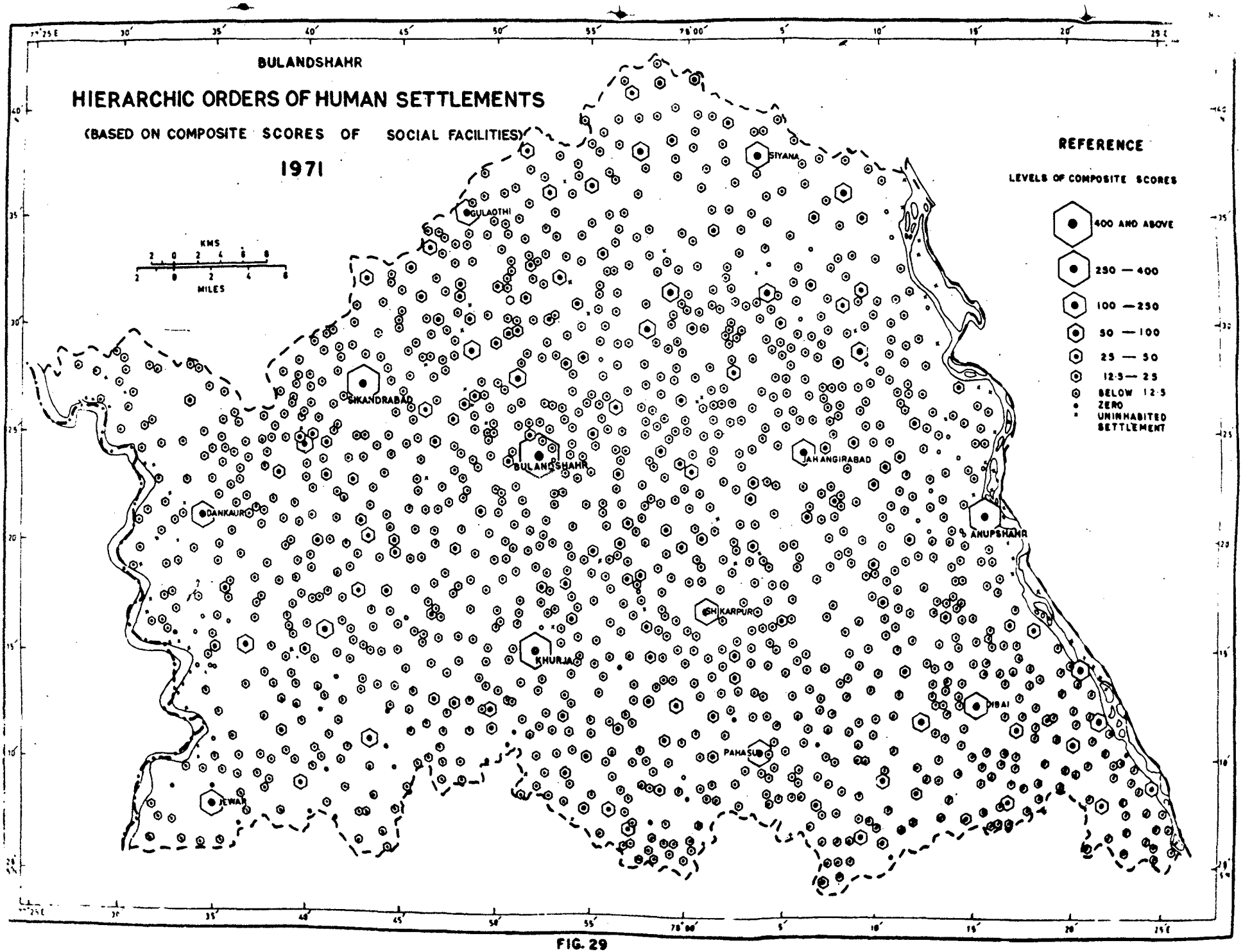

BULANDSHAHR
HIERARCHIC ORDERS OF HUMAN SETTLEMENTS
(BASED ON COMPOSITE SCORES OF SOCIAL FACILITIES)
1971
KMS
MILES
REFERENCE
LEVELS OF COMPOSITE SCORES
400 AND ABOVE
250 — 400
100 — 250
50 — 100
25 — 50
12·5 — 25
BELOW 12·5
ZERO
UNINHABITED SETTLEMENT
SIYANA
GULAOTHI
SIKANDRABAD
BULANDSHAHR
JAHANGIRABAD
DANKAUR
ANUPSHAHR
SHIKARPUR
KHURJA
DIBAI
PAHASU
JEWAR

FIG. 29

6.2.4.3 Third Order Settlements

There are eight settlements in the third order of hierarchy. All of them except Jewar are classified towns, (1971 census). Jahangirabad, a class III town with a population of 21,578 persons is the most important town in this order. It is a famous mandi and well connected by pucca roads with its adjacent towns and larger villages. These are also block headquarters. The composite score of social facilities of towns of Gulaothi and Dibai, Dankaur and Pahasu and Siyana and Shikarpur is very close to each other. Jewar has the lowest position among this order because of its being located in the Yamuna Khadar.

6.2.4.4 Fourth Order Settlements

There are fifteen settlements in the fourth order. There is only one town, Bugrasi, in this order the next four settlements namely Bhawan Bahadur Nagar, Danpur, Unchagaon and Lakhaoti are block headquarters. There are four declassified towns, e.g., Aurangabad, Jajhar, Khanpur Gantu and Rabupura. Kherli Hafeezpur also known as Mandi Shyam Nagar has an industrial estate, railway station, Dankaur. Naraura and Rajghat villages being located along the Ganga river and the latter having the location of an atomic energy centre under construction are important centres and lie in the 4th order. The rest two settlements

of this group are Baral and Malagarh well accessible by rail and road and a place of historical importance.

6.2.4.5 Fifth Order Settlements

There are 29 villages in the fifth order. All these villages are generally larger in population ranging from 1,000 to 7,000 persons. Some of them are located along pucca roads like Dhanaura Naithla, Shiwali and Amargarh, some have intermediate college facility like Bihra, Sarangpur, and Chitson-Salempur and some have religious importance of their own.

6.2.4.6 Sixth Order Settlements

In the 6th rank the settlements have population ranging from about 400 to 6,000 persons. But they are not well accessible either by road or rail. There are 112 villages in this order and they vary from small village centres to the road-side larger villages.

6.2.4.7 Seventh Order Settlements

There are 1,217 (87.8 per cent) settlements of the district in the 7th order. Both from the quantical and spatial assessment of the settlements (figs. 9, 28 and 29) there are several instances where the settlements are large enough in terms of population and yet functionally their rank is low.

Some social scientists have used different methods of ascertaining settlement hierarchy from the method used in the present study. Such scholars maintain that the concept of hierarchy is dynamic and the different levels of settlement hierarchy help in revealing various levels of nodality explained through the convergence of man and material in different centres.[20] Thus to identify major and subordinate nodes the bus frequency along the major transport routes both within and outside the area under study is suggested to be taken into account on the basis of graph technique.[21] They also suggest that the size of a place can be established on the basis of population and functions. But bus frequency from and to a place may not be the factor to enhance the functional personality of that place. It is the aggregative effect of the functions that enhances its functional personality. In the present study it is not only the existing functions of the settlements are considered but also the relative importance of the functions also comes in.

6.3 HINTERLANDS OF SERVICE CENTRES

6.3.1 Delimitation of Hinterlands of Service Centres

The spatial hierarchy of settlements deals with the area of their influence. The area or zone under the functional influence of a settlement is said to be its zone of influence or hinterland. So far there have been various methods used for delineating the hinterlands of service centres like Sociogram method, Reilly's law of Retail Gravi-

tation, Modified 'Gravity' method, and average composite score gravity method etc. But in this study modified gravity method based on the composite score of median population threshold indices has been used which is being given in the following pages systematically.

6.3.1.1 Modified Gravity Method Based on Composite Score of MPT Indices

The modified gravity model as used by Rushton[22] and L.K. Sen (1975)[23] has been followed in order to fix the limits of the service areas of service centres of various orders with a marginal modification of the application of the value 'mass' of settlements. Instead of using population as mass, the composite score of MPT indices (C.S.M.P.T.I.) has been considered as the mass of each settlement. The formula used is -

$$P = \frac{d}{1+\sqrt{\frac{C_A}{C_B}}}$$

Where,

P - Common point where the two hinterlands meet measured from the smaller centre

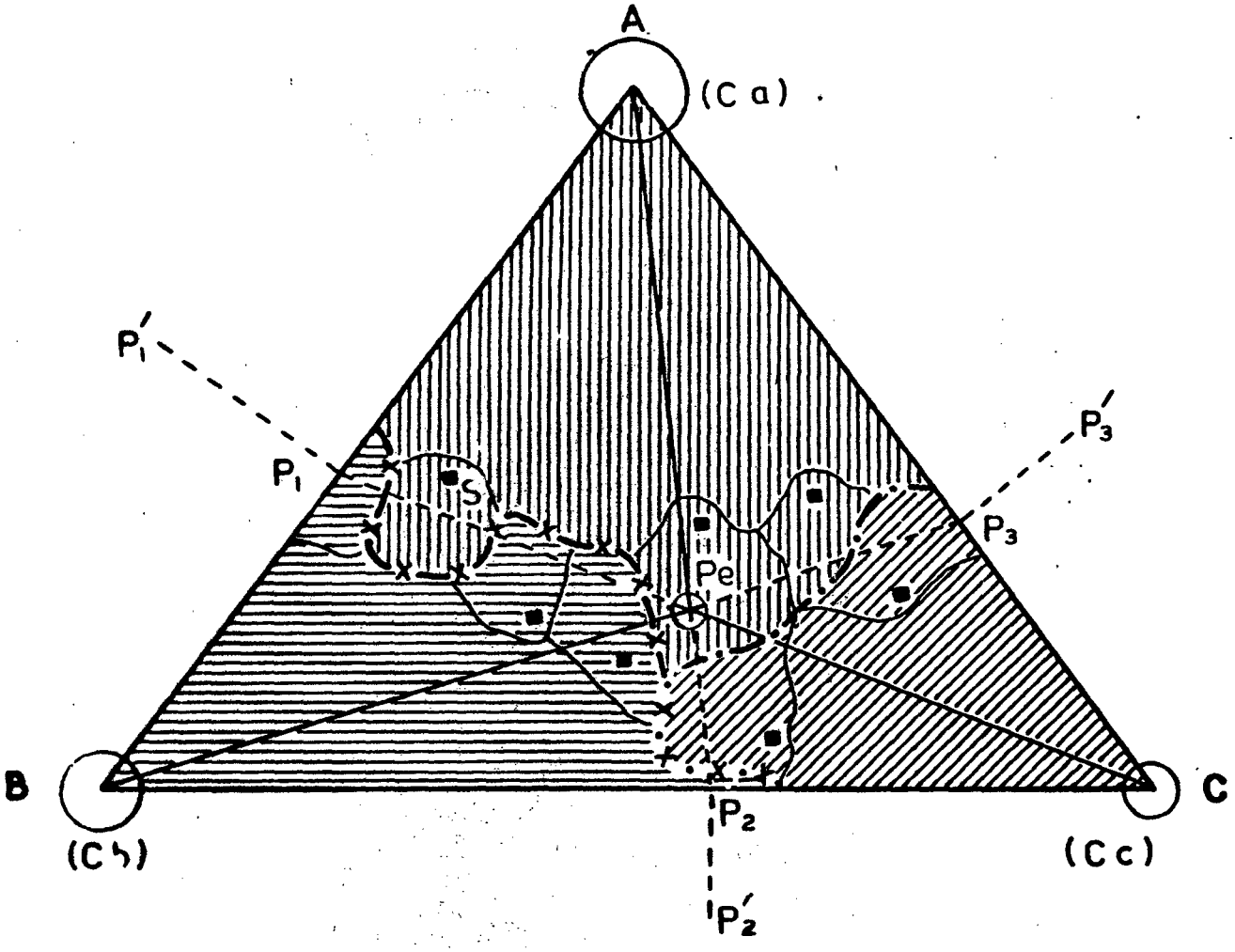
C_A - Composite score of Median population threshold indices (CSMPTI) as the mass of centre 'A' which is bigger of the two centres

C_B - CSMPTI as the mass of centre 'B' which is smaller of the two centres

d - Distance between the two centres 'A' and 'B'

DELINEATION OF HINTERLANDS OF SERVICE CENTRES

(HYPOTHETICAL)



REFERENCE

A,B,C	Identified service centres
Ca,Cb,Cc	Composite scores of A B & C centres
P_1, P_2, P_3	Common points of influence between centres
$P_1 P_1', P_2 P_2', P_3 P_3'$	Perpendiculars of common points
Pe	Points of equillibrium
■	Intermediate settlements with revenue boundary

Boundary hinterland of

— — A Centre

x x x B Centre

• • • C Centre

Hinterland area of

A Centre

B Centre

C Centre

- - - - Lines for determining hinterland boundaries

Fig. 27

Thus, the common points P_1 P_2 and P_3 in between A, B and C centres respectively help to identify the point of equilibrium P_E, where the hinterlands of each of the three centres A, B and C meet with one another. With the aid of an accompanying illustration it is clear that in the triangle ABC the intersected point of the lines joining each apex to the common point of its opposite base would be the point of equilibrium. Now the boundary of the hinterlands would not pass directly from common point to common point but via the point of equilibrium. For example the boundary of centre A will pass through the point P_1, P_E and P_3 respectively.

Finally, the revenue boundary of each settlement has been taken into account for delineating the hinterland of service centres.

While delimiting hinterlands with the help of the levels of functional hierarchy of settlements the following strategy may be followed :

(i) non-intact range method and (ii) intact range method.

In the first method the actual 'mass-values', i.e., composite score of MPT indices of settlements is taken into account but in the second one the actual mass-values of the settlement falling in the hierarcy are taken for computation. But the mass of those settlements that fall in

the higher level than the level of consideration is taken equal to the value of the upper limit of the range of the level of consideration.

This method shows that functional hinterland of the higher order service centres gets all those services rendered by lower order service centres also.

6.3.1.2 Hinterlands of Service Centres in the Study Area

In the present study (Fig. 28) the mass of each service centre in place of population is represented by the value of its composite score based on the median population threshold indices of social facilities for delineating the boundaries of the area of their influence. The main limitation in delineation of hinterland is that the first order service centre e.g., Bulandshahr encompasses the whole district in its hinterland. This happens in this case because :

(i) the Ganga and the Yamuna rivers confine the district by disconnecting it from the adjacent areas of the neighbouring districts on its eastern and the western boundary respectively;

(ii) there are several important service centres, like Jewar, Jahangirabad, Khurja, Pahasu, Arniya, Chhatari, Danpur, Dibai, Jargawan, Naraura and Ramghat etc., which lie close to the southern boundary of the district. This indicates that no service centre

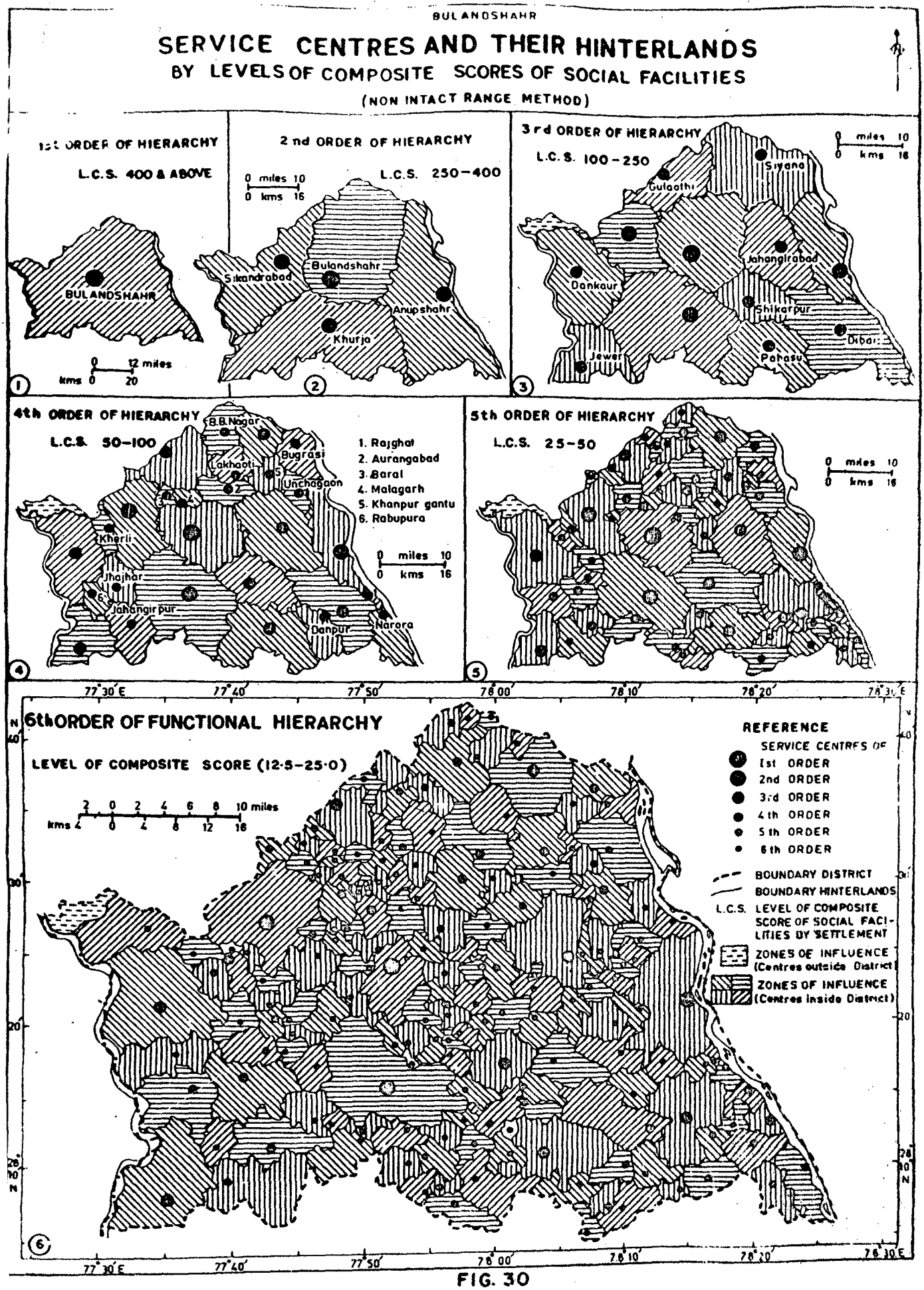

BULANDSHAHR
SERVICE CENTRES AND THEIR HINTERLANDS
BY LEVELS OF COMPOSITE SCORES OF SOCIAL FACILITIES
(NON INTACT RANGE METHOD)
1st ORDER OF HIERARCHY
L.C.S. 400 & ABOVE
BULANDSHAHR
0 12 miles
kms 0 20
1
2 nd ORDER OF HIERARCHY
L.C.S. 250–400
0 miles 10
0 kms 16
Sikandrabad
Bulandshahr
Anupshahr
Khurja
2
3rd ORDER OF HIERARCHY
L.C.S. 100–250
0 miles 10
0 kms 16
Siyana
Gulaothi
Jahangirabad
Dankaur
Shikarpur
Jewer
Pahasu
Dibai
3
4th ORDER OF HIERARCHY
L.C.S. 50–100
B.B.Nagar
Bugrasi
Lakhaoti
Unchagaon
Kherli
Jhajhar
Jahangirpur
Danpur
Narora
1. Rajghat
2. Aurangabad
3. Baral
4. Malagarh
5. Khanpur gantu
6. Rabupura
0 miles 10
0 kms 16
4
5th ORDER OF HIERARCHY
L.C.S. 25–50
0 miles 10
0 kms 16
5
77°30 E
77°40
77°50
78°00
78°10
78°20
6th ORDER OF FUNCTIONAL HIERARCHY
LEVEL OF COMPOSITE SCORE (12·5–25·0)
2 0 2 4 6 8 10 miles
kms 4 0 4 8 12 16
REFERENCE
SERVICE CENTRES OF
1st ORDER
2nd ORDER
3rd ORDER
4th ORDER
5th ORDER
6th ORDER
BOUNDARY DISTRICT
BOUNDARY HINTERLANDS
L.C.S. LEVEL OF COMPOSITE SCORE OF SOCIAL FACILITIES BY SETTLEMENT
ZONES OF INFLUENCE (Centres outside District)
ZONES OF INFLUENCE (Centres inside District)
6
77°30 E
77°40
77°50
78°00
78°10
78°20
28°30 N

FIG. 30

located in Aligarh district near the boundary may have its zone of influence inside the southern fringe of Bulandshahr district;

(iii) in the northern border fringe of the district there are service centres, e.g., Gesupur, Gulaothi, Bhawan Bahadur Nagar, Kuchesar, Siyana and Bugrasi. These have hindered the development of any important service centre of Ghaziabad district near the border;

(iv) the north-western border fringe of the district has no important service centre of the higher order. Therefore, parguna Dadri has been taken into account in the delineation of hinterlands of service centres of various orders.

If the spatial arrangement of hinterlands of the service centres is looked at by superimposing the maps of hinterlands (Figs. 30-6 and 31-6) over the map showing the levels of development (Fig. 35) it is clearly seen that the hinterlands of the 6th order of service centres are larger in size in the areas where the level of development is low. For example the blocks of Dankaur, Jewar, Pahasu and Danpur reflect this pattern. On the other hand the blocks of Gulaothi, Sikandrabad, Bulandshahr and Khurja the size of the hinterland of the 6th order service centres is smaller in the areas, where the level of development is higher. Siyana block is an exception as it has, generally larger villages at greater distance. Therefore, it may be deduced that the size of

BULANDSHAHR

SERVICE CENTRES AND THEIR HINTERLANDS

BASED ON COMPOSITE SCORES OF SOCIAL FACILITIES

(INTACT RANGE METHOD)

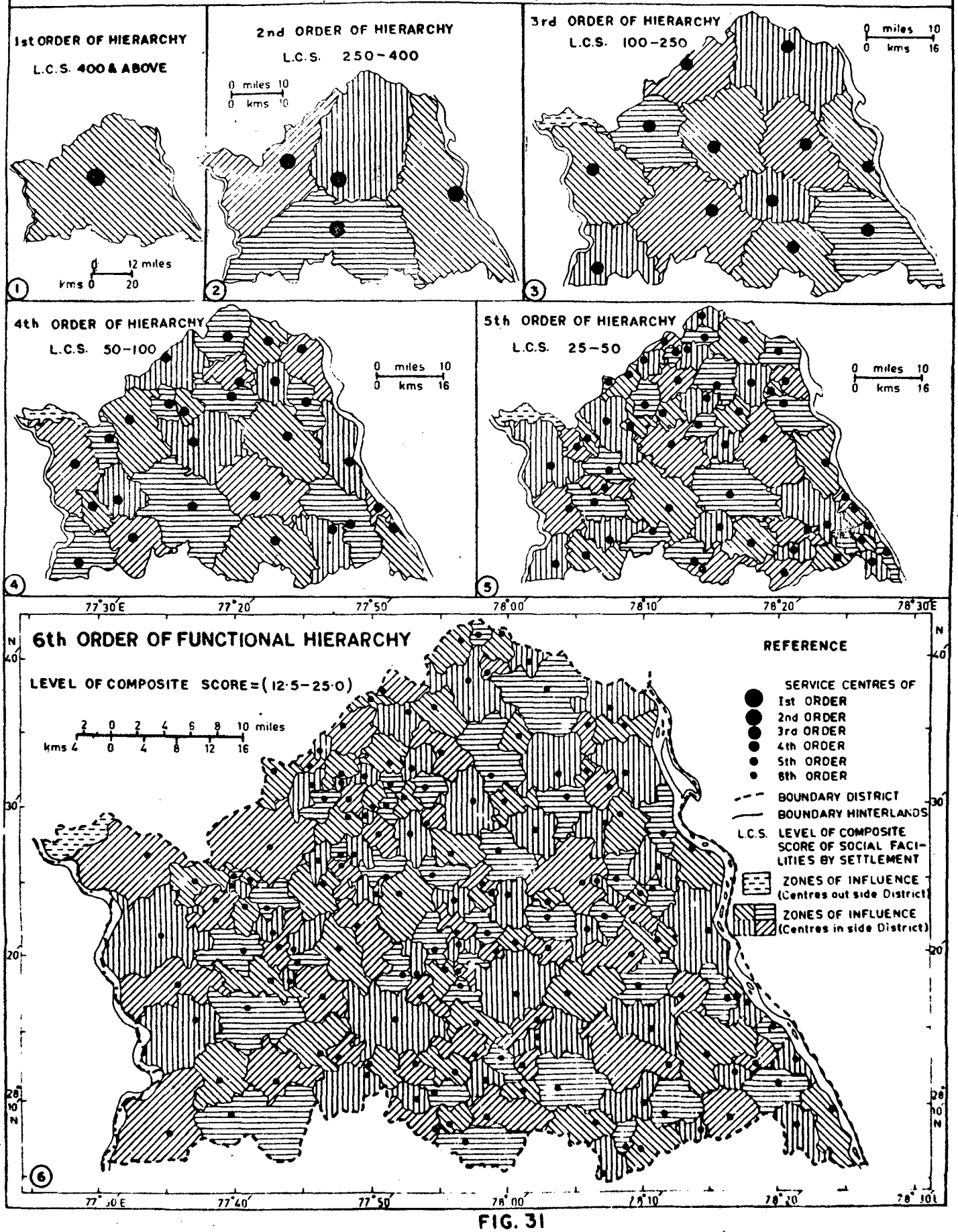


FIG. 31

the hinterland of the lowest order of service centres is inversely related to the level of development in the area. The less developed an area the larger are the hinterlands of the lowest order service centres.

6.3.1.3 Hinterlands Based on Two Methods : A Comparative Study

The delineation of hinterlands of service centres by their hierarchic orders in the present study is based on two separate methods viz., (i) non-intact and (ii) intact range methods. There is marked difference (Fig. 32) in area, population, number of dependent villages and the level of composite score of social facilities of the hinterlands delineated on the basis of both the methods. Both the methods give different result as highlighted below :

(i) the size of hinterland of a service centre delineated by non-intact range method is larger (Figs. 30 and 31) to that of the intact range method. Thus, the hinterland of a higher order centre is reduced to the maximum possible extent, while it falls in a lower level of functional hierarchy by the intact range method. It is very clear that the size of the hinterland of a first order service centre based on higher level of functions would be much larger than the hinterland based on lower order facilities. For example, on the basis of cinema, civil hospital, civil courts and

BULANDSHAHR

A COMPARISON IN THE HINTERLAND OF SERVICECENTRES

BASED ON THE NON-INTACT & INTACT RANGE METHODS

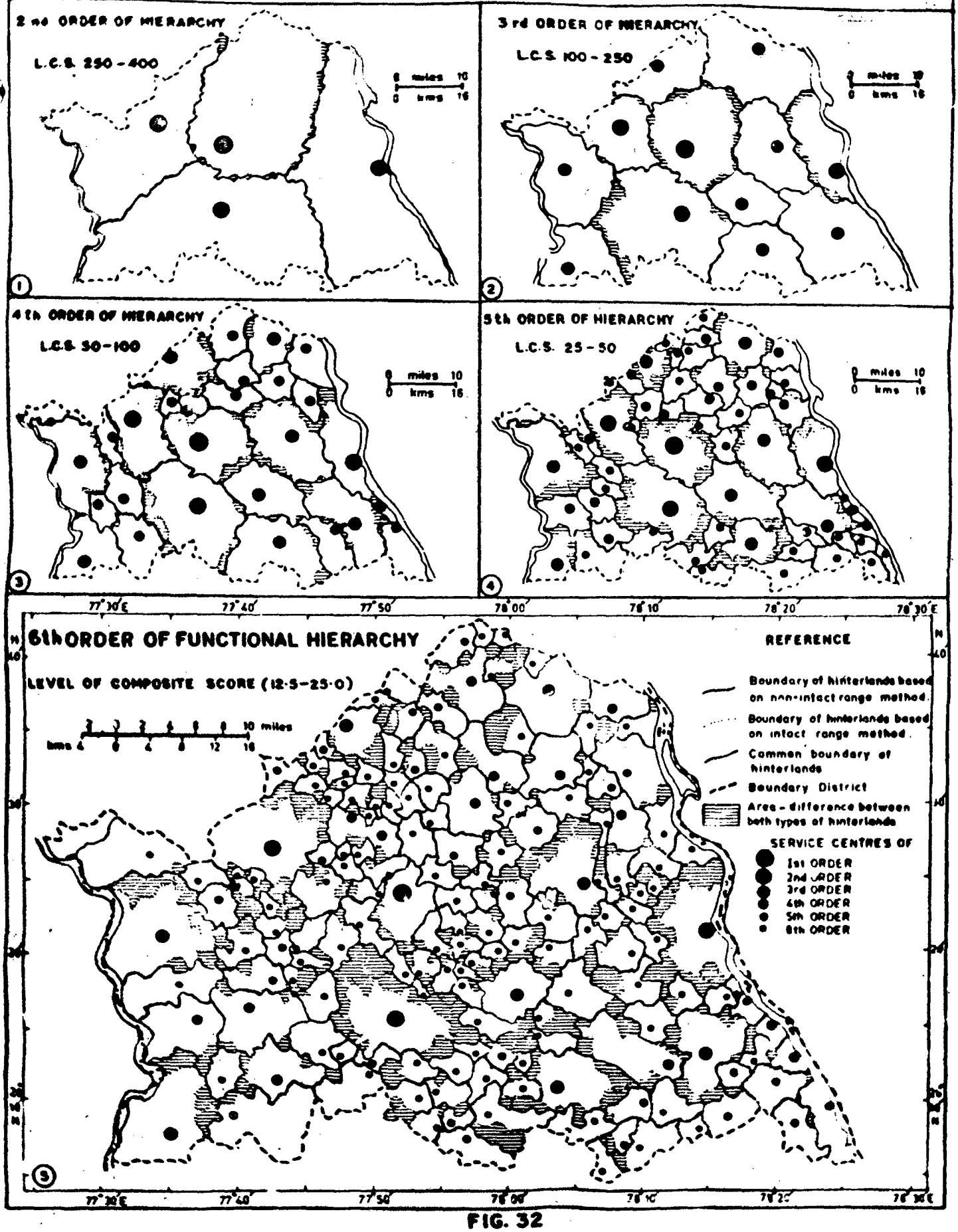


FIG. 32

district level office facilities, the hinterland of Bulandshahr town encompasses the whole district itself, but for primary school, branch post office, dispensary and weekly market etc. its hinterland would be very small. Therefore, the intact range method seems to be more appropriate in comparison to that of the non-intact range method (Fig. 32).

TABLE 6.06 Percentage Variation in Hinterland Zones of Bulandshahr Service Centre based on Intact Range Method in Comparison to that of Non-Intact Range Method

S.No.	Order of Hinterland	Per cent Variation in Hinterlands				
		% settlement served	Area	Total Composite Score	C.S. per 100 settlements	Population
1.	Ist order	00.0	00.0	00.0	00.0	00.0
2.	2nd order	-4.1	-4.9	-4.1	0.1	-3.6
3.	3rd order	-12.9	-13.3	-4.5	9.6	-10.6
4.	4th order	-10.2	-8.7	-6.2	4.4	-5.9
5.	5th order	-31.5	-30.2	-20.9	15.4	-19.2
6.	6th order	-21.7	-21.7	-3.5	21.7	-5.8

(ii) the maximum variation (30.2 per cent) between the areas of hinterlands of service centres based on both the methods (Table 6.06) and Appendix XIX) is marked in case of 5th order of settlements. The least

variation (4.9 per cent) in area of the hinterland based on the non-intact range method is seen in case of second order service centres;

(iii) in case of 5th order service centres their hinterlands contain less number of dependent settlements to the extent of about 31.5 per cent delineated on the intact range method;

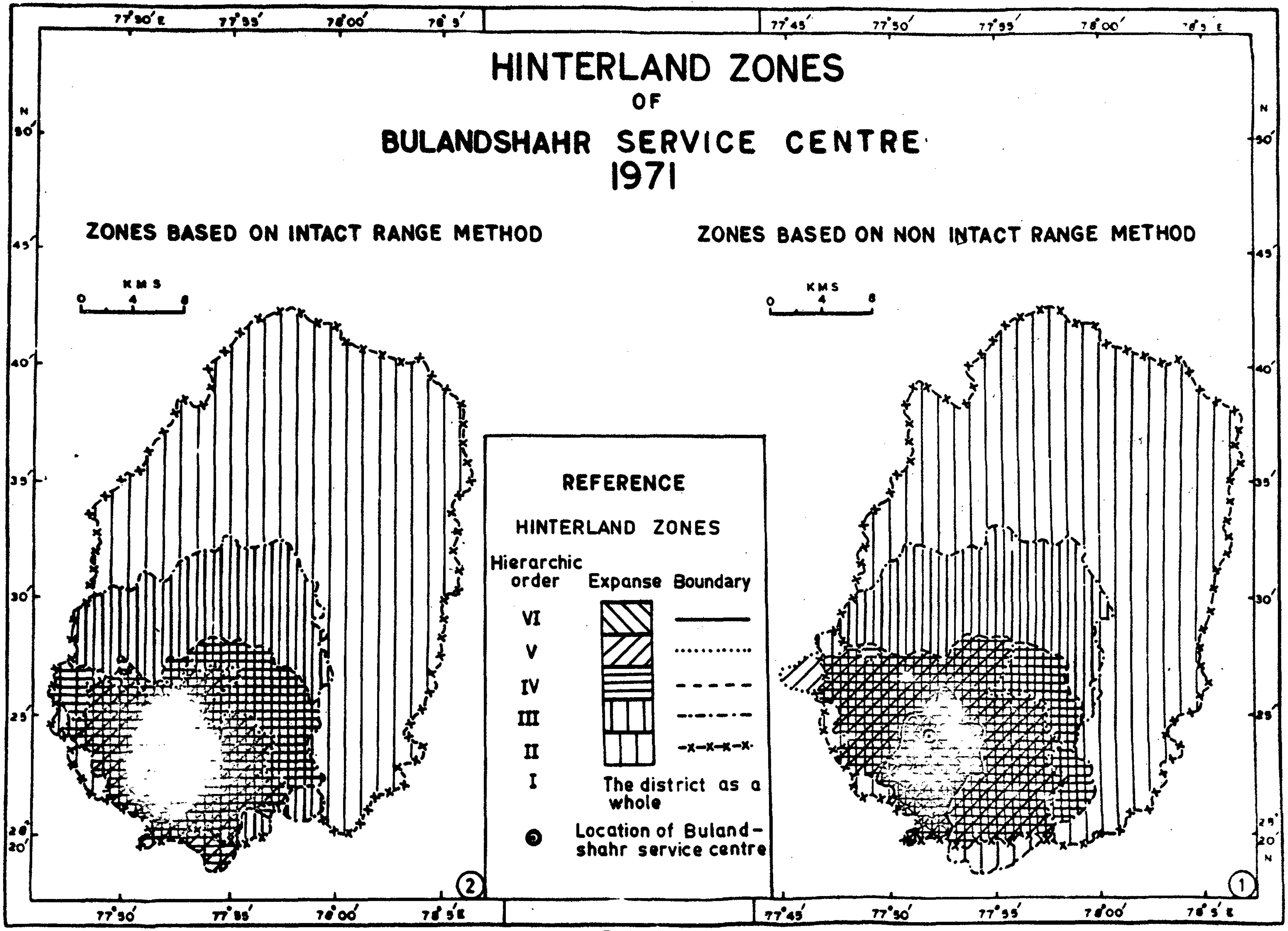
(iv) the maximum variation in the population of the hinterland delineated on the basis of both the methods is recorded (19.2 per cent) in case of the 5th order service centres.

On the basis of the above facts the intact-range method seems a better method in delineating the hinterland of various order service centres.

6.3.2 Hinterland Zones

On making an analysis of hinterland zones (Fig. 33 and Table 6.07) of a highest order of service centre marked inter-relationship is observed in their area, population, composite score and the number of dependent settlements. For taking an example Bulandshahr service centre is the only best instance for the area of the study in this connection. The following points emerge as the most important ones pertaining to zones of hinterland :

(i) the changing pattern of size, population, number of dependent settlements in each zone of hinterland



HINTERLAND ZONES
OF
BULANDSHAHR SERVICE CENTRE
1971
ZONES BASED ON INTACT RANGE METHOD
ZONES BASED ON NON INTACT RANGE METHOD
KMS
0 4 8
REFERENCE
HINTERLAND ZONES
Hierarchic order
Expanse
Boundary
VI
V
IV
III
II
I
The district as a whole
Location of Bulandshahr service centre
77°50'E
77°55'
78°00'
78°5'
77°45'
77°50'
77°55'
78°00'
78°5'E
N
50'
45'
40'
35'
30'
25'
28°20'
2
1

FIG. 33

Table 6.07

Percentage size of Hinterland zones of Bulandshahr service Centre delineated on the basis of non-intact and intact-range methods.

S.No.	Order of Hinterland	Variations based on Non-Intact Range Method					Variations based on Intact range method				
		Percent No. of Settlements	Area	Composite score (C.S)	C.S. per 100 Sett.	Population	% No. of Settlements	Area (%)	C.S. (%)	C.S./ 100 (%)	Population (%)
1.	1st order	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
2.	2nd order	24.3	22.7	25.5	104.9	27.6	23.3	21.6	24.5	105.0	25.6
3.	3rd order	12.3	9.8	14.3	116.1	12.2	10.8	8.5	13.7	127.2	10.9
4.	4th order	9.2	6.6	10.2	110.7	11.1	9.3	6.1	9.6	115.5	10.4
5.	5th order	7.8	5.5	8.9	114.4	9.9	5.3	3.8	7.0	131.9	9.0
6.	6th order	1.7	1.1	5.1	295.6	4.7	1.4	0.8	4.9	360.2	4.5

delineated on the basis of intact and non-intact range methods generally correspond (Table 6.07 and Appendix XIX);

(ii) as the order of the zone of the hinterland of a service centre decreases, the level of composite score of social facilities per 100 settlements increases.

The composite score per 100 settlements improves with the shrinkage of the zones of service centres. For instance, the composite score per 100 settlements for second to sixth order zones of the hinterland of Bulandshahr town to the composite scores per 100 settlements of the first order zone comes to 105.0, 127.2, 115.5, 131.8 and 360.2 per cent respectively.

6.3.3 Nesting of Hinterlands

The spatial arrangement of service centres in Bulandshahr district reveals that the nesting (Fig. 34) of hinterlands of the different orders of service centres does not give hexagonal pattern. The two major rivers, the Ganga and the Yamuna hinder the socio-economic interaction from outside the district from the east and the west. It has better connection from north and south. Bulandshahr town, located almost in the centre of the district is connected by only Grand Trunk road which passes through Sikandrabad, Bulandshahr and Khurja towns and one state highway viz., Meerut-Bulandshahr, through Gulaothi. These two trunk routes connect the district on its north-south axis. Therefore, the growth of service centres could not take place throughout the district. Anupshahr town even has emerged as a higher order service centre only on the basis of religious importance. Anupshahr, Khurja and Sikandrabad towns fall in the second order in functional hierarchy of settlements, while Bulandshahr is in the first order. It means if the basic locational frame of higher order centres is distorted the nesting of hinterlands of the various orders of service centres would not correspond with the Christaller's hexagonal pattern.

6.4 LEVELS OF DEVELOPMENT

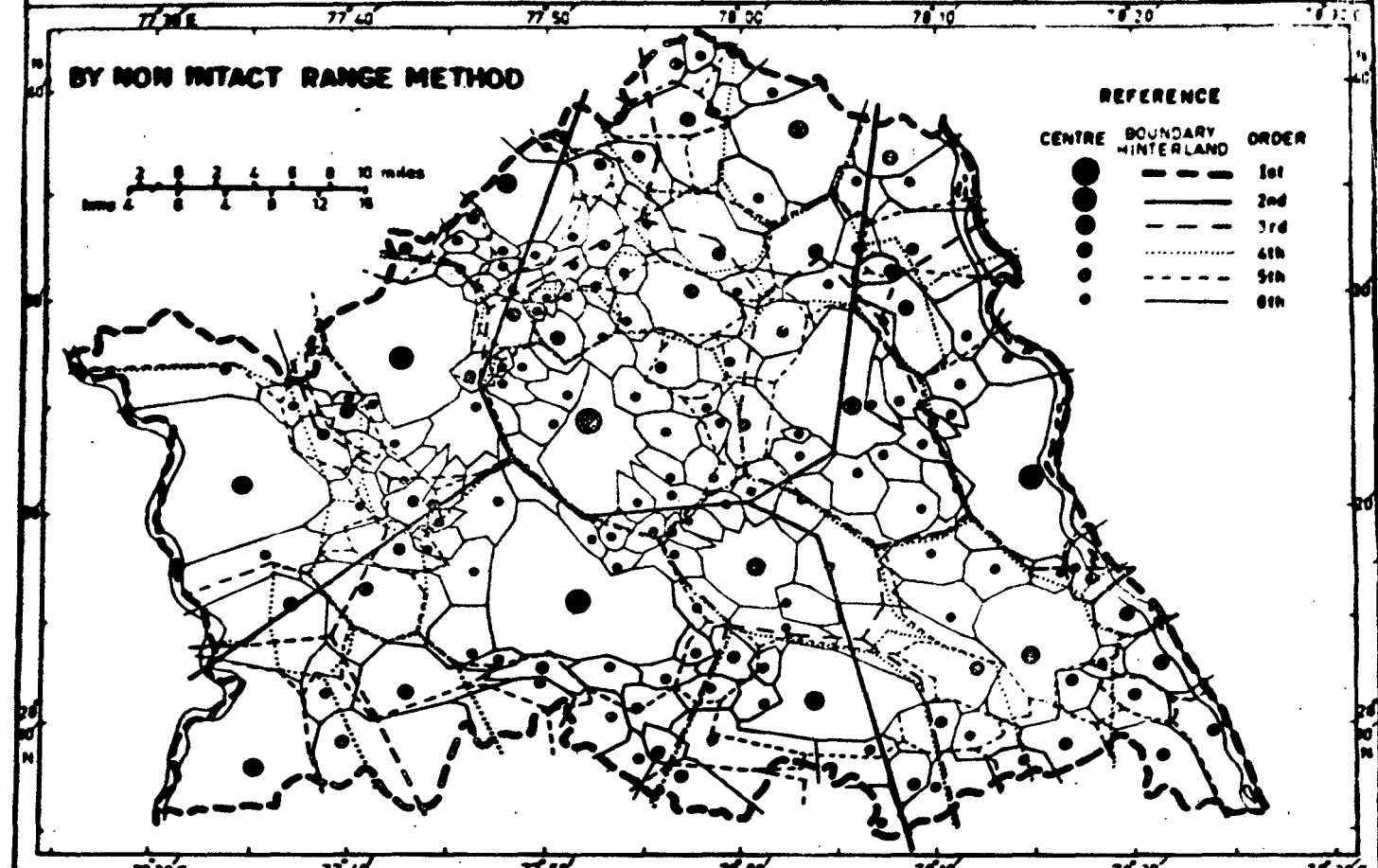
6.4.1 Introduction

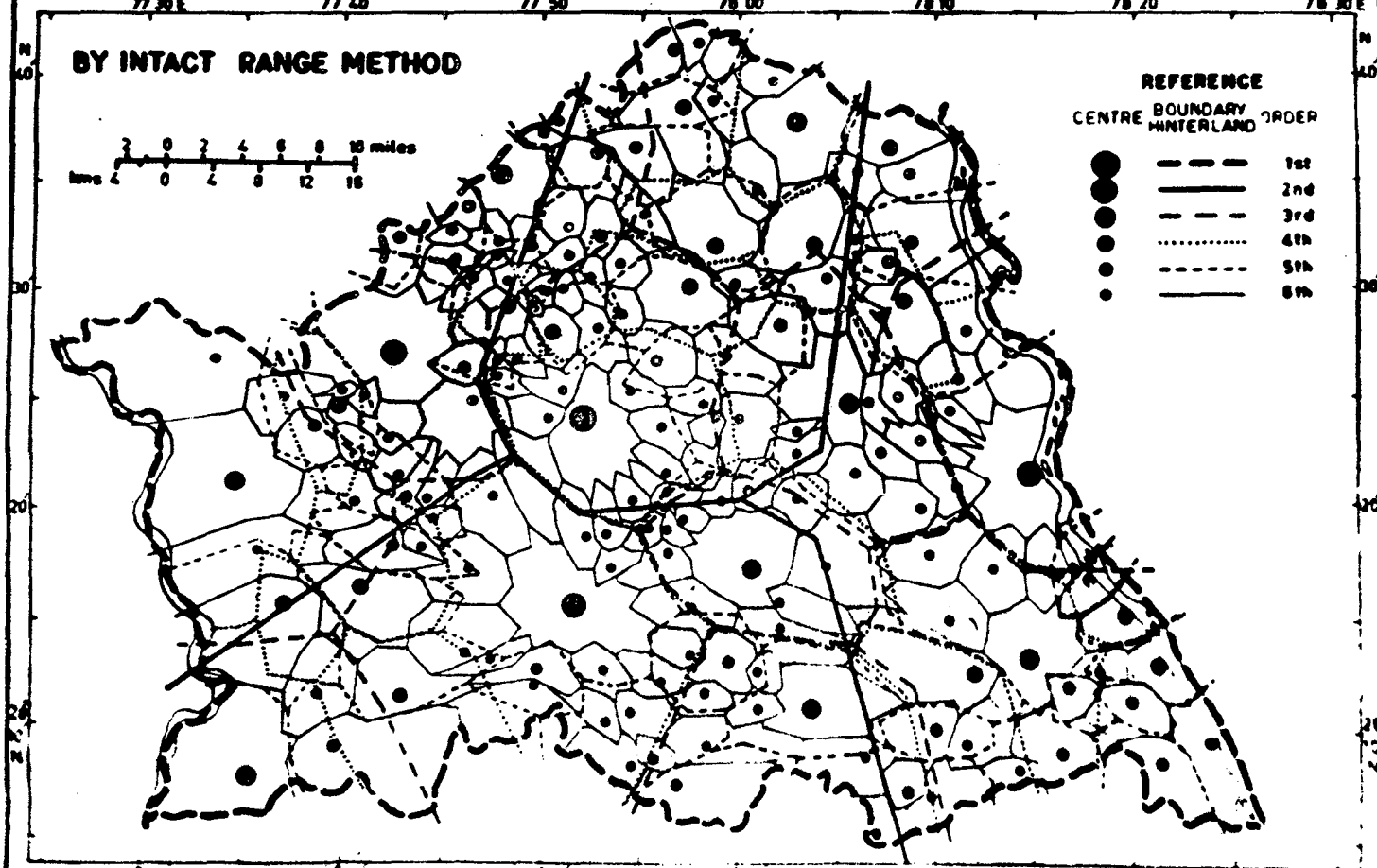
'Development is a multi-dimensional phenomenon'.[24]

BULANDSHAHR

NESTING OF HINTERLANDS

BASED ON COMPOSITE SCORE GRAVITY MODEL





Economists, Geographers and regional scientists define it in different ways stressing on its various aspects. The level of development based on social facilities manifests in itself the level of economic development also. It is generally observed that the developed regions attract better infrastructure and social facilities and with its help attain better economic development. The following pages will be devoted to have an idea of the levels of development based on the social facilities available in the district.

6.4.1.1 Criteria Justified

An area is considered less developed if per capita value of production of goods and services is less than the national average. Income is usually taken as an aggregate measure of all kinds of productions including services.[25] But income alone is not a suitable measure unless price effects are neutralised. The main problem is of estimating income from each of the sectors for a small spatial unit like district by consistent estimates.

The distribution of socio-economic infrastructure in a region, reflects its state of development because it is an essential pre-requisite for development. It is very difficult to formulate viable schemes of development in absence of infrastructure. In the present study the levels of socio-economic development have been identified at village, block and tahsil levels, and the composite scores

of social facilities have been taken into account for determining the levels of development.

6.4.1.2 Block As An Areal Unit

Development is a dynamic process, therefore, the hinterlands of service centres also change. On the other hand the administrative units are more or less stable. Blocks are formed as sub-units in tahsil to give impetus and also to organise the developmental processes. Hence they become very important for micro level planning.

6.4.1.3 Choice of Variables

All the 40 facilities grouped into major 7 categories or 12 sub-categories (Table 5.01) have been considered as variables for ascertaining the levels of development in the area of study.

6.4.2 Methodology Adopted

The values of composite scores as computed on the basis of median population threshold indices of the social facilities per hundred settlements have been used as a measure of identifying the block wise levels of development. At the first instance block-wise levels of development have been determined for individual facility. Secondly, the levels of development have been worked out on the basis of each major category of social facilities grouped in various sets. Finally, aggregating the functional gravity of spatial

distribution of all the facilities together the final picture of the levels of development emerged.

6.4.3 Levels of Development in Bulandshahr by Individual Facilities

Bulandshahr is one of the seven districts of western U.P. declared as backward, with an average per capita income of Rs. 316 per annum. Viewed in terms of the importance of the services communication (Fig. 35.1, Table 6.08) is the most important category of social service in the district. It has a composite score of 210.3 per hundred settlements and accounting for 27.8 per cent of the aggregate composite score (755.7/100 settlements) of all the 7 major categories of social facilities of the district. The lowest share (7.6 per cent) is obtained by the distribution of market facilities with a composite score of only 57.4/100 settlements. The moderate level of distribution is recorded by the agro-economic services (19.5 per cent) and educational facilities (14.7 per cent) with a composite score value of 147.4 and 110.9 per hundred settlements respectively. The other three facilities, i.e., health, public administration and leisure time amenities are poorly distributed and register a low level of development. The relative importance of the distribution may be the social facilities by major groups in the Table 6.08.

TABLE 6.08 Composite Scores of Social Facilities by Major Categories and Their Relative Share of Distribution in Bulandshahr, 1971

S.No.	Major category of social Facility	Composite Score/100 settlements	Per cent to Total
1.	Education	110.9	14.7
2.	Health	60.8	8.0
3.	Communication	210.3	27.8
4.	Market	57.4	7.6
5.	Agro-Economic Services	147.4	18.5
6.	Public Administration	87.8	11.6
7.	Leisure Time Amenities	81.1	10.8
	TOTAL	755.7	100.0

Before attempting an over-all level of development considering all the facilities together it would be worth-while to have an overview of the individual facilities as such.

6.3.1.1 Education

On the basis of the composite scores of educational facilities per 100 settlements (CS/100S) Siyana (Fig. 35-3 Table 6.07) block stands first (201.7 C.S/100S) while lowest in order is the Dankaur block with 78.8 C.S/100 settlements.

BULANDSHAHR

LEVELS OF DEVELOPMENT

(BLOCK WISE)

BASED ON THE COMPOSITE SCORES OF SOCIAL FACILITIES :

1971

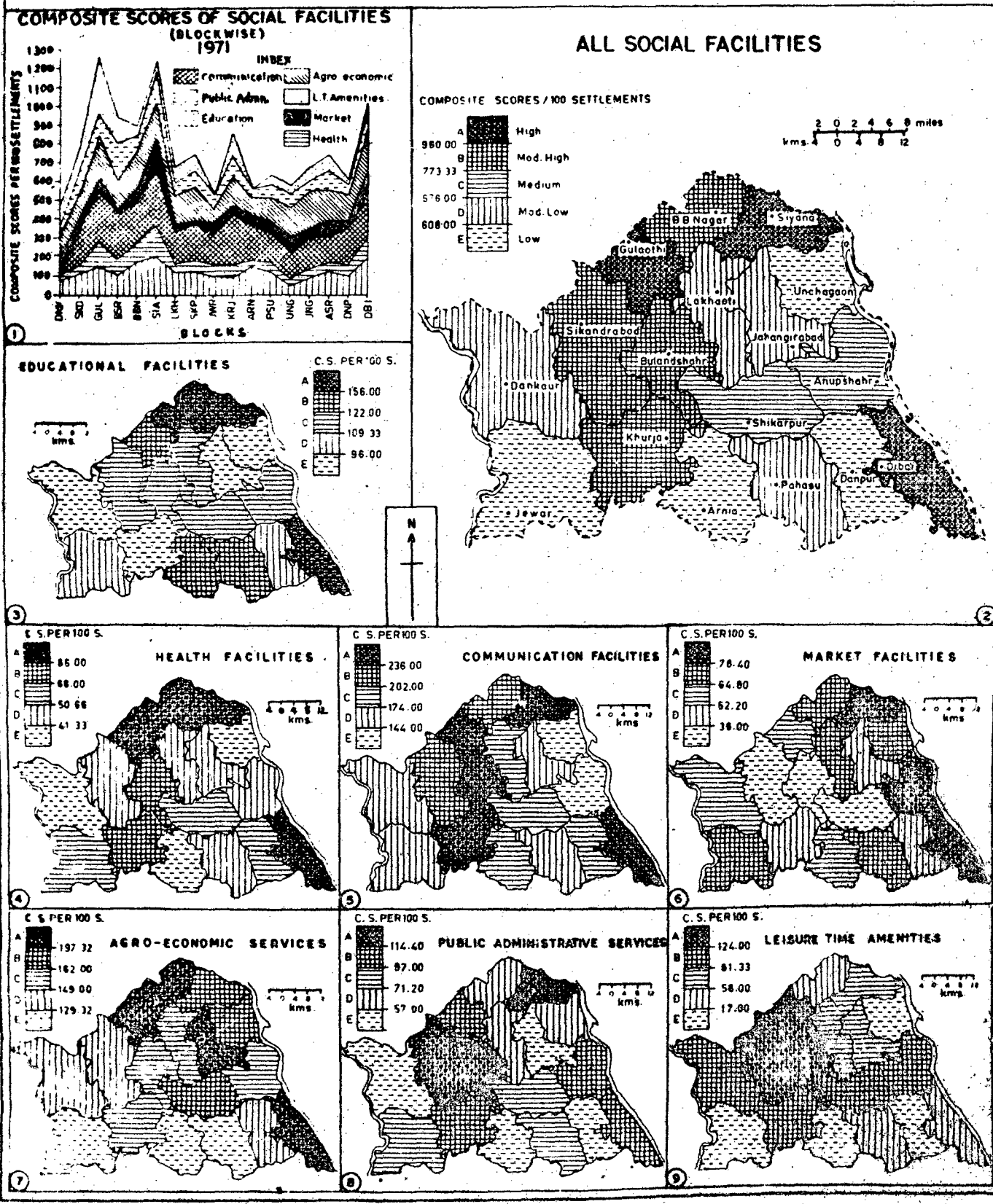


FIG. 35

The blocks of Siyana, Bhawan Bahadur Nagar and Dibai fall in the high level of development while Danjaur, Jahangirabad Khurja and Unchagaon are in low level of development in this facility. It is probably due to ample productive resources and good network of transport in the former group of blocks. The smaller size of the blocks of Siyana, Bhawan Bahadur Nagar and Dibai in comparison to others may also be one of the reasons to raise their levels of development. Because the funds in sectoral planning by the district authorities are allocated equally to each block and not on the basis of their size or the magnitude of their demand.

6.3.1.2 Health

The northern parts of the district comprising the blocks of Siyana, Gulaothi and Bhawan Bahadur Nagar and Dibai blocks record high level of development on the basis of the composite score of health facilities (Fig. 35-4, Table 6.07) per 100 settlements. The low level of development experienced in Arniya, Unchagaon and Dankaur blocks.

6.3.1.3 Communication

In the present study communication constitute postal and transport services. The high developed areas from this viewpoint are (Fig. 35-5, Table 6.07) the blocks of Siyana, Gulaothi, Khurja and Dibai because they have better inter-district as well as intra-district transport connectivity by road. The low level of development in communication

facilities is seen in Unchagaon and Anupshahr blocks because they have no direct transport links with the adjacent districts.

6.3.1.4 Market

It is observed that almost all the blocks stretching along the holy river Ganga experience the high level of development in market facilities. The blocks in which the major towns are located are found to have low level of development because market facilities in the major towns themselves serve as market place with a wide catchment.

6.3.1.5 Agro-Economic Services

Being an agricultural district, it requires optimal distribution of agro-economic services. But it is apparent from the spatial distribution that such services are inadequate. The blocks of Gulaothi, Dibai, Bhawan Bahadur Nagar and Jahangirabad have high level of development (Fig. 35-7, Table 6.07) of the distribution of agro-economic services. On the other hand Jewar, Arniya and Pahasu blocks register the low level of development.

6.3.1.6 Public Administration

The blocks of Bulandshahr, Sikandrabad and Siyana have the high level of development (Fig. 35-8, Table 6.07) in having the facilities of social security and administrative offices. Being district and block headquarters

respectively, these areas enjoy easy access to these facilities. But Siyana block has only pargana headquarters. However, it has facilities of social security and justice and easy access for administrative services because it has large size villages and connections to Bulandshahr town with a higher number of bus frequency. The low level of development in these services is seen in Danpur, Dankaur, Arniya and Jahangirabad blocks which is due to inadequate transport network.

6.3.1.7 Leisure Time Amenities

The blocks of Gulaothi, Bulandshahr and Sikandrabad are marked with the high level of development (Fig. 35-9, Table 6.07) on the basis of leisure time amenities. In the next order comes the whole central belt of the district stretching from west to east and comprising the blocks of Dankaur, Khurja, Shikarpur and Anupshahr experiences a moderately high level of development. Only the blocks either inaccessible or having no township located there, have low level of leisure time amenities. The blocks of Gulaothi (C.S. 290.2/100S) attained the first place while the lowest are the blocks of Jewar and Arniya (C.S. 0.01/100S).

6.4.4 Levels of Development Based on All the Facilities

To identify the over-all levels of development values of composite scores of all the social facilities were

aggregated together based on the median population threshold indices. Thus the final picture (Fig. 35.2, Table 6.07) of the levels of development for the district as a whole at block level is obtained.

6.4.4.1 High-Level of Development

There are only three blocks which can be included in high level of development. These blocks with their values of composite scores are Gulaothi (1254.4), Siyana (1240.6) and Dibai (1010.2). The Gulaothi blocks is highly developed because it has very fertile agricultural land and ample sources of irrigation. Gulaothi town itself is located at one of the most busy highways of the area namely Bulandshahr-Meerut road. Dibai has not only well served by many social facilities but has many market centres. It is directly connected with towns like Aligarh, Chandausi, and Budaun. The proposed atomic energy centre under construction at Naraura in this area will have impact on the future pattern of development of the block.

6.4.4.2 Moderately High Level of Development

The blocks of Bulandshahr (940.2), Bhawan Bahadur Nagar (895.6), Khurja (848.5) and Sikandrabad (794.0) fall in this category. Except Bhawan Bahadur Nagar the rest three blocks have one major town each. Bulandshahr being district headquarters, Khurja and Sikandrabad being commercial

and industrial townships have lead these blocks to attain this level. Except Bhawan Bahadur Nagar all the remaining blocks of this category are connected with rail-road.

6.4.4.3 Medium Level of Development

There are only two blocks Shikarpur and Anupshahr in this category which have composite scores of 740.9 and 735.7 per hundred settlements respectively. These blocks have average transport network and agricultural land resource with better irrigation facilities.

6.4.4.4 Moderately Low Level of Development

The blocks of Jahangirabad (CS 675.4/100S), Lakhaoti (673.1), Pahasu (634.8) and Dankaur (629.5) blocks fall in this category. Dankaur block, though sprawled over the Yamuna Khadar region, is close to Delhi and Ghaziabad and has better transport linkages. Pahasu block has a poor transport network.

6.4.4.5 Low Level of Development

The areas either lying in Khadar lands or with poor transport network or having a poor quality agricultural land and with low level of urbanisation fall in this category. The range of composite scores of social facilities in such areas varies from 524.9 to 606.7 per hundred settlements. The blocks of Danpur (606.7 C.S./100S), Unchagaon (578.3), Arniya (559.5) and Jewar (524.9) fall in this

category.

An overview of the levels gives some contiguous regional units. The northern fringe of the district has witnessed higher level of development of social facilities. Midwestern part comes next followed by the central belt of the district. The areas with low level of development are found in three separate segments. As far as the social facilities are concerned the Khadar regions of the two rivers should be given more attention.

6.5 A NORMATIVE VIEW

Most of the planning decisions for the location of the establishment of social facilities are taken mostly on political considerations.

A district is a compact areal unit for micro level planning. Community development block may be taken yet another level for micro planning. There might be two approaches for this micro planning :

1. Indicative Planning, i.e., identification of the weaker blocks; and
2. Locational Planning, i.e., the exact location where the facility has to be established

6.5.1 Indicative Planning

An indicative planning or directional planning enables a planner to understand that which of the areas should be

given priority. In the present study an endeavour has been made to indicate as to how a particular block should be chosen for locating the facility. The blocks are arranged in descending order on the basis of the levels of development and the facilities available. Thus, for the given facility the block of the last rank would be given first priority. If two or more than two blocks in rank order are bracketed together all of them would be considered for equal priority.

The results of the exercise of indicative planning for blocks in the study area are given in Appendix XX. There are 17 blocks in the district and only nine blocks have been given priority so that 50 per cent disparity might get eliminated in the distribution of a given facility.

To illustrate the indicative planning approach example of facilities (Table 6.09) of the study area has been taken. The table explains in case of primary school establishment. Siyana block has maximum number of settlements per 100 settlements while Dankaur block stands the lowest in order. Therefore, Dankaur block has to be given first priority in establishing more primary schools if the budgetary allocation is made for new establishments. The blocks of Jewar and Khurja are next to Dankaur in priority and they are bracketed together being equal in ranking order.

TABLE 6.09 Composite Scores of Social Facilities by Major Categories

S.No.	Block/Tahsil	Composite Score per 100 Settlements										
		Education	Health	Communication			Market	Agro-Economic	Public Admn.	LFA	Grand Total	Rank
				Postal	Transport	Total						
1.	Dankaur	7.8	39.4	30.2	142.8	173.0	60.7	133.2	48.5	95.9	629.5	12
2.	Sikandrabad	110.7	46.0	58.4	160.3	218.7	35.0	134.2	116.8	132.6	794.0	6
	T. SKD.	94.6	41.3	43.5	151.0	194.5	47.8	133.7	72.8	112.2	696.9	2
3.	Gulaothi	151.0	132.8	76.7	198.0	274.7	56.2	240.4	109.6	290.2	1254.9	2
4.	Bulandshahr	115.2	77.9	62.9	174.9	237.8	18.5	156.2	197.9	136.7	940.2	4
5.	B.B. Nagar	175.9	103.0	86.3	121.4	207.7	70.6	214.9	69.0	54.5	895.6	7
6.	Siyana	201.7	172.4	174.0	131.4	305.4	146.6	188.6	161.3	64.6	1240.6	1
7.	Lakhaoti	116.7	41.3	45.7	128.6	174.3	36.4	156.5	70.3	77.6	673.1	11
8.	Shikarpur	116.7	63.2	62.4	123.8	186.2	21.7	182.1	82.9	88.1	740.9	9
	T.BSR	139.5	86.9	76.9	148.4	225.3	45.5	184.1	117.9	122.9	922.1	1
9.	Jewar	102.4	57.1	60.9	88.6	149.6	69.7	74.0	72.2	00.0	524.9	15
10.	Khurja	91.3	71.7	58.7	198.1	256.8	46.4	154.5	105.5	122.1	848.5	3
11.	Arniya	154.0	29.9	55.7	119.2	174.9	55.8	90.6	54.3	00.0	559.5	10
12.	Pahasu	122.7	45.8	60.3	92.3	152.6	69.2	123.6	71.8	49.1	634.8	14
13.	T. KRJ	115.9	51.9	45.4	110.7	156.1	60.5	111.0	77.0	44.0	616.4	4
13.	Unchagaon	95.0	36.8	57.8	73.5	131.3	77.9	163.8	65.9	7.6	578.3	17
14.	Jahangirabad	68.5	46.0	67.2	95.7	162.9	51.3	195.8	55.5	75.4	675.4	13
15.	Anupshahr	121.7	46.1	59.3	98.9	138.2	81.2	161.2	100.5	86.8	735.7	16
16.	Dunpur	103.5	64.1	42.5	151.5	194.0	42.8	141.6	47.7	13.0	606.7	8
17.	Dibai	193.3	106.2	84.1	152.9	237.0	110.2	223.6	109.4	30.5	1010.2	5
	T. ASR	122.4	61.4	60.5	118.1	178.6	72.4	159.5	71.6	51.7	717.6	3
Dist. BSR		110.9	60.8	61.8	139.3	210.3	57.4	147.4	87.8	81.1	755.7	

In case of the distribution of college establishments 10 out of 17 blocks have no settlement having college establishments. Therefore, all the 10 blocks (Table 6.10) are bracketed together in rank order and should be given equal priority for the establishment of college in each of the 10 blocks.

6.5.2 Locational Planning

The next problem of district planners is to pin point whether facility would go to the next block in priority. For example, Dankaur block gets the first priority for having higher secondary school (Table 6.09). But there is no such settlement with 5340 persons (MPT value) which does not have a higher secondary school. Jahangirabad block also does not qualify for having a higher secondary school. Thus, Unchagaon block, which has a settlement named Khanpur Gantu (location code no. 31, Appendix XXI) with a population of 7294 persons qualifies to get a higher secondary school.

If there are more than one claimants for a facility the priority would be decided by looking at the median population threshold (Appendix XXI). For example, Jahangirabad and Siyana would be selected for the establishment. It mears the first priority goes to Jahangirabad and then to Siyana.

TABLE 6.10 Block-wise Determination of Priority Orders to Plan for Locating Educational Facilities in Bulandshahr District, 1971

Priority Order**	Blocks* by Priority Orders for the Planning of Educational Facilities			
	Primary School	Junior High School	Higher Secondary school	College
1.	DNK	KRJ	DNK	DNK,JNB,UNG, JWR,DNP,SKP, BSU,ARN,BBN, SIA
2.	JWR,KRJ	LKH	JNB	SKD
3.	JNB	DNK,ASR	UNG	BSR
4.	LKH	DNP	SKD	KRJ
5.	UNG	BSR	KRJ	ASR
6.	BSR	JWR	DNP	DBI
7.	BSU	JNB	BSR	LKH
8.	SKD	SKP	ASR	GUL
9.	DBI	SKD	LKH	-
10.	SKP	UNG	JWR/BBN	-
11.	ASR	GUL	BSU	-
12.	DNP	BSU	SKP	-
13.	GUL	ARN	GUL	-
14.	ARN	DBI	ARN	-
15.	BBN	SIA	SIA	-
16.	SIA	BBN	DBI	-
17.	-	-	-	-

* Abbreviations used for block names refer to the list of abbreviations

** Priority orders are based on the block-wise ranking orders in the development of social facilities

An attempt has been made to identify the settlements by blocks for the area under study that require establishments of certain social facilities. Appendix XXI gives an indication for identifying the locations for establishment of facilities in the district of Bulandshahr.

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CHAPTER 7

SOCIAL FACILITIES AND THEIR CORRELATES

The state of spatial distribution of social facilities in an area reflects its socio-economic development. Generally, the environmental, technological and institutional factors play an important role in determining the provision for the location of social facilities, but sometimes political decisions generally taken in respect of the locational planning for social facilities and amenities distort the picture of the expected relationship. However, some factors viz., (i) the size of settlements and their distance-relationships, (ii) the nature and magnitude of man-power resource, and (iii) potentiality of production bases etc., are major factors that influence the spatial distribution of social facilities.

7.1 CHOICE OF VARIABLES

In the present chapter an attempt has been made to explore the relationship between the distribution of social facilities (the explained variable) and a set of nine "explanatory" variables. The data has been computed at village level for all the 1,385 inhabited settlements (Table 7.01).

TABLE 7.01 The Selected Variables

S.No.	Symbol	Variable	Abbreviation
		Explained Variable	
1.	Y	Composite Score of Social Facilities(Dependent variable)	CS
		Explanatory Variables	
2.	X_1	Size of Settlement	SZ
3.	X_2	Density of Population (per sq. km.)	DP
4.	X_3	Growth of Population 1961-71 (per cent)	GP
5.	X_4	Percentage of Scheduled Caste population to the total population	SC
6.	X_5	Literacy Rate (per cent)	Lit
7.	X_6	Percentage of primary work force to the total work force	PWF
8.	X_7	Percentage of non-primary work force to the total work force	NPWF
9.	X_8	Percentage of net irrigated area to the net cultivated area	NIA
10.	X_9	Distance of settlement from the nearest urban centre	DU

7.2 COMPOSITE SCORE OF SOCIAL FACILITIES : THE EXPLAINED VARIABLE

As many as 40 facilities have been taken into account for computing the value of the composite scores of social facilities. The computation of score of each facility is

based on the 'median population threshold index (Table 6.03) of that facility as computed according to the modified Reed-Muench method.[1] This method provides an index to determine the relative importance of functions or facilities with each other. Therefore, the value of the composite score of social facilities is computed by a non-arbitrary rule.

7.3 EXPLANATORY VARIABLES

The existence of infrastructural facilities is primarily a function of mutual interaction between men and men. The institutional frame of society constrains the proper rate of development based on technology and consequently, the development of infrastructural facilities is also affected by it. Thus, the regional variations in the spatial distribution of social facilities mirrors the magnitude and the nature of interplay among these three sets of variables. The following nine variables have been chosen to examine their relationships with the spatial distribution of social facilities.

7.3.1 Size of Settlement

While the distribution of population in a region is influenced by its natural landscape, its spatial patterns are determined by the existing spatial organisation of socio-economic activities. It is known that the degree of human inter-action and inter-dependence increases with the

increase in the size of population of the settlements, which means a considerable scope of development in the number and nature of social facilities. Keeping this fact in view the settlement size has been taken into account as an independent variable to explain its mode of relationship with social facilities.

The hypothesis here is that the population size of settlements has a positive relationship with the magnitude of the social facilities.

7.3.2 Density of Population

The density of population is an important indicator of population pressure on land. It is worthwhile to understand the relationship between the density of population and the distribution of social facilities.

The underlying hypothesis here is that the higher the density of population the higher is the degree of distribution of social facilities.

7.3.3 Growth of Population

The growth of population generally enhances the magnitude of the density of population. Sometimes, due to natural calamities, negative growth is observed. Therefore, the demand for establishment of new social facilities in a settlement has to be viewed in the context

of growth of population. It is with this view-point that the growth of population has been taken as one of the explanatory variables.

The hypothesis here is that the growth of population is directly related with the distribution of social facilities.

7.3.4 Scheduled Caste Population to Total Population

The social system in India is inconceivable without caste, which is still the foundation of the Indian social fabric. It is a well known fact that the differences in the modes of domestic and social life, types of houses and patterns of cultural life and the occupational characteristics of the people are determined by the caste differences as prevailing in the country.[2] Scheduled Caste represent those communities which suffer or have suffered from untouchability and are socially depressed. The Scheduled Tribe population in the study area is negligible. Therefore, in the light of the above criterion the percentage share of Scheduled Caste population to the total population has been taken as one of the institutional factors for relationship with the distribution of social facilities.

It is being hypothesized that the higher the percentage of Scheduled Caste in a village, the lower will be the composite score of social facilities.

7.3.5 Literacy Rate

The rate of literacy determines the quality of population in a region. The civic sense in the people is the function of educational standards of the population. The literacy of population helps to bring the sense of awakening among people towards socio-economic development of the society. The literacy rate has been taken as one of the important independent variables for examining its relationship with the distribution of social facilities.

The underlying hypothesis here is that the higher the rate of literacy the higher is the level of distribution of social facilities in the settlements.

7.3.6 Primary Work-force to Total Work-force

The level of socio-economic development of an area is not only reflected in the proportion of its working population, but also by the relative distribution of its labour force among the various work activities. In agrarian economies the share of primary work-force in the total work-force determines the characteristic functional organisation of the area concerned. In fact, labour is the primary instrument for increasing production within the framework of existing practices and processes of production. Even in this modern world, where agriculture is undertaken through small-sized land holdings and low-level of mechanisation, primary labour force plays a crucial role as a

factor in agricultural development. Consequently, the spatial organisation of social facilities is oriented to serve the needs of an agrarian economy. But the level of distribution of such facilities is generally low.

The hypothesis envisaged here is that the higher the share of primary work force to the total work force the lesser social facilities are available in the settlements.

7.3.7 Non-Primary Work-Force to Total Work-Force

In the advanced countries relatively small share of their man-power is devoted to primary production, and large proportion of workers is employed in manufacturing and services. Economic development leads to a shift of labour from agricultural to secondary and tertiary sectors. Therefore, the quantum of non-primary occupations are one of the most important scales to measure the degree of socio-economic development. The nature of social facilities catering to the need of such a labour force is different. Therefore, to examine the relationship between the distribution of social facilities and the share of non-primary work-force to the total work force is taken as one of the independent variables.

The underlying hypothesis here is that the share of non-primary work force to total work force, the higher is the level of distribution of social facilities.

7.3.8 Net Irrigated Area to Net Cultivated Area

Lack of irrigation is like a technological constraint especially in Indian agriculture and once this is removed the agriculturists tend to apply modern inputs and adopt changes in cropping pattern that bring them the highest yield.[4] Irrigation facilities help an area in bringing socio-economic prosperity. The percentage share of net irrigated area to net cultivated area has been chosen as one of the explanatory variables to see how prosperity and development accelerated by irrigational facilities are related with, the distribution of social facilities in the study area.

The hypothesis is that the percentage of net irrigated area to net cultivated area ensures for better distribution of social facilities.

7.3.9 Distance of Settlement from the Nearest Urban Centre

The towns have the facilities almost of every nature. The rural settlements are dependent on the towns located nearest to them for a number of social facilities. If the distance of the town from a rural settlement is not much the villagers would have better interaction and would avail the facilities available there. But in the case the distance is large most of the lower order facilities will have to be made available within the village itself.

In order to examine the nature of relationship between the distribution of social facilities and the distance factor of settlements, the distance of rural settlement from the nearest urban centre has been selected as one of the independent variable in the present analysis.

The hypothesis here is that the greater the distance between the rural settlement and the nearest urban centre higher is the quantum of social facilities available in the settlement.

7.4 GENERAL CHARACTERISTICS OF THE VARIABLES

The mean value of composite score per settlement in the district is 8.307 which has very high coefficient of variation. The average size of settlement in the district is worked out to be of 1398 persons. The average distance of a village from its nearest urban settlement is about 10.77 kilometres. The maximum variation in the mean values of all the variables is found in the 'density of population'. The coefficient of variation in this variable is computed as 4.606. The minimum variation (0.489) is found in the literacy rate.

7.5 MULTIPLE REGRESSION ANALYSIS

The identification of the actual relationships among the variables has been worked out through three specific stages :

TABLE 7.02 Computed Values of Means, Standard Deviations and Coefficients of Variation of the Variables

S.No.	Variable Abbreviations	Symbol	Mean Value	Standard Deviation	Coefficient of variatio
1.	CS (Numbers)	Y	8.31	34.65	4.171
2.	SZ (Persons)	X_1	1398.00	3249.49	2.324
3.	DP (P/Sq. Km.)	X_2	656.00	3022.57	4.606
4.	GP (Per cent)	X_3	31.08	82.29	2.648
5.	SC (per cent)	X_4	22.51	17.37	0.777
6.	Lit (per cent)	X_5	19.47	9.58	0.489
7.	PWF (per cent)	X_6	87.58	55.67	0.636
8.	NPWF (per cent)	X_7	13.42	14.49	0.895
9.	NIA (per cent)	X_8	80.81	60.44	0.748
10.	DU (Km.)	X_9	10.77	8.21	0.762

(i) in the first stage the contribution of each added variable in explaining the dependent variable has been found out with the help of the value of R^2;

(ii) in the second stage looking at the changes in the value of $\bar{R}^2$, the relevance of the inclusion of each added variable is tested;

(iii) in the final stage after observing the changes in the values of the regression coefficients and their standard errors, on the one hand, and seeing the changes in the values of F-ratio, on

the other, such a step is spotted out in which the relationship of variables may be determined as an optimal fit.

The regression of Y and X is shown in the first step for the independent variable that shows the maximum of R^2. The variable which shows next highest value of R^2 is added in the second step and so on. The coefficients of correlation are given in Table 7.03.

7.5.1 The First Step

The computed results (Table 7.04) of step-wise regression analysis show that the density of population (X_2) explains the maximum proportion of variation in the distribution of social facilities followed by settlement size (X_1), non-primary work force (X_7), proportion of net irrigated area (X_8), primary work force (X_6), distance of settlement from the nearest urban centre (X_9), literacy rate (X_5), growth of population (X_3) and the proportion of Scheduled Caste population (X_4). The contribution of Scheduled Caste population in increasing the value of R^2 is nil as is clear from the column (Table 7.04) showing the difference in R^2. The contribution of primary work force (X_6), distance from the nearest urban centre (X_9), literacy rate (X_5) and growth of population (X_3) in increasing the value of R^2, however, is very low ranging between 0.002 and 0.001 only.

TABLE 7.03 Correlation Matrix (Correlation Coefficient of the Variables)

Variables	Y	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9
Y	1.000	0.596	0.740	-0.004	0.009	0.166	-0.065	0.304	0.010	-0.184
X_1		1.000	0.595	-0.009	-0.039	0.219	-0.018	0.319	0.162	-0.074
X_2			1.000	0.035	0.030	0.142	0.023	0.191	0.119	-0.067
X_3				1.000	-0.055	0.042	0.066	0.012	0.007	0.004
X_4					1.000	-0.020	0.054	0.031	0.056	-0.001
X_5						1.000	0.161	0.262	0.280	-0.029
X_6							1.000	-0.058	0.166	0.264
X_7								1.000	0.074	-0.051
X_8									1.000	0.028
X_9										1.000

TABLE 7.04 RESULTS OF STEP WISE REGRESSION ANALYSIS

Variable	Reg. Coeff.	S.E.	t	R^2	Increase in R^2	$\bar{R}^2$	F
STEP-1						$(0.740)^2$	
X_2	0.008	0.0002	40.935*	0.547	0.000	= 0.548	1676-038*
STEP-2							
X_2	0.007	0.0002	27.676*			$(0.765)^2$	
X_1	0.003	0.0003	11.169*	0.585	0.038	= 0.585	975.225*
STEP-3							
X_2	0.007	0.0002	28.147*				
X_1	0.002	0.0002	9.141*			$(0.774)^2$	
X_7	0.301	0.043	7.006*	0.599	0.014	=0.599	689.081*
STEP-4							
X_2	0.007	0.0002	28.819*				
X_1	0.002	0.0002	9.819*				
X_7	0.340	0.043	7.981*			$(0.782)^2$	
X_8	-0.069	0.010	-7.023*	0.613	0.014	=0.612	147.85*
STEP-5							
X_2	0.007	0.0002	28.777*				
X_1	0.002	0.0002	10.093*				
X_7	0.368	0.044	8.371*				
X_8	-0.101	0.016	-6.270*			$(0.785)^2$	
X_6	0.043	0.017	2.511**	0.615	0.002	= 0.613	40.689*
STEP-6							
X_2	0.007	0.0002	28.687*				
X_1	0.002	0.0002	10.139*				
X_7	0.374	0.044	8.500*				
X_8	0.111	0.017	-6.519*				
X_6	0.058	0.018	3.122*			$(0.784)^2$	
X_9	-0.161	0.076	-2.113	0.616	0.001	=0.615	368.906*

Variable	Reg. Coeff.	S.E.	t	R^2	Increase in R^2	$\bar{R}^2$	F
STEP-7							
X_2	0.007	0.0002	28.700*				
X_1	0.002	0.0002	9.912*				
X_7	0.358	0.045	8.029*				
X_8	-0.115	0.017	-6.829*				
X_6	0.057	0.018	3.114*				
X_9	-0.158	0.076	-2.017			$(0.784)^2$	
X_5	0.128	0.065	0.956	0.617	0.001	=0.615	317.398*
STEP-8							
X_2	0.007	0.0002	28.780*				
X_1	0.002	0.0002	9. 863*				
X_7	0.361	0.045	8.096*				
X_8	-0.118	0.017	- 6.974*				
X_6	0.061	0.019	3.298 *				
X_9	-0.163	0.076	- 2.144				
X_5	0.133	0.065	2.033***			$(0.785)^2$	
X_3	-0.013	0.007	-0.866	0.618	0.001	=0.616	317.398*
STEP-9							
X_2	0.007	0.0002	28.706*				
X_1	0.002	0.0002	9.827*				
X_7	0.361	0.045	8.083*				
X_8	-0.118	0.017	-6.970*				
X_6	0.061	0.019	3.296*				
X_9	-0.163	0.076	- 2.143				
X_5	0.133	0.065	2.031***				
X_3	-0.013	0.007	-0.863			$(0.785)^2$	
X_4	-0.000	0.033	-0.0 5	0.618	0.000	=0.616	247.517*

Column Head Abbreviations:
Reg.Coeff. = Regression coefficient,
S.E. = Standard Error
t = Computed 't' value
R^2 = Coefficient of Determination
$\bar{R}^2$ = Adjusted R^2
$\bar{R}$ = Standard Error of Estimate (Adjusted for Degree of freedom)
F = F-Value for analysis of variance.

* = Significant at 1% level of significance.
** = Significant at 2% level of significance.
*** = Significant at 5% level of significance.

Degree of Freedom (d.f.)=(n-K)=Total No. of observations-No.of variables entered.
d.f. in step 1 = (1385-2) = 1383.

7.5.2 Second Step

On making an observation of $\bar{R}^2$, however, it is clear that although the contribution of the proportion of primary work force (X_6) and the distance of settlement from the nearest urban centre (X_9) is very poor, but these two variables can be retained in the analysis as they are responsible for marginal increase in $\bar{R}^2$. The addition of the proportion of primary work force (X_6) in the 5th step and the distance of the nearest urban centre in the 6th step of the analysis show a very marginal increase in the value of $\bar{R}^2$ i.e., 0.001 and 0.002 respectively. The value of $\bar{R}^2$ remains constant as literacy rate (X_5) and the proportion of Scheduled Caste population (X_4) are added.

The increase in the value of $\bar{R}^2$ caused by growth of population (X_3) is marginal and is equal to 0.001 only. Thus it is clear that the contribution of X_5, X_4, and X_3 in increasing the value of R^2 is not strong enough to counter-balance the explanatory power of the model due to decrease in the degrees of freedom (N-K). Therefore, it would be worthwhile not to proceed beyond the 5th step.

The computed values of the regression coefficients for density of population (X_2), settlement size (X_1) and non-primary work force (X_7) show consistently significant values at 1.0 per cent level of significance almost in all the steps of the analysis. The values of regression coeffi-

cient for net irrigated area (X_8) in each step of the analysis, at no level, proves to be significant. It is interesting to note that the level of regression coefficient of primary work force (X_6) in step 5 is significant at 2.0 per cent level of significance but the value in step 6 is significant at 1.0 per cent level. It shows that due to the addition of the distance of settlement from the nearest urban centre (X_9) in step 6 the variable of primary work force (X_6) shows a further increase in its value of regression coefficient from 0.043 to 0.058. The fact may also clearly be observed from the correlation matrix (Table 7.03) that the correlation coefficient between the variables X_6 and X_9 is 0.264 which is a positive value.

7.5.3 Third Stage

It is clear from the step-wise regression analysis (Table 7.04) that although the values of F-ratio are significant in all the steps of the analysis at 1.0 per cent level of significance, but beyond the step 3 upto 6th step the F-ratio value falls very sharply. Thus, it is obvious that the relationship of the independent variables given in the step 3 with the dependent variable (Y) may be identified as an optimal fit. The results given in this step show that population density (X_2), size of settlement (X_1) and the proportion of non-primary work force are the most significant variables. In other words it may also be stated that the average change in composite score

of social facilities per settlement (Y) caused by a unit change in density of population (X_2), size of settlement (X_1) and proportion of non-primary work force (X_7) is 0.007, 0.002 and 0.301 respectively. Thus, the exact form of the model is as follows :

$$Y = a + b_2 X_2 + b_1 X_1 + b_7 X_7 + e$$
$$\text{or } Y = a + b_1 X_1 + b_2 X_2 + b_7 X_7 + e$$

$$(SE_1) \quad (SE_2) \quad (SE_3)$$

On putting the values of the above mentioned derivatives the equation (Appendix XXI) may be shown as follows :

$$Y = -4.04296 + .002 X_1 + .007 X_2 + .301 X_7 + e$$
$$(.0002) \quad (.00024) \quad (.043)$$
$$R^2 = 0.599$$

There is an important point to note that like density of population (X_2) the r value of size of settlement (X_1) is also high with composite score of social facilities (Y). The coefficient of correlation between X_1 and X_2 is as high as .595 (Table 7.03). This could be the reason why X_2 in the second step has not contributed significantly to R^2. This problem of multicollinearity is, however, important and which is often very difficult to handle should be kept in mind while interpreting the results.

7.6 VALIDATION OF HYPOTHESES

There were nine hypotheses tested in this analysis.

The hypotheses have been examined in the light of the results of multiple regression analysis, which indicate the type of relationship between the distribution of social facilities and their correlates. Table 7.05 summarises the results of tests of hypotheses based on the consideration of the values of simple correlation coefficients and regression coefficients and their level of significance.

7.6.1 Simple Correlation Test

On the basis of the correlation coefficients one is led to accept only six of the nine hypotheses. The rejected hypotheses are those pertaining to the growth of population (X_3), Scheduled Caste Population (X_4) and the distance of settlement from the nearest town (X_9). Out of the six validated hypotheses, one based on the net irrigated area is significant and weak.

7.6.2 Regression Coefficient Test

The results of regression analysis reveal a different picture. Firstly, the hypotheses regarding the Scheduled Caste population is accepted, i.e., the composite score of social facilities prove to be inversely related to the proportion of Scheduled Castes. Secondly, the hypothesis pertaining to the primary work force is rejected. Thus, it is clear that the percentage of primary work force to total work force (significant at 2 per cent level) is positively related to the composite score of social facilities

TABLE 7.05 Tests of Hypotheses

Variables	'r' consideration		'b' consideration	
	r	t	b	T
Settlement size (X_1)	0.596*	27.623	0.002*	9.827
Density of Population (X_3)	0.740*	40.914	0.007*	28.706
Growth of Population (X_4)	-0.004	-0.149	-0.013	-0.863
Scheduled Caste Population (X_5)	0.009	0.335	-0.002	-0.005
Literacy Rate (X_6)	0.166*	6.260	0.133***	2.031
Primary Work Force (X_6)	-0.065**	-2.422	0.061**	3.296
Non-primary Work Force (X_7)	0.304*	11.867	0.361*	8.083
Net Irrigated Area (X_8)	0.010	0.372	-0.118*	-6.970
Distance from the Nearest Town (X_9)	-0.184*	-3.135	-0.163***	-2.143

r = simple correlation coefficient
b = Regression coefficient

$t = r\,(n-2)/(1-r^2)$

T = b/S.E. (b)
n = number of observations
S.E.(b) - standard error of b

* = significant at 1 per cent level

** = significant at 2 per cent level

*** = significant at 5 per cent level

in the settlements. Thirdly, the hypothesis pertaining to net irrigated area is rejected although the value is insignificant, and therefore, requires more detailed investigations. The rest of the hypotheses have been validated. Density of population is proved to have a very strong relationship with the distribution of social facilities.

7.7 CONCLUSION OF THE ANALYSIS

On the basis of both the methods considered above for determining the validity of the hypotheses the following statements (Table 7.06) may be made.

(i) The hypotheses pertaining to the size of settlement (X_1), density of population (X_2), proportion of Scheduled Caste Population (X_4), literacy rate (X_5) and the proportion of non-primary work force (X_7) are accepted. Although, one of these accepted hypotheses that of the proportion of Scheduled Caste Population is proved weakly and insignificantly.

(ii) The hypotheses based on the growth of population (X_3), net irrigated area (X_8) and the distance of settlement from the nearest urban centre (X_9) are rejected.

(iii) The hypothesis pertaining to primary work force (X_6) significant at 2 per cent level of confidence

TABLE 7.06 Determination of Validity of Formulated Hypotheses@

Formulated Hypotheses		Validity of Hypotheses by 'r' test criteria	'b' test criteria	Final Consideration	Hypotheses after being Tested
CS	SZ	Accepted*	Accepted*	Accepted*	$Y \propto X_1$
CS	DP	Accepted*	Accepted*	Accepted*	$Y \propto X_2$
CS	GP	Rejected	Rejected	Rejected	$Y \propto 1/X_3$
CS	1/SC	Accepted	Accepted	Accepted	$Y \propto 1/X_4$
CS	Lit	Accepted*	Accepted***	Accepted***	$Y \propto X_5$
CS	1/PWF	Accepted**	Rejected**	Rejected**	$Y \not\propto X_6$
CS	1/NPWF	Accepted*	Accepted*	Accepted*	$Y \propto X_7$
CS	NIA	Rejected	Rejected*	Rejected*	$Y \not\propto 1/X_8$
CS	DU	Rejected*	Rejected***	Rejected***	$Y \propto 1/X_9$

@ For abbreviations used for hypotheses refer to Table 7.01 of this chapter

* significant at 1 per cent level

** significant at 2 per cent level

*** significant at 5 per cent level

is accepted by the simple correlation test but is rejected in the regression coefficient test. Therefore, it may be inferred that the variable of the proportion of primary work force has not specific relationship with the distribution of social facilities in the settlements.

NOTES AND REFERENCES

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3. Primary work-force includes persons classed as

   (i) Cultivators

   (ii) Agricultural labourers, and persons engaged in

   (iii) Livestock, forestry, fishing, hunting and plantations, orchards and allied activities

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CHAPTER 8

A SUMMARY OF CONCLUSIONS

This dissertation deals with the spatial organisation of social facilities in Bulandshahr district.

The study has led to the following main conclusions:

The maximum number of settlements (65.21 per cent) fall in the size group of 500 - 2,000 persons. The near-neighbour analysis shows that the 'R' value is 1.35, meaning thereby that the spatial pattern of settlement distribution in the district is random approaching towards uniformity.

The 'R' value in various size-groups of settlements varies from 0.88 for lowest size group to 1.88 in case of the largest one. This further strengthens the contention that the distribution of settlements is not uniform. It is also revealed by Gini's coefficient ratio (0.0237) computed at block level between per cent number of settlements and per cent area of the district.

The mean spacing between settlements is 1.92 kilometres for the district as a whole. The results of the correlation and regression analysis show that the spacing (Y) is the function of the size of settlements (X) because both the variables have positive linear relationship

($Y = 0.702 + 0.02X$).

The maximum number of settlements having social facilities are concentrated in the population size category of 1,000 - 2,000 persons. The settlements lying in the Khadar region of the major rivers are poor in social facilities.

About 82 per cent settlements of the district have a cluster of two facilities each. Six to ten facilities together (Appendix XV) are found in 95 settlements (6.86 per cent) of the district. About 2.17 per cent settlements in the district have more than 10 facilities each.

The rural areas of the district are poor in educational facilities. Even primary schools are located only in 54.58 per cent settlements. About 32 per cent medical care establishments are located in towns. Improved sanitary service facilities are confined to only bigger towns.

Every seventh settlement has one branch post office. The telephone facility is, however, confined to some of the urban centres only. About one-half of the settlements are accessible by unmetalled roads, 39.9 per cent by metalled roads and only 3.7 per cent by railways.

About 5 per cent settlements have weekly markets and the regulated markets are confined to urban centres. The weekly markets mostly in the settlements with Muslim

majority are held on Fridays and in the settlements with a majority of Hindu population are held either on Tuesday, Thursday or Saturdays.

Out of the total settlements of the district about 63.54 per cent have electric current meant for agricultural purposes. In areas, where canal irrigation is not available tubewells and pumping sets get electricity for irrigation purposes. Other facilities like credit etc., are neither adequate nor uniformly distributed in the district.

Every ninth village in the district has nyay panchayat centre, but police station and police outposts are located in mostly townships. The recreational facilities are poorly distributed and are confined to urban centres only.

The relative importance of the functions has often been measured by giving weightages arbitrarily but in the present study an endeavour has been made to identify the hierarchy of settlements and the levels of development on the basis of facilities. A technique of median population threshold (MPT) based on modified Reed-Muench method has been employed and the MPT indices as the 'functional mass' of each settlement in the form of composite score of social facilities has been worked out. The following aspects emerge from this analysis :

(i) The higher order of functions (social facilities) have higher median population threshold (Table 6.03)

barring a few exceptions. This shows that larger the size of the population of settlement, higher is the order of the functional hierarchy.

(ii) On the basis of the composite score of social facilities per 100 settlements and the levels of development at the block level it is found that the blocks of Gulaothi, Siyana and Dibai are characterised by a high level of development while Jewar, Arniya, Danpur and Unchagaon record the low level.

The hinterlands of settlements with facilities have been delineated on the basis of the composite scores of social facilities rather than on the basis of the 'mass of settlements'. To delimit the hinterlands of identified service centres (Fig. 27) two methods viz., (i) non-intact range method and (ii) intact range method have been used. The study reveals that :

(i) the size of the hinterland of the higher order service centres is generally larger than those of the lower order service centres;

(ii) the order of the hinterland of a service centre decreases as the level of composite score of social facilities increases (Fig. 33).

The correlation analysis of social facilities and a set of variables reveals that :

(i) the composite score of social facilities is positively correlated with each of the explanatory variables, i.e., the size of settlement (X_1), density of population (X_2), rate of literacy (X_5) and proportion of non-primary work force to the total work force (X_7);

(ii) the composite score of social facilities is inversely related with each of the selected variables of growth of population (X_3), proportion of Scheduled Caste population (X_4) and the distance of settlement from the nearest urban centre (X_9);

(iii) the distribution of social facilities has no specific relationship with the proportion of primary work force to the total work force (X_6) and the percentage of net irrigated area to net cultivated area (X_8).

Further, the step-wise multiple regression analysis helps in determining the equation showing optimal relationship between the distribution of social facilities and the selected explanatory variables. The equation is given below :

$$Y = -4.04296 + .0002\ X_1 + .007\ X_2 + .301\ X_7 + e$$

where,

Y = composite score of social facilities

X_1 = size of settlement

X_2 = density of population

X_7 = proportion of non-primary work force to total work force

and e = error term

The above relationship between Y and X explains that the size of settlement (X_1), density of population (X_2) and the proportion of non-primary work force (X_7) are the most significant variables and have a linear relationship with the distribution of social facilities.

The present study reveals that the intra district disparities at the block level are very large. The study has far reaching implications for planning for the future location of such facilities in space, particularly in agriculturally developing areas, such as Bulandshahr district. District planning in India continues to be arbitrary and investment decisions are mostly motivated by political exigencies. An humble attempt has been made in this study to furnish an empirical framework with regard to the social infrastructure and thus lay down the basis for priority decisions in the location of a proposed facility. Thus in the light of this diagnostic approach adopted in the present study the district planners can bridge-up the functional gaps between the settlements and the imbalances in the levels of development in social infrastructure may be reduced to the minimum, if not fully removed.

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APPENDIX - I

THE COPY OF THE LETTER OF THE D.M. (ZILA ADHIKARI) BULANDSHAHR TO THE COMMISSIONER AND SECRETARY, REVENUE BOARD, U.P., LUCKNOW REGARDING THE PARTICULARS OF THE AREA OF BULANDSHAHR DISTRICT TRANSFERRED TO THE NEWLY FORMED DISTRICT OF GHAZIABAD ON NOV. 14, 1976.

आर० एन० तिवारी
जिला अधिकारी

अर्द्ध शा० पत्र सं० 3386 स०का०/सात
कार्यालय जिलाधिकारी
बुलन्दशहर
दिनांक जुलाई 31, 1976

प्रिय श्री वासल

आपके टेलीफून निर्देशानुसार गाजियाबाद को नया जिला बनाये जाने हेतु दादरी परगना से सम्बन्धित सूचना इस कार्यालय से टेलीग्राम दिनांक 29-7-76 द्वारा प्रेषित की जा चुकी है (प्रतिलिपि संलग्न है) जो आपको उपलब्ध नहीं हुई है, वांछित सूचना पुनः प्रेषित है।

सादर।

परगना दादरी जिला बुलन्दशहर से सम्बन्धित

1- परगना	दादरी
2- कानूनगो क्षेत्र की संख्या	2
3- लेखपाल क्षेत्रों की संख्या	37
4- मालगुजारी	243117 (रु०)
5- विकास कर	575165
6- जनसंख्या	197718
7- गांवों की संख्या	178
8- कुल क्षेत्रफल	96216 हैक्टर
9- कृषि क्षेत्रफल	43787 हैक्टर
10- विकास खण्ड के नाम तथा संख्या	1- दादरी 2 - बिसरख

भवदीय

(आर० एन० तिवारी)

श्री एन० पी० वासल
आयुक्त एवं सचिव
राजस्व परिषद उ० प्र०
लखनऊ

संख्या 3387 स० का०/सात तद् दिनांक 31-7-1976

प्रिय महोदय,

उपरोक्त अर्द्ध शा० पत्र की प्रति लिपि आपके अवलोकनार्थ एवं सूचनार्थ प्रेषित।

सादर।

भवदीय

(आर० एन० तिवारी)

श्री [illegible] दुबे
आयुक्त एवं सचिव
राजस्व उत्तर प्रदेश शासन
लखनऊ

कार्यालय जिलाधिकारी, बुलन्दशहर

सं० मीमो/ सात स०का०   दिनांक 22-1-77

विषय :- परगना दादरी के ग्रामों की सूची, [illegible]।

तहसीलदार सिकन्दराबाद

कृपया उपरोक्त विषयक सूची जिस प्रकार भी सम्भव हो सके तुरन्त [illegible] उपलब्ध कराने की व्यवस्था [illegible] में [illegible] की सुनिश्चित [illegible] करें।

जिलाधिकारी
बुलन्दशहर

Appendix-I contd..........

सूची लेखपाल मय क्षेत्र तथा उसके क्षेत्र के समस्त ग्राम जो तहसील सिकन्द्राबाद से जनपद गाजियाबाद में गए

क्र0 सं0	नाम लेखपाल	क्षेत्र	लेखपाल के क्षेत्र के समस्त ग्राम
1	श्री बलबीर सिंह	अबेजा	1- अबेजा, 2- विशनूली, 3- जौन समाना 4- सादीपुर, 5- अब्दुल्लापुर उर्फ बादलपुर
2	श्री राजवीर सिंह	बंबावड़	1- बंबावड़, 2- कूढीखेरा, 3- महावड़, 4- आकलपुर जागीर, 5- जैतवारपुर, मोहम्मदपुर, अनवापुर
3	श्री परमेश्वरी दयाल	बिसाहड़ा	1- बिसाड़ा व असगरपुर बिसाड़ी, 2- शरादतपुर राजतपुर, 3- प्यावली ताजपुर, 4- रसूलपुर डासना
4	श्री देवेन्द्र कुमार	बील	1- बील, 2- बढ़ेरा, 3- मिलक बढ़ेरा, 4- नूरपुर
5	श्री दीपचन्द	चिटहरा	1- चिटहरा, 2- बील अकबरपुर, 3- वैरंगपुर उर्फ नई बस्ती
6	रंगराज	कपरौला	1- कपरौला, 2- गिरधरपुर सुनारसी, 3- लालपुर हाजीपुर, 4- दुरियाई
7	श्री मोहनलाल	दादरी	1- दादरी, 2- कटपुरा, 3- नगला किरानी, 4- महीउद्दीनपुर उर्फ गारवपुर 5- शाहपुर खुर्द
8	श्री हरिस्वरूप	धूम	1- धूम मानकपुर, 2- दुजाना, 3- इस्लामाबाद
9	श्री रामफूल	दुजाना	1- दुजाना, 2- इस्लामाबाद, 3- हादीपुर बिढ़ौली, 4- कचे बावरसाबाद
10	श्री मोहनलाल	चारचा	1- चारचा, 2- गुलावठी खुर्द, 3- औरंगाबाद,
11	श्री भगत सिंह	कलौंदा	1- कलौंदा, 2- करीसा, 3- दयानगर,
12	श्री केदार चन्द्र	बैट	1- बैट, 2- पीगपुर, 3- नगला नैनसुख, 4- वानन्दपुर
13	श्री सोहनलाल	छपरौला	1- छपरौला, सिरसैहा, 2- उपलारसी, 3-चक्रसैन उर्फ बनीवास, 4- मुठियानी, 5- फूलपुर
14	परिक्षित	सुनारसी	1- सुनारसी, 2- कस्तूपुर बांगर, 3- नगला चमरू, 4- सैथली
15	श्री महेन्द्र चन्द्र	रानौली लतीफपुर	1- रानौली लतीफपुर, 2- तमोलीपुर, 3- पटाड़ी, 4- बालापुर कला, 5- दादूपुर छपरौला
16	रामचन्द्र	बरौला	1- बरौला, 2- शरफाबाद, 3- मीरना, 4-आगमपुर, 5- मुठारी
17	वीरेन्द्र सिंह	बिसरख जलालपुर	1- बिसरख जलालपुर, 2- वलाउद्दीनपुर, 3- बकारसा जलालपुर
18	देवदत्त (विजयपाल)	छलैरा	1- छलैरा बांगर, 2- छलैरा खादर, 3-नया बांस, 4- मौरंगाबाद बांगर, मौरंगाबाद खादर, 5- राजपुर खादर
19	धनराज	फतेहपुर बेगमपुर	1- फतेहपुर बेगमपुर, 2- हाजीपुर उर्फ सराय सदर 3- गेयातिभाबाद, 4- बाढ़पुर, 5-नगला परनवास
20	रणवीर सिंह	सोरखा	1- सोरखा, 2-सरफाबाद फूलपुरभटपुर नगर, 3- निठारी खुर्द, 4- पर्थला खंजरपुर, 5- गढ़ी चौखंडी, 6-बहलोलपुर, 7-इलाहाबास उर्फ बलायर ढेरी
21	दुर्गा प्रसाद	घोड़ी बछेड़ा	1- घोड़ी बछेड़ा, 2- प्रद्युम्नपुर गजरौला उर्फ नबादा, 3- मथुरापुर गंगापुर, 4-राजपुर बांगर, 5- बिरौड़ी चक्रसैनपुर
22	सुरेश दत्त	गुलिस्तापुर	1- गुलिस्तापुर, 2- जैतपुर वैशपुर, 3- रसूलपुर राय, 4- रायपुर जागीर, 5-साकीपुर
23	प्रेमराज	चिप्याना बुजुर्ग	1- चिप्याना बुजुर्ग, 2- खैरा, 3- शाह बेरी, 4- हैबतपुर
24	सुन्दरलाल	कैमराला	1- कैमराला चक्रसैनपुर, 2- दत्तावली, 3-चमरावली रामगढ़, 4- हजारतपुर, 5- जुनपत, 6-बौढ़ाकी, 8- धापखेड़ा, 7- चमरौली बौढ़ाकी
25	तुलाराम	खेड़ी	1- खेड़ी, 2- सुनपुरा, सौरनपुर, 3- भीलारावल, 4- बेदपुरा, 5- सादुल्लापुर, 6- रौजा जलालपुर
26	दीपचन्द	आमका	1- आमका, 2- बोदना कला, 3- अच्छेजा, 4- तिलपुर, 5- देवला, 6- बोदना खुर्द
27	महेशप्रसाद	जलपुरा	1- जलपुरा, 2- कुलेसरा, 3- हल्दौनी, 4-इलाहाबास, 5- इलाहाबास
28	लक्ष्मी चन्द	मामुरा	1- मामुरा, 2- होशियारपुर, 3- चौड़ा सादतपुर 4- गिझौड़ा, 5- रघुनाथपुर, 6- हरौला मकनपुर
29	कन्हैयालाल	मंगरौली दौलतपुर	1- दौलतपुर मंगरौली बांगर, 2- दौलतपुर मंगरौली खादर, 3- नगला नगली, 4-याकूबपुर, 5- चकमगरौला, 6- असदुल्लापुर, 7- छपरौली बांगर, 8- छपरौली खादर, 9- वाजिदपुर बांगर, वाजिदपुर खादर, 10- चकदसिया, 11-गौसलपुर
30	धीरज सिंह	पाली	1- पाली, 2- पल्ला, 3- मकौड़ा, 4-कटहरा, 5- तिलपता करनवास
31	महाराज सिंह	पतवाड़ी	1- पतवाड़ी, 2- रौजा याकूबपुर, 3- मिलक लच्छी, 4- खैरपुर गुर्जर
32	नारवीर सिंह	रिठौरी	1- रिठौरी, 2- भटौना, 3- मतलपुर रामपुर, 4- डाबरा, 5- शमसुद्दीनपुर, 6-चचायकपुर
33	रणवीर सिंह	इस्दरा	1- इस्दरा, 2- मुरियाना, 3- महमदपुर रदारपुर उर्फ नारायणगढ़, 4- मोमिनपुर
34	शांति स्वरूप	सुरजपुर	1- सुरजपुर, 2-मलकपुर, 3- हल्दौनी 4- बैगमपुर, 5- मुबारिकपुर
35	मनुराम	सदरपुर	1- सदरपुर, 2-शाहपुर गोवर्धनपुर बांगर 3- शाहपुर गोवर्धनपुर खादर, 4- चक लालपुर, 5- चक मसतपुर, 6- सुलतान पुर, 7-असगरपुर जागीर
36	राजेन्द्र कुमार	सौरखा	1- सौरखा जाहिदाबाद, 2- सलारपुर खादर, 3- मूढ़ा
37	रणधीर (मेघराज)	कुल्याना	1- कुल्याना, 2- पनौला, 3- छिजारसी, 4- सेनी, 5- रिवीनगाबाद

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बुलन्दशहर

APPENDIX II : GENERAL PARTICULARS OF BULANDSHAHR DISTRICT THROUGH THE PHASES OF ADMINISTRATIVE REORGANISATIONS SINCE 1961.

Sl. No.	Particulars	Years of Reorganisation					
		1961*	1967*	1972**	1976 (A)	(B)	(C)
1.	Area of the District (Sq. Km.)	4984.2	4984.2	4946.4	4385.22	.....	4344.0
	(i) Rural	4956.9	4956.9	4905.5	4345.30	.....	4304.0
	(ii) Urban	27.3	27.3	40.9	40.02	....	40.0
2.	Total number of Tahsils	4	4	4	4	4	4
3.	Total number of Parganas	13	13	13	12	12	12
4.	Total number of Blocks	19	14	19	17	17	17
5.	Total number of settlements	1682	1682	1658	1479	1479	1479
6.	Total number of Urban Settlements	13	13	13	12	12	12
7.	Total number of Rural Settlements	1669	1669	1645	1467	1467	1467
	(a)Inhabited Rural Settlements	1539	1539	1537	1373	1373	1373
	(b)Uninhabited Rural Settlements	130	130	108	94	94	94
8.	Total Number of Residential Houses	280627	280627	314425	286505	N.A.	N.A.
9.	Total Number of Households	---	---	361932	314950	N.A.	N.A.
10.	Total Population Persons	1737397	1737397	2073343	1877816	1875625	1909565
	(a) Rural	1517515 (87.3)	1517515 (87.3)	1796935 (86.7)	1614469 (86.3)	1612278 (85.9)	1646218 (86.7)
	(b) Urban	219882 (12.7)	219882 (12.7)	276408 (13.3)	263347 (13.4)	263347 (14.1)	263347 (13.3)
11.	Sex Ratio (Females/1000 males)	880	880	854	855	855	855
12.	Scheduled Caste Population % to Total	---- (20.3)	---- (20.3)	425875 (20.5)	394337 (20.9)	N.A.	394521 (20.66)
	(a) Male	--- (19.8)	--- (19.8)	228898 (20.5)	211905 (20.5)	N.A.	N.A.
	(b) Female	--- (21.0)	--- (21.0)	196977 (20.6)	182432 (21.1)	N.A.	N.A.
13.	S.T. Population to Total Pop.(%)	(0.05)	(0.05)	(0.05)	(0.06)	N.A.	N.A.
14.	Literacy Rate (%) Persons	(21.9)	(21.9)	(21.9)	(21.9)	N.A.	(22.0)
	(a) Male	(27.7)	(27.7)	(32.8)	(32.6)	N.A.	N.A.
	(b) Female	(5.7)	(5.7)	(9.2)	(9.3)	N.A.	N.A.
15.	Density of Population(persons/sq.km.)	349	349	424	426	N.A.	440
16.	Decadal Growth of Population(%)	(15.84)	(15.84)	(19.34)	(19.34)	N.A.	N.A.
17.	Total Work Force (% to Total Population)	563341 (32.4)	563341 (32.4)	551756 (26.6)	501870 (26.7)	N.A.	N.A.
	(a) Primary Sector Work Force (% to total work force)	420662 (74.6)	420662 (74.6)	400396 (72.6)	366013 (72.9)	N.A.	N.A.
	(b) Secondary Sector Work force (% to total work force)	22152 (3.9)	22152 (3.9)	50670 (9.2)	45349 (8.7)	N.A.	N.A.
	(c)Tertiary Sector Work Force (% to total work force)	120527 (21.5)	120527 (21.5)	100690 (18.2)	90508 (18.4)	N.A.	N.A.
18.	Cultivators (% to Total Work Force)	316964 (56.3)	316964 (56.3)	301921 (54.7)	273336 (54.5)	N.A.	N.A.
19.	Agricultural Labourers (% to Total Work Force)	70302 (8.4)	70302 (8.4)	93000 (16.9)	87749 (17.2)	N.A.	N.A.
20.	Work Force in Other occupations (% to Total Work Force)	186075 (35.3)	186075 (35.3)	368113 (28.4)	140785 (28.3)	N.A.	N.A.
21.	Non-Working Force (% to Total Population)	1174056 (67.6)	1174056 (67.6)	1521587 (77.4)	1375946 (73.3)	N.A.	N.A.

Data Source — (A) = Statistics Computed from the District Census Handbooks(DCH) of 1961 and 1971
(B) = Data obtained from Revenue Department of District Bulandshahr
(C) = Data obtained from the office of the District Statistics Officer, Bulandshahr
* = Data computed from DCH 1961 of Bulandshahr District.
** = Data computed from DCH 1971 of Bulandshahr District.
( ) = Figures given in paranthesses refer to percentage positions.

Appendix III

Distribution of Population, Sex Ratio, Literacy, Their Overall and Decadal details of Growth During 1901-71 in Bulandshahr District

Year	Persons	Male	Female	Total	Rural	Urban
1901	1,137,039	598,571	538,468	900	897	911
1911	1,122,743	591,736	531,007	897	899	886
1921	1,066,149	562,338	503,811	896	903	857
1931	1,136,873	603,971	532,902	882	891	838
1941	1,317,223	689,861	627,362	909	922	845
1951	1,499,884	797,314	702,570	881	885	864
1961	1,737,397	924,150	813,247	880	882	866
1971	2,073,343	1,118,441	954,902	854	852	867
		Percentage	Distribution	of	Population	
1901	100.00	52.64	47.36	100.00	83.76	16.24
1911	100.0	52.70	47.30	100.00	85.16	14.84
1921	100.0	52.74	47.26	100.00	85.63	14.37
1931	100.0	53.13	46.87	100.00	84.62	15.38
1941	100.0	52.37	47.63	100.00	84.03	15.97

Appendix III (cont'd...)

1951	100.00	53.16	46.84	100.00	84.44	15.56
1961	100.00	53.19	46.81	100.00	87.34	12.66
1971	100.00	53.94	46.07	100.00	86.67	13.33
	Decadal Growth of Population and Sex Ratio					
1901						
1911	-1.26	-1.14	-1.39	-1.26	0.22	-2.74
1921	-5.04	-4.96	-5.12	-5.04	0.44	-3.27
1931	6.63	7.40	5.77	6.63	-1.33	-3.22
1941	15.88	12.45	17.73	15.88	3.48	0.84
1951	13.87	15.68	11.99	13.87	-4.01	2.25
1961	15.84	13.73	15.75	15.84	-0.34	0.23
1971	19.34	21.02	17.42	19.34	-3.40	0.12
	Overall Variations of Population And Sex Ratio					
1901						
1911	-1.26	-1.14	-1.39	-1.26	0.39	-9.76
1921	-6.33	-6.05	-6.44	-6.23	-4.14	-17.03
1931	-0.01	0.50	-0.98	-0.01	1.01	-5.31
1941	15.85	15.25	16.51	15.84	16.22	13.90

Appendix III (cont'd...)

1951	31.91	33.20	30.48	31.91	32.98	26.40
1961	52.80	54.39	51.03	34.56	59.34	19.06
1971	82.35	86.85	77.44	82.34	88.68	49.67
	Decadal Rate of Literacy (Per cent)					
1901	2.90	5.25	0.25	-	N.A.	N.A.
1911	3.36	5.88	0.52	-	N.A.	N.A.
1921	4.15	7.37	0.51	-	N.A.	N.A.
1931	5.55	9.37	1.14	-	N.A.	N.A.
1941	-	-	-	-	N.A.	N.A.
1951	12.93	21.14	3.48	-	N.A.	N.A.
1961	20.51	32.44	6.79	-	N.A.	N.A.
1971	21.90	32.80	9.20	-	N.A.	N.A.

APPENDIX - IV

FREQUENCY DISTRIBUTION OF HUMAN SETTLEMENTS AND THEIR POPULATION SIZE IN BULANDSHAHR DISTRICT, 1961 and 1971

S.No.	Size Class (Persons)	Human Settlements					Population				
		Rural	Urban	Total	%age to Total	Cumulative Frequency	Rural	Urban	Total	%age to Total	Cumulative Frequency
1.	200	89 (127)	-	89 (127)	5.7 (8.2)	5.7 (8.2)	8,984 (13,425)	-	8,984 (13,325)	0.4 (0.8)	0.4 (0.8)
2.	200 - 499	242 (337)	-	242 (337)	15.6 (21.7)	21.3 (29.9)	88,000 (122,141)	-	88,000 (122,141)	4.4 (7.0)	4.8 (7.8)
3.	500 - 999	518 (520)	-	518 (520)	33.6 (26.4)	54.9 (56.3)	381,123 (380,955)	-	381,123 (380,955)	18.4 (21.9)	23.2 (29.7)
4.	1000 - 1999	485 (410)	-	485 (410)	31.2 (33.5)	86.1 (89.8)	682,098 (561,288)	-	682,098 (561,288)	32.9 (32.3)	56.1 (62.0)
5.	2000 - 4999	191 (137)	-	191 (137)	12.3 (8.8)	94.4 (98.6)	553,122 (388,838)	-	553,122 (388,838)	26.7 (22.4)	82.8 (84.4)
6.	5000 - 9999	11 (8)	3 (4)	14 (12)	0.9 (0.8)	99.3 (99.4)	71,092 (50,868)	20,270 (27,989)	91,362 (78,857)	4.6 (4.6)	87.4 (89.0)
7.	10000 and above	1 (-)	10 (9)	11 (9)	0.7 (0.6)	100.0 (100.0)	12,516 (-)	256,138 (191,893)	268,654 (191,893)	12.8 (11.0)	100.0 (100.0)
	TOTAL	1537 (1539)	13 (13)	1550 (1552)	100.0 (100.0)	100.0 (100.0)	1,796,935 (1,517,515)	276,408 (219,882)	2,073,343 (1,737,397)	100.0 (100.0)	100.0 (100.0)

Figures in paranthesos refer to the year 1961, The data for the year 1971 has been used for the area of the district prior to the 1976 reorganisation

Appendix V

Frequency Distribution of Population and Human Settlements by their Size Groups (1971) Reorganised in the District of Bulandshahr

S.No.	Population size-class (Persons)	Population 1971 New Bulandshahr					Inhabited Settlements 1971				
		Total Population Old Buld. Dist.	Population tran. to GZD. District	Total Population (Persons)	% population to Total	Cum. Freq. of % Population	Old Buld. Dist. No.	Trans. to GZB Dist.	New Bulandshahr Dist. No.	% to total	Cumulativ Frequency
1.	200	8,984	1,972	1,012	0.37	0.37	89	17	72	5.20	5.20
2.	200 - 499	88,000	9,086	78,914	4.20	4.57	241	24	217	15.67	20.87
3.	500 - 999	381,123	43,124	337,999	18.00	22.57	519	58	461	33.29	54.16
4.	1000 - 1999	682,098	62,838	629,260	32.98	55.55	486	44	442	31.92	86.08
5.	2000 - 4999	553,122	59,989	493,133	26.26	81.81	190	20	170	12.27	98.35
6.	5000 - 9999	71,092 (20270)	5,457	65,635 (20,270)	4.58	86.39	8 (3)	1	7 (3)	0.94	99.29
7.	10000 - 19999	12,516 (92,779)	- (13,061)	12,516 (79,718)	4.92	91.31	1 (6)	- (1)	1 (5)	0.43	99.72
8.	20000 - 49999	(53,609)	-	(53,609)	2.85	94.16	(2)	-	(2)	0.14	99.86
9.	50000 & above	(109,750)	-	(109,750)	5.84	100.00	(2)	-	(2)	0.14	100.00
10.	Total	2,073,343	195,527	1,877,816	100.00	100.00	1550	165	1385	100.0	100.00

N.B.: The figures given in parentheses refer to the urban population settlements
* This population figures are computed directly from the 1971 DCH of Bulandshahr district which differ from the data maintained by the D.S.T.O. Bulandshahr

APPENDIX - VI

DECADAL AND OVERALL VARIATION IN THE NUMBER OF RURAL AND URBAN INHABITED SETTLEMENTS IN BULANDSHAHR DISTRICT DURING 1901-71

Year	Rural Settlements					Urban Settlements					All Settlements					All settlements of U.P. State				
	Total No.	No. 1901-71	%age	No.	%age	Total No.	No.	%age	No.	%age	Total No.	No.	%age	No.	%age	Rural	Urban	Total No.	Decadal Variation %	Overall Variation
1901	1509					23					1532					108,644	461	109,105		
1911	1521	12	0.79	12	0.79	21	-2	8.69	-2	8.69	1542	+10	0.65	+10	0.65	108,208	424	108,632	-0.43	-0.43
1921	1514	-7	0.46	5	0.33	19	-2	9.52	-4	17.39	1533	-9	0.58	+ 1	0.06	109,724	448	110,172	-1.42	+0.98
1931	1523	+9	+0.59	14	0.92	19	0	0.00	-4	17.39	1542	+9	0.58	+10	0.65	111,001	452	111,453	+1.16	+2.15
1941	1517	-6	-0.39	8	0.53	20	+1	5.26	-3	13.04	1537	-5	0.32	+5	0.37	105,773	458	106,231	-4.68	-2.63
1951	1524	+7	+0.46	15	0.99	22	+2	10.0	-1	43.4	1546	+9	0.58	+14	0.91	111,722	486	112,208	+5.63	+2.84
1961	1539	+15	+0.98	30	1.18	13	-7	31.81	-10	43.47	1552	+8	0.51	+20	1.30	112,624	267	112,891	+0.61	+3.47
1971	1537	-2	-0.12	28	1.85	13	0	0.0	-10	43.47	1550	-2	0.12	+18	1.17	112,561	325	112,876	-0.01	+3.46
1976	1373	-164	-10.67	136	9.01	12	-1	7.69	-11	47.82	1385	-165	10.64	147	9.59	112,561	325	112,886	+0.01	+3.47

Data refers to the settlements of the New District of Bulandshahr as came into being after reorganisation of November 14, 1976

APPENDIX - VII

THE NEAREST NEIGHBOUR ANALYSIS AND ITS METHODOLOGICAL EXPLANATION

The Nearest Neighbour Analysis involves the measurement of distance from an individual point to the nearest neighbour irrespective of direction. It helps in distinguishing three kinds of basic distributions of points (settlements over an area) namely : (i) uniform, (ii) random, and (iii) clustered. The problem of the N-N Analysis is that of finding a single index for any given pattern, running on a continuous scale, i.e., from one extreme when all the points are clustered to the other extreme, a situation in which all the points are distributed uniformly.

Nearest Neighbour Index (R) :

The N-N Index was originally devised by plant ecologists J.P. Clark and F.C. Evans. It measures the deviation of any spatial pattern of the distribution of points from randomness. Assuming the distribution of points as random and the probability distribution of the distance between points and their first nearest neighbour as normal the expected mean nearest neighbour distance rE between the points in a given area is given by :

...../.....

$$rE = \frac{1}{2\sqrt{P}} = \frac{1}{2\sqrt{N/A}}$$

where N is the number of settlements and A is the area of the place.

The N-N Index R is the ratio of the actual mean distance (rA) between nearest neighbour points in a given area to the mean expected distance of random distribution of the same number of points in the same area i.e. rE. Thus :

$$R = \frac{rA}{rE} = \frac{rA}{2\sqrt{P}} = \frac{rA}{2\sqrt{N/A}}$$

$$\text{where } rA = \frac{\Sigma r}{N}$$

The ratio R ranges from zero, when there is <u>maximum aggregation</u> of all the points at one location, through which (the limit of which at 5% levels of significance, 2.58 and 1.96 respectively) it represents a <u>random distribution</u> upto 2.15 which represents <u>even distribution</u>.

The Standard Error (S.E.) of the expected mean is given as :

$$SE = \frac{0.26126}{\sqrt{N.P}}$$

$$\text{Or} \quad SE = \frac{0.26126}{\sqrt{N^2/A}}$$

If the value of R falls between zero and 1 or 1 - 2.15, they may be explained as approaching cluster and approaching uniform respectively, provided that the value of rE is significantly different from rA otherwise the pattern should be considered as random and the difference between rA and rE is attributed to the chance factors only. The statistics

$$Z = \frac{rA - rE}{SE} \quad \text{or} \quad \frac{rA - rE}{\sigma rE}$$

is a Standard Normal variate (Z) and used to test the significance of the difference between rA and rE. Thus, summarily the patterns of distribution of settlementson the basis of the value of R may be classified as follows:-

'R' Value	Pattern	Remarks
0	Complete clustering	... ...
0-1	Approaching cluster	If Z Standard Normal variate is significant at 1% level of significance
1	Random	
1-2.15	Approaching uniform	
2.15 (or 2.1491)	Even or uniform	If Z is significant at 1% level of significance

...../.....

Example :

Area - District Bulandshahr

rA = 1.19

A = (4385.22 sq. Km.)

N = 1385

rE = 0.89

R = 1.34

$$\text{Standard Error } \sigma rE = \frac{0.26126}{\sqrt{N^2/A}} = \frac{0.26126}{\sqrt{\frac{1385 \times 1385}{4385.22}}}$$

$$= 0.0124915$$

$$Z = \frac{rA - rE}{\sigma rE} = \frac{1.19 - 0.89}{.0124915}$$

$$= \frac{0.20}{0.0124915} = 16.01$$

which is significant at 1% level of significance; so the distribution may be inferred as approaching uniform; These results can be summarised as below:-

Region	rA	rE	R	S.E.	Z	Pattern
Bulandshahr District	1.19	0.89	1.34	0.0124915	16.01	Approaching uniform

APPENDIX - VIII

SPATIAL PATTERNS OF DISTRIBUTION OF SETTLEMENTS IN BULANDSHAHR DISTRICT, 1971
NEAREST NEIGHBOUR ANALYSIS (N - N ANALYSIS)

S.No.	Particular	No. of Inhabited Settlements	Total Area (sq. km.)	Total Actual Distance	'P' Value	Mean Actual N-N Distance	Mean Expected N-N Distance	N.N.D. Index	Standard Error	Standard Normal Variate	State of Significance State	State of Significance Level	Distribution Pattern of Settlements
	SIZE GROUP OF SETTLEMENTS BY POPULATION (PERSONS)												
1.	Below 200	72	4385.22	219.51	0.02	3.14	3.57	0.88	0.423786	10.146630	Significant	1%	Approaching Random
2.	200 - 499	217	4385.22	597.37	0.05	2.75	2.27	1.21	0.0231962	20.693044	- do -	1%	Approaching Uniform
3.	500 - 999	461	4385.22	703.26	0.11	1.53	1.52	1.01	0.0011847	20.258293	- do -	1%	Random
4.	1000 - 1999	442	4385.22	797.25	0.10	1.80	1.56	1.15	0.0131561	18.242488	- do -	1%	Approaching Uniform
5.	2000 - 4999	170	4385.22	461.06	0.04	2.71	2.50	1.08	0.0260127	8.072979	- do -	1%	Random
6.	5000 and above	23	4385.22	216.29	0.01	9.40	5.00	1.88	0.1316875	33.412434	- do -	1%	Approaching Uniform
7.	All Groups (District Buld.)	1385	4385.22	1654.18	0.32	1.19	0.89	1.34	0.0124915	24.016331	- do -	1%	Approaching Uniform
	N-N ANALYSIS BY TAHSILS												
8.	Sikandrabad	246	4385.22	305.40	0.31	1.24	0.89	1.39	0.0299771	12.342754	Significant	1%	Approaching uniform
9.	Bulandshahr	395	4385.22	461.84	0.32	1.17	0.88	1.33	0.0231184	12.54412	- do -	1%	- do -
10.	Khurja	354	4385.22	440.30	0.30	1.24	0.91	1.36	0.254216	17.701482	- do -	1%	- do -
11.	Anupshahr	390	4385.22	446.56	0.33	1.15	0.87	1.32	0.0230117	12.167723	- do -	1%	- do -
12.	Rural Bulandshahr	1573	4385.22	1645.28	0.31	1.20	0.90	1.33	0.0012600	23.808201	- do -	1%	- do -

For details please see Appendix VII, N-N-D scale : R = 0 is complete; R = 1 is Random, R = 2.1491 is Even or Uniform

If R turns between zero and 1.0 and 1.0 and 2.1491 patterns are approaching cluster and approaching uniform respectively subject to the significance of standard Normal variate at 1% level of significance

APPENDIX - IX

DISTRICT BULANDSHAHR (U.P.), 1971

SPATIAL PATTERN OF DISTRIBUTION OF SETTLEMENTS BASED ON THE GINI'S COEFFICIENT RATIO TECHNIQUE* BY BLOCKS & TAHSILS

Sl. No.	Block	No. of Settlements (S)	Area (Sq. Km.)	Percent Block settlement to the total District Settlements (X)	Percent Block area to the total District Area (Y)	Order of variables X in ascending order: X	Order of variables X in ascending order: Y	Cumulative Percentages: X_i	Cumulative Percentages: Y_i	X_iY_{i+1}	Y_iX_{i+1}
1.	[illegible]	13[illegible]	435.2	9.5[illegible]	9.95	9.59	9.95	9.53	9.95	170.43	117.01
2.	[illegible]	116	350.52	8.33	8.22	8.33	8.22	11.75	10.17	2[illegible].03	447.33
3.	G[illegible]L	59	159.2	4.26	3.63	6.86	3.03	24.62	23.20	775.28	720.31
4.	[illegible]	95	200.3	6.86	5.03	6.79	8.29	31.41	31.49	1200.65	909.10
5.	[illegible]	47	103.7	3.39	4.19	6.64	6.63	33.05	30.14	1701.22	[illegible].55
6.	[illegible]	34	172.5	2.45	3.9[illegible]	6.57	6.57	44.62	44.[illegible]	2200.53	2235.50
7.	[illegible]	74	203.4	5.34	4.75	6.50	6.40	51.12	51.11	2936.33	2930.65
8.	[illegible]	86	277.6	6.22	6.33	6.22	6.33	57.34	57.44	3600.41	3541.12
9.	[illegible]	94	353.3	6.79	8.29	6.05	5.49	63.39	62.93	4331.72	4343.43
10.	[illegible]	[illegible]	291.7	6.64	6.63	5.63	5.72	69.02	68.65	5003.32	5115.11
11.	[illegible]	78	251.0	5.63	5.72	5.49	5.00	74.51	73.65	5253.94	5286.84
12.	[illegible]	90	280.5	6.50	6.40	5.42	5.05	79.93	78.70	6670.16	6710.75
13.	[illegible]	64	210.1	4.63	4.80	5.34	4.75	[illegible].27	[illegible].45	7525.08	7502.16
14.	[illegible]	76	219.4	5.49	5.00	4.63	4.00	89.90	88.25	8250.01	8309.62
15.	[illegible]	91	288.3	6.57	6.57	4.26	3.63	94.15	91.88	9043.95	8962.8[illegible]
16.	[illegible]	75	221.6	5.42	5.05	3.39	4.19	97.55	96.07	9755.00	9607.00
17.	[illegible]	[illegible]	[illegible].9	6.05	5.49	2.45	3.93	100.00	100.00	----	----
	TOTAL	1385	4383.22	100.00	100.00						

TAHSIL WISE ANALYSIS :

Sl. No.	Tahsil	No. of Settlements (S)	Area (Sq. Km.)	X	Y	X (ascending)	Y	X_i	Y_i	X_iY_{i+1}	Y_iX_{i+1}
1.	[illegible]	[illegible]46	796.72	17.76	18.17	28.53	27.06	28.53	27.06	1562.04	1579.10
2.	[illegible]	395	1021.70	28.52	20.05	28.16	26.91	53.63	53.77	4633.18	4504.20
3.	[illegible]	354	1186.50	25.55	27.06	25.55	27.06	82.24	81.83	8224.00	8183.00
4.	[illegible]	390	1180.30	28.16	26.91	17.76	18.17	100.00	100.00	----	----
	TOTAL	1385	4383.22	100.00	100.00					14324.16	14266.53

* For details please see Appendix XX.

Formula $G = \frac{1}{10,000}\left[\sum_{i=1}^{n} X_iY_{i+1} - X_{i+1}Y_i\right]$ Where G = Gini's Coefficient Ratio, n = Number of observations, X, Y = Settlement and Area Attributes.

Results: (A) In Case of Blocks $G = \frac{1}{10,000}$ (69530.65 - 69263.47) = .[illegible] i.e. no concentration

(B) In case of Tahsils $G = \frac{1}{10,000}$ (14324.16 - 14266.53) = .005773 i.e. no concentration.

APPENDIX - X

Lorenz Curve and The Gini's Coefficient

(As the Measure of Inequlaity in the distribution patterns)

Lorenz Curve :

The curve, which has long been used to measure the inequality in the distribution of wealth or income, was first expounded by M.O. Lorenz in 1905 (In his article "Methods of Measuring the Concentration of Wealth", Quarterly publication of the American Statistical Association 9(70): pp. 209-19, June, 1905). It has also been used to measure depict the state of concentration of settlements population and other demographic attributes.

It basically deals with the cumulative percentage distributions of the two attributes at different points. The cumulative percentages of one variable upto certain points are plotted on a graph against the cumulative percentage of the other variable upto the same points. The different points so obtained are then joined by a smooth freehand curve. For comparison a diagonal line is also drawn, joining the last point and the origin, showing the line of equal distributions. The deviations of any curve from this diagonal is proportion to the level of inequality in the distribution of one attribute in relation to the

other*. For example see figures 8A, 8D, 8H etc. given in the text part of this dissertation.

Gini's Coefficient :

The overall concentration found in any lorenz curve may also be measured numerically in terms of the ratio of the area under the curve and the line of equal distribution to the area of the triangle formed by the X-axis. The Y-axis and the line of equal distribution. In case value of the given variable say population is unofrmly distributed, the curve will fall on the line and the area between the curve and line would be zero. Whereas the area of the trianlge would be $\frac{100 \times 100}{2} = 5000$, the ratio in this case would be $\frac{0}{5000} = 0$. In case of highest concentration, i.e., when all the settlements are concentrated only at one place, the curve will move along the Y-axis and then along the X-axis, such that the area between the curve and the line would be very close to the area of the triangle and the ratio would be nearly unity. This ratio, hence varies between zero and one.**

The ratio mentioned above is known as Gini's Coefficient (G) and can be numerically worked out by

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* A Mahmood: Statistical Methods in Geographical Studies, Rajesh publications, New Delhi, 1977, p.109.

** Ibid, p.112-14.

the following formula.

$$G = \frac{1}{100 \times 100} \left| \sum_{i=1}^{n} X_i Y_i + 1 - (X_i + 1 Y_i) \right|$$

Where X_i = The cumulative percentage distribution of attribute X

Y_i = The cumulative percentage distribution of attribute Y.

n = The number of observations

G = Gini's coefficient (The ration in between the area of the triangle formed between the line of equal distribution and the Y-axis and the area lying between the curve and the line of equal distribution)

The computation of 'G' value requires all the columns of the Appendix-IX given in the part of the General tables. The values of column 11 i.e., the value of $X_i Y_i + 1$ is obtained by multiplying first element of column 9 by the second element of column 10 and so on. The column 12 of the table is obtained by multiplying the first element of column 10 with the second element of column 9, the second element of column 10 with the third element of column 9 and so on. The sum of column 9 gives X_1Y_i+1 and that of column 10 gives $Y_1X_1 + 1$. For example, using the values from the table GT-8, the Gini's coefficient $G = \frac{1}{100 \times 100} (69500.86 - 69263.47) = 0.0237$. This G value shows that there is no concentration among settlements but the pattern of distribution is very close to uniformity.

Appendix XI

Average Spacing Among Settlements of Bulandshahr District, 1971 (Based on the Mather's Model)

S.No.	Block/Tahsil	Area (sq.km.)	No. of settlements	Average spacing
	Blocks			
1.	Dankaur	436.20	130	1.97
2.	Sikandrabad	360.52	116	1.89
3.	Gulaothi	159.20	59	1.77
4.	Bulandshahr	220.30	95	1.64
5.	B.B. Nagar	183.70	47	2.12
6.	Siyana	172.50	34	2.42
7.	Lakhaoti	208.40	74	1.80
8.	Shikarpur	277.60	86	1.93
9.	Jewar	363.30	94	2.11
10.	Khurja	291.70	92	1.86
11.	Arniya	251.00	78	1.83
12.	Pahasu	280.50	90	1.90
13.	Unchagaon	210.10	64	1.95
14.	Anupshahr	288.30	91	2.91
15.	Jahangirabad	219.40	76	1.83
16.	Danpur	221.6	75	1.85
17.	Dibai	240.9	84	1.82
	Tahsils			
1.	Sikandrabad	755.5	246	1.88
2.	Bulandshahr	1221.7	395	1.90

Appendix XI (cont'd...)

3.	Khurja	1186.5	354	1.97
4.	Anupshahr	1180.3	390	1.87

Spacing By Size-Group of Settlements
District Bulandshahr

S.No.	Settlement - size-Groups (Persons)	Area (sq.km.)	No. of Settle-ments	Average spacing (km.)	Model Used (Mather's Model)
1.	Less than 200	4385.22	70	8.50	S = 1.0746.
2.	200 - 499	4385.22	217	4.83	A/N
3.	500 - 999	4385.22	461	3.31	S - Average spacing
4.	1000 - 1999	4385.22	442	3.38	A - area of study region
5.	2000 - 4999	5385.22	170	5.45	N - no. of settle-ments
6.	5000 and above	4385.22	23	14.84	
DISTRICT BULANDSHAHR		4385.22	1385	1.91	

APPENDIX - XII

AVERAGE SPACING* AMONG SETTLEMENTS (MATHER'S MODEL)**

Spacing refers to the average distance at which the settlements are located and their functions or facilities are distributed. This distance consideration is some what different to that of the Nearest Neighbour (N-N) analysis. With the help of the average spacing we can assess the general pattern of spatial distribution of settlements in a given areal unit without — dealing with the complicated and time consuming — exercises.

The formula to work out the average spacing was first propounded by Mather has been used in various studies related to the size and distance relationships among the human settlements. The formula is as follows:

$$S = 1.0746 \sqrt{A/N}$$

Where S = Average spacing in unit length(Km/mile)

A = Area of the study region (Sq. Km./Sq. Mile)

N = Number of settlements in the study region.

1.0746 = Spacing constant of the Mather Model

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* Quoted in A.B. Mukherjee's article "Spacing of Rural Settlements in Rajasthan: A Spatial Analysis" published in the READINGS IN RURAL SETTLEMENTS OF GEOGRAPHY (ed.) by R.L. Singh, K.N. Singh and R.P.B. Singh, Varanasi, N.G.S.I.(1975) pp. 252-268.

** E.C. Mather, 'A Linear Distance Map of Farm Population in the U.S.', AAAG,, Vol. 34, 1944, pp. 173-80.

Appendix XI (cont'd...)

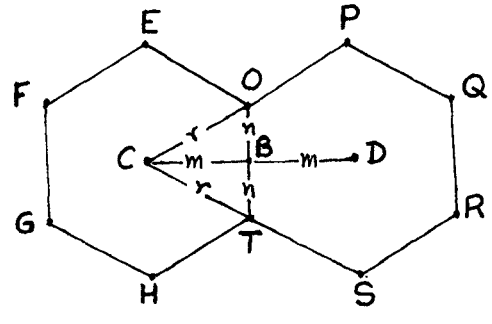
3.	Khurja	1186.5	354	1.97
4.	Anupshahr	1180.3	390	1.87

Spacing By Size-Group of Settlements
District Bulandshahr

S.No.	Settlement - size-Groups (Persons)	Area (sq.km.)	No. of Settle-ments	Average spacing (km.)	Model Used (Mather's Model)
1.	Less than 200	4385.22	70	8.50	S = 1.0746.
2.	200 - 499	4385.22	217	4.83	A/N
3.	500 - 999	4385.22	461	3.31	S - Average spacing
4.	1000 - 1999	4385.22	442	3.30	A - area of study region
5.	2000 - 4999	5385.22	170	5.45	N - no. of settle-ments
6.	5000 and above	4385.22	23	14.84	
DISTRICT BULANDSHAHR		4385.22	1385	1.91	

Derivation of Model :

The spacing model is based on the assumption that the space of the region is geometric and homogenous and the settlements are optimally distributed equi-spaced. This state of spatial distribution of settlements can only be possible when the settlements are located at the centres of equi-lateral hexagons of equal size, and well touched with each other. In such a condition what is the distance between the two nearest settlements is defined as the Mather's spacing and worked out in the formula as follows:



Let EFGHTO and OPQRST be the two equilateral hexagons equal to each other and C, D as their respective centres.

A is the area of the hexagon EFGHTO equal to the area of OPQRST

N = 1 i.e. the number of settlements in one hexagon.

S = CB+BD = 2 x m = The optimal average distance between C and D.

STEP 1 : The $\triangle$ COT is an equilateral triangle

$\therefore$ $\triangle$ COB = $\triangle$ CTB (both are right angle triangles)

$\therefore$ $A = 6 \times \triangle COT$

or $A = 12 \times \triangle COB$ or $A = 12 \times \triangle CTB$

or $$\frac{A}{N} = \frac{12 \times \triangle COB}{1} = 12 \times \triangle COB \quad \ldots\ldots\ldots(1)$$

STEP 2 : Now in the triangle COB, let CO = r , CB = m and OB = n

$$(CO)^2 = (CB)^2 + (OB)^2$$

or $$r^2 = m^2 + n^2$$

or $$m^2 = r^2 - n^2$$

or $$m = \sqrt{r^2 - n^2}$$

or $$m = \sqrt{r^2 - (\tfrac{1}{2}r)^2}$$

or $$m = \sqrt{\frac{4r^2 - r^2}{4}} \quad \ldots\ldots\ldots\ldots\ldots\ldots(2)$$

or $$m = \frac{\sqrt{3}}{2} r$$

STEP 3 : or $$r^2 = \frac{4}{3} (m)^2 \quad \ldots\ldots\ldots\ldots\ldots\ldots(3)$$

Area of $\triangle$ COB $= \frac{1}{2}$ CB x BO $= \frac{1}{2}$ CB x $\frac{1}{2}$ (OT)

$= \frac{1}{4}$ CB x OT $= \frac{1}{4}$ m x 2n

$= \frac{1}{4}$m.r..... (4)

STEP 4 : From the equation No. (1), (2) and (4)

$$\frac{A}{N} = 12(\triangle COB) = 12(1/4\ m.r)$$

$$= 3\ m.r. = 3\left(\frac{3}{2}r\right).r$$

$$= \frac{3\sqrt{3}}{2} r^2$$

$$\text{or} \quad r^2 = \frac{2}{3\sqrt{3}} \cdot \frac{A}{N} \quad \ldots\ldots\ldots\ldots\ldots\ldots (5)$$

STEP 5 : On putting the values of r^2 equal to each other based on the equations (3) and (5) respectively.

$$r^2 = r^2$$

$$\text{or} \quad \frac{4}{3}(m)^2 = \frac{2}{3\sqrt{3}} \cdot \frac{A}{N}$$

$$\text{or} \quad 2(m)^2 = \frac{1}{\sqrt{3}} \cdot \frac{A}{N}$$

$$\text{or} \quad m^2 = \frac{1}{2\sqrt{3}} \cdot \frac{A}{N}$$

$$\text{or} \quad m = 0.5373451316 \times \sqrt{A/N}$$

$$\text{or} \quad 2m = 1.07469102632\sqrt{A/N}$$

$$\text{or} \quad S = 1.0746\sqrt{A/N}$$

APPENDIX - XIII : DISTRICT BULANDSHAHR :
MEAN SIZE AND AVERAGE SPACING* OF SETTLEMENTS

Sl. No.	Block	POPULATION			SETTLEMENTS			MEAN SIZE OF SETTLEMENT			Area (Sq. Km.)	Spacing Among	
		Rural	Urban	Total	Rural	Urban	Total	Total	Rural	Urban		Rural settlements (Kms.)	All settlements (Kms.)
1.	DNK	107,470	6,913	114,383	129	1	130	879.06	833.10	6913	436.2	1.98	1.97
2.	SKD	122,793	3,203	154,824	115	1	116	1334.68	1067.76	3203	360.52	1.90	1.89
3.	GUL	77,982	17,376	95,358	58	1	59	1616.23	1344.52	77376	159.2	1.77	1.77
4.	BSR	117,994	59,505	177,499	94	1	95	1868.41	1255.25	59505	220.3	1.65	1.64
5.	BBN	83,844	----	83,844	47	-	47	1783.91	1783.91	---	183.7	2.12.	2.12
6.	SIA	66,432	23,636	90,068	32	2	34	2649.05	2076.00	11818	172.5	1.80	2.42
7.	LKH	86,664	---	86,664	74	--	74	1171.14	1171.14	----	208.4	2.11	1.80
8.	SKP	90,250	16,565	106,815	85	1	86	1242.03	1061.76	16565	277.6	1.93	1.93
9.	JVR	122,350	---	122,350	94	-	94	1301.60	1301.59	----	363.3	2.11	2.11
10.	KRJ	86,397	50,254	136,642	91	1	92	1485.23	949.42	50245	291.7	1.92	1.86
11.	ARN	82,632	-----	82,632	78	-	78	1059.38	1059.38	---	251.0	1.93	1.93
12.	PSU	103,487	6,203	109,690	89	1	90	1218.78	1162.77	6203	280.5	1.90	1.90
13.	[illegible]	93,901	-- --	93,901	64	-	64	1467.20	1467.20	---	210.	1.95	1.95
14.	JHB	84,341	21,578	105,919	75	1	76	1393.67	1124.55	21578	219.4	1.83	1.83
15.	ASR	24,732	12,253	106,985	90	1	91	1175.66	2748.00	12253	288.3	1.92	1.91
16.	DNP	93,126	---	93,126	75	-	75	1241.68	1241.68	---	221.6	1.85	1.85
17.	DBI	100,074	17,042	117,116	83	1	84	1394.24	1205.7	17042	240.9	1.82	.1.82
TOTAL		1614,469	263,347	1877,816	1373	12	1385	1355.82	1175.87	21945	4385.22	1.92	1.91

* Spacing technique refers to Kather's Model (For details see Appendix XIII)

APPENDIX - XIV

(A) CORRELATION BETWEEN MEAN SIZE AND AVERAGE SPACING OF HUMEAN SETTLEMENTS, 1971

Sl. No.	Block	X (Mean size of settlement)	Y (Average Spacing) Kms.	X^2	Y^2	XY
1.	DNK	8.90	1.97	79.2100	3.8809	17.5330
2.	MKD	13.35	1.89	178.2225	3.5721	25.2315
3.	GUL	16.16	1.77	261.1456	3.1329	28.6032
4.	BSR	18.68	1.64	348.9424	2.6896	30.6352
5.	BBN	17.84	2.12	318.2656	4.4944	37.8208
6.	SIA	26.49	2.42	701.7201	5.8564	64.1058
7.	LKH	11.71	1.80	137.1241	3.2400	21.0780
8.	SKP	12.42	1.93	154.2564	3.7249	23.9706
9.	JWR	13.02	2.11	169.5204	4.4521	27.4722
10.	KRJ	14.85	1.86	220.5225	3.4596	27.6210
11.	ARN	10.59	1.93	112.1481	3.7249	20.4387
12.	PSU	12.19	1.90	148.5961	3.6100	23.1610
13.	UNG	14.67	1.95	215.2089	3.8025	28.6065
14.	JNG	13.94	1.83	194.3236	3.3489	25.5102
15.	ASR	11.76	1.91	138.2976	3.6481	22.4616
16.	DNP	12.42	1.85	154.2564	3.4225	22.9770
17.	DBI	13.94	1.82	194.3236	3.3124	25.3708
		X	Y	X^2	Y^2	XY
		242.93	32.70	3726.0839	63.3722	472.5971

...../.....

$$\text{Now} \quad r = \frac{(XY) - (X \quad Y)/N}{\sqrt{X^2 - \frac{(x)^2}{N}}\sqrt{Y^2 - \frac{(Y)^2}{N}}}$$

$$= \frac{472.5971 - \frac{(242.93)(32.70)}{17}}{\sqrt{3726.0839 - \frac{(242.93)^2}{17}}\sqrt{63.3722 - \frac{(32.70)^2}{17}}}$$

$$= \frac{472.5971 - 467.283}{\sqrt{254.6143}\sqrt{0.472789}}$$

$$= \frac{5.3141}{10.971758} = 0.4843416$$

$$= 0.484$$

T Test :

$$t = r\sqrt{\frac{(n-2)}{1-r^2}}$$

$$= .484\sqrt{\frac{(17-2)}{1-(.484)^2}}$$

$$= .484\sqrt{\frac{15}{.765744}} = .484\sqrt{19.588792}$$

$$= (.484)(4.426) = 2.142184$$

$$= 2.142$$

Hence r is significant at 5% level (since t table value is 2.13) and it is obvious that X and Y have positive relationship with each other.

(B) REGRESSION ANALYSIS

$\Sigma X = 242.93$ $\quad\quad$ $\Sigma X^2 = 3726.0839$

$\Sigma Y = 32.70$ $\quad\quad$ $\Sigma Y^2 = 63.3722$

$\Sigma XY = 472.5971$

$N = 17$

$$\bar{X} = \frac{X}{N} = \frac{242.93}{17} = 14.30$$

$$\bar{Y} = \frac{Y}{N} = \frac{32.70}{17} = 1.92$$

$Y = a + bX$ $\quad$ or $\quad$ $a = Y - bX$

$$b = \frac{XY - \frac{X\ Y}{N}}{X^2 - \frac{(X)^2}{N}} = \frac{472.5971 - \frac{(242.93)(32.70)}{17}}{3726.0839 - \frac{(242.93)^2}{17}}$$

$$= \frac{5.3141}{254.6143} = 0.0208711$$

$$= 0.021$$

Now $a = \bar{Y} - b\bar{X}$

$= 1.92 - 0.21\ (14.30)$

$= 1.92 - 0.2984567$

$= 0.7015433$

$= 0.702$

Now linear regression Equation

$Y = a + bX$

OR $\quad Y = 0.702 + 0.021X$ .....(1)

As per equation (i) the values of x in relation to different values of y may be computed as follows:

Y	1.5	1.6	1.7	1.8	1.9	2.0	Average Spacing (Kms.)
X	38.0	42.8	47.5	52.3	57.0	61.8	Mean Size of Settlement ('00 persons)

Procedure for test of Significence

(1) Now T_v (Total variation) $= \leq Y^2 - \frac{(\leq Y)^2}{N}$

$= 0.472789$

$= 0.479$

(2) Expalined Variation $E_v = b \left(\leq XY - \frac{\leq X \leq Y}{N} \right)$

$= .021 \quad (5.3141$

$= 0.1115961$

$= 0.112$

(3) Coefficient of Determination $R^2 = \frac{E_v}{T_v}$

$= \frac{0.11}{0.47} = 0.23604525$

$= 0.236$

(4) Unexplained Variation $U_v = T_v - E_v$

$= 0.4727890 - 0.1115961$

$= 0.3611929$

$= 0.361$

(5) Standard Deviation(Error (S.E.)

$$U = \sqrt{\frac{U_v}{n-1}} = \sqrt{\frac{.3611929}{17-1}} = \sqrt{\frac{.3611929}{16}}$$

$$= \sqrt{\frac{.6009932}{16}} = \sqrt{.037562075} = .1936491$$

$= 0.194$

(6) Standard Error of b

$$SE(b) = \sqrt{\frac{U}{x^2 - \frac{(x)^2}{N}}} = \frac{.1936491}{15.956638} = .0121576$$

$= .012$

(7) $t = \frac{b}{SE(b)} = \frac{.021}{.012} = 1.75$

(8) $df = 17 - 2 = 15$

Significant at 10% level of significance

(1.75) t table value 1.75 computed value.

Appendix XV

District Bulandshahr Population Size-Group wise Number of Settlements Having Social Facilities During 1971

Facility	No. of settlements (having facility) by population size group of persons									
	Below 200	200 to 499	500 to 999	1000 to 1999	2000 to 4999	5000 to 9999	10,000 and above	Total	Total Rural	Total Urban
All Settlements	72	217	461	442	170	13	10	1385	1373	12
(A) EDUCATIONAL FACILITIES										
1. P.S.	-	32	200	349	152	13	10	756	744	12
2. J.H.S.	-	1	4	28	45	9	10	97	86	12
3. H.S.S.	-	-	1	17	19	6	10	53	41	12
4. College	-	-	-	-	1	-	7	8	1	7
(B) HEALTH FACILITIES										
(a) Medical										
5. Disp.	-	-	1	6	6	1	15	15	13	2
6. F.P.C.	-	1	2	3	5	4	7	22	13	9
7. M.C.W.	-	-	1	5	5	4	1	16	16	-
8. Hosp.	-	1	2	10	13	8	9	43	32	11
9. H.C.	-	-	-	-	-	1	4	5	2	3
(b) Sanitary										
10. P.T.	-	-	-	-	-	-	8	8	-	8
11. O.S.D.						3	9	9	-	9

					(C) COMMUNICATION SERVICES						
(a)	Postal										
12.	B.P.O.	1	2	9	65	100	11	9	197	185	12
13.	P.T.O.	-	-	-	2	1	5	10	18	6	12
14.	Phone	-	-	-	-	-	2	10	12	1	11
(b)	Transport										
15.	K.R.	41	131	229	211	81	5	10	708	696	12
16.	P.R.	22	60	171	189	86	10	10	548	536	12
17.	RLY.	2	8	16	17	5	-	3	51	48	3
					(D) MARKET FACILITIES						
18.	W.M.	-	-	2	10	43	8	7	70	64	6
19.	F.M.	-	2	6	11	5	2	10	36	26	10
20.	R.M.	-	-	-	6	10	7	10	33	21	12
21.	A.S.S.	-	2	6	13	19	9	10	59	48	11
22.	C.S.S.	-	1	-	5	13	8	4	31	25	6
23.	S.M.C.	-	1	1	7	13	5	-	27	26	1
24.	V.H.	-	-	1	1	6	4	10	22	12	10
25.	E.A.U.	28	124	281	292	133	12	10	880	868	12
(b)	Credit										
26.	A.C.S.	-	-	-	-	-	1	8	9	-	9
27.	N.A.C.S.	-	-	-	-	-	1	3	3	-	3
28.	L.S.S.	-	-	3	7	4	1	3	18	15	3
29.	Bank	-	-	-	-	-	2	8	10	-	10

					(F) PUBLIC ADMINISTRATION SERVICES						
(a)	S.J. &S.										
30.	N.P.C.	-	2	19	69	71	7	-	168	168	-
31.	P.S.O.P.	-	-	-	1	-	4	10	15	4	11
(b)	Admn. H. Qrs.										
32.	B.H.Q.	-	-	-	2	3	2	10	17	6	11
33.	P.H.Q.	-	-	-	-	2	2	8	12	2	10
34.	T.H.Q.	-	-	-	-	-	-	4	4	-	4
35.	D.H.Q.	-	-	-	-	-	-	1	1	-	1
					(G) LEISURE TIME AMENITIES						
(a)	Religious										
36.	Temple	-	9	16	41	19	5	9	99	87	12
37.	Mosque	-	2	5	20	5	5	8	45	33	12
(b)	Recreational										
38.	P.L.	-	-	-	-	-	1	6	7	-	7
39.	R.R.	-	-	-	-	-	-	4	4	-	4
40.	Cinema	-	-	-	-	-	-	3	3	-	3

* Abbreviations used for facilities refer to Text Table No. 4.01.
The statistics regarding all the classified facilities has been computed by the author himself. The raw data has been taken from the D.C.H. Bulandshahr Pt. X-A and the district offices concerned.

APPENDIX - XVI

DETERMINATION OF MEDIAN POPULATION THESHOLDS (M.P.T.) FOR SETTLEMENT FUNCTION

(Based on the Reed-Muench Technqiue as used by Hagget and Gunawardena*)

As a result of the complexity of locational decisions the simple concept of an 'entry level' or population threshold for providing more logical results must be replaced by one of an 'entry zone': at the lower limits of the zone all settlements lack the function while at the upper limits of the zone all settlements possess the function being considered. The purpose of this consideration is to explore this zone and to suggest a simple method for locating its centre which is termed as median threshold population. A simple bioassay method known as the Reed-Muench method which was put forward in 1938** may be used in determing the median population threshold for a settlement function.

For a settlement analogy let us assume our problem is to determine the population threshold for a function (F_1) among a group of settlements of varied sizes. The given table illustrates such a simple situation. Fifty settlements are selected for study, ten being drawn at random from each of five population strata. For the lowest stratum (settlements with less than 200 inhabitants) all places are without the

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* P. Hagget and K.A. Gunawardena: 'Determination of population thresholds for settlement function by the Reed-Muench Method', Professonal Geographer, Vol.XVI, No.4, July 1964, pp.6-9.

** I.J. Reed and H. Muench: 'A Simple Method of Estimating Fifty per cent Endpoints' American Journal of Hygiene, Vol. 27, May, 1938, pp. 493-97.

function F_1, for the highest stratum (settlements with more than 800 inhabitants) all places have the function F_1. Between these two extremes the proportion "without" declines as "with" increases. Cumulating summing of the two columns gives values for an index 'Ag' indicating absence of the function F_1 at this and greater levels and for an index P_s indicating presence of the function F at this and smaller levels. From these indices a final value P may be computed of the proportion of settlements with the function F_1 at each of the five population levels as per following expression $P = 100. Ps/P_S+Ag$. Values for this proportion P are given in the final row of the given table.

TABLE

Determination of Median Population Theshold PT_{50} for Function F_1

Population Level	STRATUM				
	1	2	3	4	5
	0-199	200-399	400-599	600-799	800-999
Number of settlements	10	10.	10	10	10
With Function F_1	0	3	4	6	10
Without Function F_1	10	7	6	4	0
With Function F_1 absent at this and greater levels(Ag)	27	17	10	4	0
With Function F_1 present at this and smaller levels(Ps)	0	3	7	13	23
Proportion of Settlements with function F_1 present (percent)	0	15	41	76	100

From these five proportions the value of the median population theshold, PT_{50}, for the function F_1 may be simply derived. Inspection of Table shows that for settlements from the 3rd stratum (with population between 400 and 599) only 41 per cent had the function F_1 but that for the fourth stratum (with population between 600 and 799) the proportion has risen to 76 per cent. Clearly the median value lies somewhere between these values. The exact position of the 50 per cent point can be estimated as (50-41)/(76-41) = 0.26 i.e. the median value lies 26 per cent of the distance between the mid-points of stratum 3 and stratum 4. With an inter-stratum distance of 200 inhabitants the media value is: 500 + 0.26(200) = 522 = PT_{50}. The median population threshold for function F_1 is thus a settlement with about 550 inhabitants.

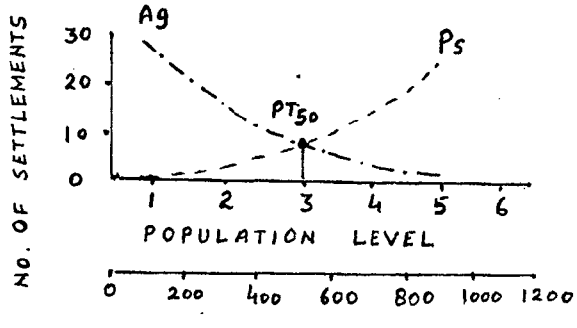

Figure: Determination of Median Threshold Population (PT_{50}) by graphical method.

The value for PT_{50} may be obtained graphically by plotting the values of Ag and Ps from the given table on the same set of axes (given figure). The curves for the two parameters cross at a population value at which the number of settlements without the function F_1 at this and smaller sizes is equal to the number of settlements with that function at this and greater sizes. This is the 50 per cent population threshold; it yields a value for PT_{50} equalto that obtained by the algebraic method.

In using the Reed-Muench method it should be remembered that it was designed for use with cases where the observed fatality rates covered the entire range from nil to total mortality i.e. zero to 100 per cent. Therefore, estimates of population thresholds should be designed to include cases of settlements in which no settlements has a given function and a conversely cases in which all settlements have the function.

APPENDIX - XVII

DISTRICT BULANDSHAHR : HIERARCHIC ORDERS OF (SERVICE CENTRES) SETTLEMENTS ON THE BASIS OF COMPOSITE SCORE OF MEDIAN POPULATION THRESHOLD INDICES OF SOCIAL FACILITIES

Sl. No.	Location Code(1971) (LC)	Service Centre (S.C.)	Composite Score (C.S.)
1st Order (C.S. 250 - 400)			
1.	19/2/I	Bulandshahr	451.3
2nd Order (C.S. 100 - 250)			
1.	19/3/II	Khurja	364.8
2.	19/1/III	Sikandrabad	290.8
3.	19/4/IX	Anupshahr	289.6
4.			
3rd Order (C.S. 100 - 250)			
1.	19/4/IV	Jahangirabad	244.8
2.	19/2/VIII	Gulaothi	224.5
3.	19/4/V	Dibai	219.6
4.	19/1/XI	Dankaur	196.8
5.	19/3/XIII	Pahasu	184.8
6.	19/2/VII	Siyana	172.7
7.	19/2/VI	Shikarpur	168.3
8.	51	Jewar	122.8

Appendix - XVII (Cont'd...)

4th Order (C.S. 50 - 100)

1.	19/2/XII	Bugrasi	90.4
2.	184	B.B. Nagar	82.9
3.	271	Danpur	76.0
4.	74	Unchagaon	70.0
5.	377	Naraura	63.3
6.	238	Lakhaoti	62.4
7.	272	Aurangabad	60.7
8.	77	Jahangirpur	60.3
9.	305	Jhajhar	57.1
10.	39	Baral	55.9
11.	213	Kherli	55.9
12.	132	Malagarh	53.2
13.	31	Khanpur Gantu	51.3
14.	11	Rabupura	50.4
15.	378	Rajghat	50.0

5th Order (C.S. 25 - 50)

Tahsil Sikandrabad

1.	246	Bilaspur	36.3
2.	319	Kakor	49.3
3.	333	Wair	30.2
4.	367	Gesupur	41.2
5.	406	Abilsuri	29.3

Appendix - XVII (Cont'd...)

Tahsil Bulandshahr			
6.	30	Bhatona	41.4
7.	147	Agauta	41.7
8.	195	Kuchesar	31.3
9.	162	Ahmadnagar	27.5
10.	165	Partabpur	25.2
11.	172	Saidpur	40.4
12.	283	Saraichhabila	30.9
Tahsil Khurja			
13.	59	Thora	36.8
14.	138	Meena Mojpur	28.6
15.	233	Arniya Khurd	46.3
16.	238	Muni	35.3
17.	263	Karora	47.9
18.	348	Chondhera	35.9
19.	355	Chatari	39.8
Tahsil Anupshahr			
20.	36	Narsena	25.6
21.	52	Daultapur	32.4
22.	99	Jadal	28.8
23.	302	Shiwali	25.0
24.	282	Dharampur	27.8
25.	340	Karanbas	38.4
26.	362	Palakaser	33.0

Appendix - XVII (Cont'd...)

27.	369	Belon	43.4
28.	405	Ramghat	28.0
29.	411	Jurgawan	36.5

6th Order

Block Dankaur

1.	178	Kasna	18.7
2.	211	Jamalpur	13.9
3.	212	Rajpur Kalan	
4.	220	Salempur Gujar	14.0
5.	286	Mirzapur	16.2
6.	313	Sunpera	15.2

Block Sikandrabad

7.	320	Dhanura	12.7
8.	322	Khanpur	24.1
9.	329	Fatehpur Jadon	14.2
10.	331	Nithari	13.2
11.	334	Bhonra	14.2
12.	339	Mahepa	12.3
13.	342	Astoli	17.1
14.	348	Chiti	13.4
15.	390	Mohana	13.9
16.	408	Birkhera	14.0
17.	411	Mohammadpur	13.1
18.	413	Chanderu	12.6
19.	416	Sarai Ghasi	13.9
20.	438	Choba	16.0

Appendix - XVII (Cont'd...)

Block Gulaothi

21	11	Khushalpur	14.0
22.	15	Atmad Sarai	19.9
23.	17	Harchana	14.0
24.	18#	Chhaprawat	21.4
25.	31	Kurli	18.4
26.	37	Kainthala	12.8
27.	40	Ganaura	14.7
28.	33	Kota	18.4
29.	137	Nagla Sheikh	12.8
30.	140	Shahnagar	17.1
31.	144	Lohagra	13.6
32.	152	Ajitpur	13.8

Block Bulandshahr

33.	47	Bhor	15.5
34.	64	Naithla	21.3
35.	75	Chandpur	12.9
36.	86	Basendua	18.6
37.	105	Pondri	13.0
38.	112	Utraoli	14.2
39.	133	Jeoligarh	20.7

Appendix - XVII (Cont'd...)

Block B.B. Nagar			
40.	161	Banboi	15.5
41.	189	Kesopur	18.2
42.	197	Banhpur	15.6
43.	198	Ladhpur	15.1
Block Siyana			
44.	202	Waira	14.2
45.	214	Buklona	15.6
46.	216	Mankri	14.2
47.	228	Barauli	23.8
Block Lakhapti			
48.	245	Bihra	22.0
49.	254	Pavsara	16.4
50.	258	Aulina	15.4
51.	289	Balka	16.5
52.	299	Mursana	14.1
53.	301	Maharajpur	15.7
54.	315	Manglaur	14.7
Block Shikarpur			
55.	318	Chitson	22.8
56.	320	Rasulpur	15.2
57.	326	Ghungraoli	12.6

Appendix - XVII (Cont'd...)

58.	328	Poothri Khurd	22.0
59.	331	Surjauli	22.8
60.	335	Anchru Kalan	15.1
61.	346	Salempur	22.3
62.	353	Barauda	13.7
63.	354	Sarawa	15.8
64.	356	Lohra	12.6
65.	371	Barasu	13.3
66.	381	Bohich	21.8
67.	393	Jakheta	16.9
68.	398	Chakla	12.9
Block Jewar			
69.	83	Ranhera	19.0
Block Khurja			
70.	121		24.4
71.	137	Sarangpur	13.6
72.	141	Meena Kalendergorhi	18.0
73.	169	Quarsi	17.3
74.	175	Dharpa	15.6
75.	193	Meerpur	17.0
Block Arniya			
76.	213	Baragaon	15.8
77.	220	Dussehra	17.6

Appendix - XVII (Cont'd...)

78.	222	Jawai	17.7
79.	231	Kahrooa	15.1
80.	256	Surjaoli	17.7
81.	262	Aterna	14.2
82.	264	Pharkana	14.2
83.	265	Pairo	14.6
84.	269	Badsha Panchayai	15.1

Block Pahasu

85.	291	Banel	18.2
86.	322	Utraoli	12.9
87.	360	Kamona	12.3
88.	369	Bahlalpur	15.1
89.	371	Tyor Buzurg	24.0

Block Unchagaon

90.	38	Umarpur	14.6
91.	80	Amargarh	20.6
92.	89	Kanona	16.3

Block Jahangirabad

93.	2	Parwana	17.1
94.	27	Sekhupur Rora	18.4
95.	219	Khalaur	15.5
96.	220	Sankhni	14.9

Appendix - XVII (Cont'd...)

Block Anupshahr			
97.	149	Daraura	16.9
98.	152	Khanauda	14.6
99.	164	Ahar	23.1
100.	168	Drawar	20.4
101.	221	Ahmad Ngr. Tali	19.4
102.	222	Chachrai	14.4
103.	229	Andhiyar	12.9
104.	240	Malakpur	19.2
105.	244	Bibiyana	15.5
Block Danpur			
106.	259	Satbara	22.4
107.	266	Daulatpur	22.2
108.	277	Shekhupur	23.2
109.	296	Rahim Kot	13.3
110.	319	Jirauli	18.2
Block Dibai			
111.	334	Talwar	23.7
112.	374	Rambiloni	12.5

APPENDIX XVIII

DISTRICT BULANDSHAHR : 1971

BLOCK-WISE COMPOSITE SCORES OF SOCIAL FACILITIES* PER HUNDRED SETTLEMENTS

S NO.	BLOCK/TEHSIL	Education P.S.	Education J.H.S.	Education H.S.S.	Education COL.	Education TOTAL	Health Medical DISP.	Health Medical F.P.C.	Health Medical M.C.W.	Health Medical HOSP.	Health Medical H.C.	Health Medical SUB TOTAL	Health Sanitary P.T.	Health Sanitary O.S.D.	Health Sanitary SUB TOTAL	Health TOTAL
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	DANKAUR	44	25	[illegible]	0.0	78.8	[illegible]	[illegible]	0.0	9.0	0.0	30.8	0.0	8.6	8.6	39.4
2	SIKANDRABAD	53.1	35	[illegible]	12.8	110.7	9.5	5.1	0.0	10.1	0.0	24.7	11.6	9.7	21.3	46.9
	T. SIKANDRABAD	49.6	31.5	7.5	6.0	94.6	13.6	4.8	0.0	9.6	0.0	28.0	5.4	7.9	13.3	41.3
3	GULAOTHI	54	11.6	[illegible]	25	151.0	9.6	40.6	10.8	9.9	19.9	90.8	22.9	19.1	42.0	132.8
4	BULANDSHAHR	50.5	31	18.0	15	115.2	0.0	12.6	6.7	18.6	12.8	50.7	14.2	13.0	27.2	77.9
5	B.B. NAGAR	80.9	70.8	24.2	0.0	175.9	11.9	12.7	4.4	37.6	0.0	103.0	0.0	0.0	0.0	103.0
6	SIYANA	97.1	54.4	50.2	0.0	201.7	0.0	17.6	0.0	17.3	34.6	69.5	39.9	63.0	102.9	172.4
7	LAKHAOTI	48.6	25.1	23.0	20.1	116.7	0.0	16.2	17.2	7.9	0.0	41.3	0.0	0.0	0.0	41.3
8	SHIKARPUR	55.8	34.4	26.5	0.0	116.7	0.0	13.9	0.0	20.5	0.0	34.4	15.7	13.1	28.8	63.2
	T. BULANDSHAHR	60.2	58.4	25.9	15.0	139.5	2.6	18.2	11.3	17.9	9.0	59.0	13.7	14.2	27.9	86.9
9	JEWAR	46.8	31.4	24.2	0.0	102.4	5.9	6.3	13.6	18.8	12.5	57.1	0.0	0.0	0.0	57.1
10	KHURJA	46.8	16.0	12.3	16.2	91.3	12.1	19.5	6.9	6.4	0.0	44.9	14.6	12.2	26.8	71.7
11	ARNIYA	65.4	52.1	36.5	0.0	154.0	14.3	0.0	8.1	7.5	0.0	29.9	0.0	0.0	0.0	29.9
12	PAHASU	58.2	45.2	23.3	0.0	122.7	0.0	6.6	7.1	19.6	0.0	33.3	0.0	12.5	12.5	45.8
	T. KHURJA	52.2	33.5	24.1	4.1	115.9	7.8	8.4	9.0	13.3	3.3	41.8	3.8	6.3	10.1	51.9
13	UNCHAGAON	50.0	36.2	8.8	0.0	95.0	0.0	0.0	0.0	36.8	0.0	36.8	0.0	0.0	0.0	36.8
14	JAHANGIRABAD	47.0	34.0	7.5	0.0	88.5	0.0	0.0	7.9	0.0	23.3	31.2	0.0	14.8	14.8	46.6
15	ANUPSHAHR	58.2	28.4	18.8	16.3	121.7	6.1	0.0	0.0	12.9	0.0	19.0	14.8	12.3	27.1	46.1
16	DANPUR	58.7	29.6	15.2	0.0	103.5	0.0	7.9	17.0	23.6	15.6	64.1	0.0	0.0	0.0	64.1
17	DIBAI	54.8	52.8	67.8	17.7	193.1	6.6	7.1	15.2	49.1	0.0	78.0	14.8	13.4	28.2	106.2
	T. ANUPSHAHR	54.1	36.0	24.8	7.5	122.4	3.8	4.6	6.5	28.7	3.3	45.9	6.9	8.6	15.5	61.4
	DISTT. BULANDSHAHR	54.6	36.0	24.8	7.5	119.4	6.0	9.0	7.4	18.2	3.5	44.1	7.7	9.7	74.4	61.5

S NO.	BLOCK/TEHSIL	Communication Postal A.P.O.	Communication Postal P.T.O.	Communication Postal Ph.	Communication Postal SUB TOTAL	Communication Transport K.R.	Communication Transport P.R.	Communication Transport RLY.	Communication Transport SUB TOTAL	Communication TOTAL	Market W.M.	Market F.M.	Market R.M.	Market TOTAL
1	2	18	19	20	21	22	23	24	25	26	27	28	29	30
1	DANKAUR	15.6	6.1	8.5	30.2	106.6	17.2	19.0	142.8	173.0	16.0	20.9	23.8	60.7
2	SIKANDRABAD	35.0	13.7	9.7	58.4	48.3	65.9	48.1	160.3	218.7	13.4	16.3	5.3	35.0
	T. SIKANDRABAD	24.7	9.7	9.1	43.5	79.1	39.2	32.7	151.0	194.5	14.8	17.9	15.1	47.8
3	GULAOTHI	44.2	13.5	19.0	76.7	65.2	59.3	73.5	198.0	274.7	35.2	10.6	10.4	56.2
4	BULANDSHAHR	42.7	8.4	11.8	62.9	48.6	100.2	26.1	174.9	237.8	5.4	6.6	6.5	18.5
5	B.B. NAGAR	86.3	0.0	0.0	86.3	67.8	53.6	0.0	121.4	207.7	44.2	0.0	26.4	70.6
6	SIYANA	93.8	47.0	35.2	174.0	61.4	70.0	0.0	131.4	305.4	91.7	18.5	36.4	146.6
7	LAKHAOTI	35.2	10.5	0.0	45.7	62.4	66.2	0.0	128.6	174.3	28.1	0.0	8.3	36.4
8	SHIKARPUR	43.8	18.6	0.0	62.4	65.2	58.6	0.0	123.8	186.2	0.0	14.6	7.1	21.7
	T. BULANDSHAHR	51.4	14.1	11.4	76.9	60.7	70.5	17.2	148.4	225.3	25.0	[illegible]	12.5	45.5
9	JEWAR	30.8	17.0	13.1	60.9	51.4	37.2	0.0	88.6	149.5	16.5	33.5	19.7	69.7
10	KHURJA	57.8	8.7	12.2	58.7	45.4	51.7	101.0	198.1	256.8	5.6	27.4	13.4	46.4
11	ARNIYA	55.7	0.0	0.0	55.7	55.0	48.4	15.8	119.2	174.9	39.9	8.0	7.9	55.8
12	PAHASU	51.5	8.8	0.0	60.3	31.7	60.6	0.0	92.3	152.6	34.6	20.9	13.7	69.2
	T. KHURJA	27.0	9.0	9.4	45.4	45.6	35.4	29.7	110.7	156.1	25.5	23.0	14.0	60.5
13	UNCHAGAON	45.3	0.0	12.5	57.8	42.9	30.6	0.0	73.5	131.3	48.7	9.8	19.4	77.9
14	JAHANGIRABAD	41.9	10.5	14.8	67.2	60.7	35.0	0.0	95.7	162.9	20.5	8.3	22.5	51.3
15	ANUPSHAHR	38.2	8.8	12.3	59.3	37.4	41.5	0.0	78.9	138.2	39.9	27.7	13.6	81.2
16	DANPUR	42.5	0.0	0.0	42.5	55.7	38.0	57.8	151.5	194.0	34.6	0.0	8.2	42.8
17	DIBAI	61.7	19.0	13.4	84.1	39.2	91.6	22.1	152.9	237.0	43.3	57.4	29.5	110.2
	T. ANUPSHAHR	43.8	8.2	8.5	60.5	46.8	55.5	15.8	118.1	178.6	37.3	17.7	17.4	72.4
	DISTT. BULANDSHAHR	42.5	9.6	9.7	61.8	56.2	55.3	22.8	134.3	196.1	26.2	16.3	14.7	57.2

S NO.	BLOCK/TEHSIL	Agro-Economic Services Agricultural A.S.S.	C.S.S.	S.M.C.	V.H.	E.A.U.	Credit A.C.S.	N.A.C.S.	L.S.S.	BANK	TOTAL
1	2	31	32	33	34	35	36	37	38	39	40
1	DANKAUR	21.1	10.0	16.4	11.3	28.0	0.0	28.5	7.5	10.4	135.2
2	SIKANDRABAD	18.9	5.5	12.2	6.3	42.8	11.4	0.0	25.3	11.8	134.2
	T. SIKANDRABAD	20.1	7.9	14.4	9.0	35.0	5.3	15.0	15.9	11.1	133.7
3	GULAOTHI	27.9	22.0	24.0	25.0	29.6	22.4	0.0	66.4	23.1	240.4
4	BULANDSHAHR	23.1	13.7	7.4	7.7	36.8	13.9	39.3	0.0	14.3	156.2
5	B.B. NAGAR	35.0	27.6	15.1	31.5	64.0	0.0	0.0	41.7	0.0	214.9
6	SIYANA	48.5	19.1	41.7	21.7	57.4	0.0	0.0	0.0	0.0	188.6
7	LAKHAOTI	29.7	17.5	19.1	9.9	67.1	0.0	0.0	13.2	0.0	156.5
8	SHIKARPUR	25.5	7.5	16.5	8.6	70.0	15.4	0.0	22.8	15.8	182.1
	T. BULANDSHAHR	29.2	16.4	17.9	15.0	53.6	10.0	9.4	22.3	10.3	184.1
9	JEWAR	17.5	20.7	7.5	15.7	12.6	0.0	0.0	0.0	0.0	74.0
10	KHURJA	17.9	7.0	0.0	16.0	44.1	14.3	40.5	0.0	14.7	154.5
11	ARNIYA	28.2	16.6	9.0	18.9	17.9	0.0	0.0	0.0	0.0	90.6
12	PAHASU	18.3	7.2	15.7	8.2	44.3	14.7	0.0	0.0	15.2	123.6
	T. KHURJA	20.1	12.8	8.0	14.6	30.0	7.4	10.5	0.0	7.6	111.0
13	UNCHAGAON	25.7	20.3	22.2	11.5	53.5	0.0	0.0	30.6	0.0	163.8
14	JAHANGIRABAD	21.7	25.6	9.3	9.7	68.1	17.4	0.0	25.7	17.9	195.8
15	ANUPSHAHR	6.0	14.3	7.8	0.0	52.3	14.4	40.8	10.7	14.9	161.2
16	DANPUR	29.3	17.3	18.9	9.8	65.3	0.0	0.0	0.0	0.0	141.6
17	DIBAI	32.7	15.4	16.8	8.8	34.1	15.8	0.0	0.0	0.0	223.6
	T. ANUPSHAHR	22.5	18.3	14.5	7.6	54.2	10.1	9.4	12.5	10.4	159.5
	DISTT. BULANDSHAHR	23.4	14.5	13.8	11.7	44.4	8.5	10.5	12.7	9.8	149.3

S NO.	BLOCK/TEHSIL	Public Admn. S.T.S. N.P.C.	P.S.O.P.	Adminis. H. Qrs. B.H.Q.	P.H.Q.	T.H.Q.	D.H.Q.	TOTAL	L.T.A. Rel. TMP.	MSQ.	Recreation P.L.	R.R.	CIN.	TOTAL	All Facilities GRAND TOTAL
1	2	41	42	43	44	45	46	47	48	49	50	51	52	53	54
1	DANKAUR	25.3	7.5	7.1	9.6	0.0	0.0	48.5	87.8	28.1	0.0	0.0	0.0	95.9	629.5
2	SIKANDRABAD	45.5	8.4	8.0	10.2	24.7	0.0	116.8	52.2	26.2	15.1	0.0	32.1	132.6	794.0
	T. SIKANDRABAD	34.8	7.9	7.6	10.3	12.0	0.0	72.8	63.7	27.2	6.1	0.0	15.2	112.2	696.9
3	GULAOTHI	55.9	16.5	15.8	21.4	0.0	0.0	109.6	124.9	165.3	0.0	0.0	0.0	290.2	1254.9
4	BULANDSHAHR	48.6	10.2	9.8	13.3	32.0	84.0	197.9	20.6	25.6	19.6	31.8	39.1	136.7	940.2
5	B.B. NAGAR	49.1	0.0	19.9	0.0	0.0	0.0	69.0	41.6	12.9	0.0	0.0	0.0	54.5	895.6
6	SIYANA	77.6	28.8	27.6	37.3	0.0	0.0	161.3	28.8	35.8	0.0	0.0	0.0	64.6	1240.6
7	LAKHAOTI	44.5	13.2	12.6	0.0	0.0	0.0	70.3	52.9	24.7	0.0	0.0	0.0	77.6	673.1
8	SHIKARPUR	46.0	11.3	10.9	14.7	0.0	0.0	82.9	74.0	14.1	0.0	0.0	0.0	88.1	740.9
	T. BULANDSHAHR	50.9	12.4	14.1	12.9	7.6	20.2	117.4	57.0	43.1	4.6	7.6	9.9	122.9	922.1
9	JEWAR	38.6	10.3	9.9	13.4	0.0	0.0	72.2	0.0	0.0	0.0	0.0	0.0	00.0	524.9
10	KHURJA	39.4	10.6	10.1	13.7	32.9	0.0	105.7	15.9	13.2	20.1	32.7	40.2	122.1	848.5
11	ARNIYA	42.3	0.0	12.0	0.0	0.0	0.0	54.3	0.0	0.0	0.0	0.0	0.0	00.0	559.5
12	PAHASU	36.6	10.8	10.4	14.0	0.0	0.0	71.8	21.7	6.7	20.7	0.0	0.0	49.1	634.8
	T. KHURJA	39.1	8.3	10.5	10.6	8.5	0.0	77.0	9.6	5.1	10.4	8.5	10.4	44.0	616.4
13	UNCHAGAON	36.1	15.2	14.0	0.0	0.0	0.0	65.9	7.6	0.0	0.0	0.0	0.0	7.6	578.3
14	JAHANGIRABAD	30.3	12.9	12.3	0.0	0.0	0.0	55.8	12.8	7.9	24.4	30.3	0.0	75.4	675.4
15	ANUPSHAHR	32.6	10.7	10.2	13.8	33.2	0.0	100.5	26.9	6.6	26.3	35.0	0.0	86.8	735.7
16	DANPUR	35.2	0.0	12.5	0.0	0.0	0.0	47.7	13.0	0.0	0.0	0.0	0.0	13.0	606.7
17	DIBAI	57.4	23.3	11.1	15.1	0.0	0.0	109.4	23.3	7.2	0.0	0.0	0.0	30.5	1010.2
	T. ANUPSHAHR	55.1	12.5	12.0	6.4	7.6	0.0	71.6	17.5	4.6	14.2	15.4	0.0	51.7	717.6
	DISTT. BULANDSHAHR	40.0	10.5	11.4	10.0	8.5	86.0	86.0	34.9	19.7	9.3	8.5	7.8	80.2	749.7

* ABBREVIATIONS USED REFER TO THE TABLE NO. 5·01

APPENDIX - XIX

Number of Dependent Settlements (No. D.S), Area, Composite Score (C.S), C.S.per 100 Settlements (C.S./100s) and the Population of Hinterland, Zones of Bulandshahr Service Centre, 1971 Based on the (i) Non-Intact Range and (ii) Intact Range Methods

S.No.	Order of the Zone of Hinterland	Non-Intact Range Method (NIR)					Intact Range Method (IR)					Variation between both the Methods				
		No. of D.S.	Area in Acres	C.S.	C.S/100s	Population	No. of D.S.	Area in Acres	C.S.	C.S/100s	Population	No. of D.S.	Area in Acres	C.S.	C.S/100s	Population
1.	First Order	1385	1083588	10467.0	755.7	1877816	1385	1083588	10467	755.7	1877816					
2.	Second Order	337	246249	2671.1	792.6	517495	323	234146	2562	793.2	498634	14	-12103	-109.1	+0.6	-18861
3.	Third Order	171	105713	1500.7	877.6	229350	149	91692	1432	961.6	205106	22	-14021	-67.9	+84.0	-24244
4.	Fourth Order	128	71936	1070.6	836.4	208152	115	65687	1003	872.8	195930	13	-6249	-66.9	+36.4	-12222
5.	Fifth Order	108	59420	933.2	864.1	186930	74	41484	737	997.2	150161	34	-17936	-195.3	+133.1	-35769
6.	Sixth Order	24	11745	536.1	2233.7	89043	19	9194	517	272.1	83871	5	-2551	-18.9	+488.4	-5172

APPENDIX - XX

BULANDSHAHR DISTRICT : 1971

BLOCK-WISE DETERMINATION OF PRIORITY ORDERS TO PLAN FOR LOCATING NEW SOCIAL FACILITIES

Sl. No.	BLOCK	Block-wise Priority Orders of Planning for Social Facilities**								
		I	II	III	IV	V	VI	VII	VIII	IX
1.	Dankaur	PS, HSS, C, MCW*, HC, BPO, PR, ACS	FPC, PTO, Ph, Bnk	JHS, Rly, EAU	H,	WM, CSS,	ASS,	---	---	----
2.	Sikandrabad	MCW, HC*, RM, CSS,	C, VH, ACS	FPC, BPO, Ph, Bnk	HSS, WM,	Disp, ASS	KR,	SMC, EAU	PTO, FM	PS,
3.	Gulaothi	----	----	----	EAU	HC,	Disp, MCW, H, Rly, FM	PTO, RM,	Rly,	C,
4.	Bulandshahr	------	MCW, WM, FM, RM, SMC,	C, HC, PTO, VH, ACS	Ph, Bnk	H, Rly,	JHS, CSS, EAU	PS, HSS, KR,	FPC, ASS	H, BPO
5.	S.B. Nagar	C, Disp, HC, PTO, Ph, Rly, FM, ACS, Bnk	----	----	-----	----	----	Disp,	SMC	FPC, KR,
6.	Siyana	C*, Disp*, MCW, Rly, ACS*, Bnk*,	----	----	----	-----	----	---	H,	FM,
7.	Lukhaoti	Disp*, HC, Ph, Rly, FM, ACS, Bnk	JHS,	H,	BPO,	PS,	PTO, RM,	---	WM,	VH,
8.	Shikarpur	C, Disp, MCW*, HC*, Ph, Rly, VH	----	RM,	CSS,	VH	---	FM, ACS	C,	JHS, HSS, ASS, Bnk
9.	Jewar	C, Rly, EAU, ACS*, Bnk,	PS, Disp, HC, BPO, ASS	SMC,	FPC, PR	---	WM,	JHS, MCW	Ph, KR,	PTO,
10.	Khurja	JHS, H, HC*, SMC	PS, CSS,	MCW, WM ASS,	C, PTO, ACS,	HSS, BPO, Ph KR, Bnk,	----	----	Disp, PR, RM, EAU	Rly.,
11.	Araiya	C, FPC, HC, PTO, Ph, ACS, Bnk	H, Rly, EAU	FM,	RM,	MCW, SMC	---	PR,	----	Disp, KR, CSS,
12.	Pahasu	C, Disp, HC*, Ph, KR, Rly.	---	CSS,	MCW, ASS, VH	FPC, PTO	ACS	Bnk	PS,	WM, SMC, EAU
13.	Unchagaon	C, Disp, FPC*, MCW*, HC, PTO, Rly, ACS, Bnk	PR,	HSS,	KR,	FM,	PS,	Ph	----	----
14.	Jahangirabad	C*, Disp, MCW, HC*, Rly.	HSS,	PR,	PS, FM	---	PTO,	FPC, WM, ASS	JHS, BPO	ACS
15.	Anupshahr	FPC, MCW*, HC*, Rly, ASS, VH	KR,	JHS, Disp.	SMC	C, PTO, ACS	BPO, Ph., PR, SMC, Bnk	H, CSS, VH	HSS,	RM,
16.	Daupur	C, Disp, PTO, Ph, FM, ACS, Bnk	---	----	HC,	JHS, PR, RM	HSS,	FPC, BPO, Rly.	VH	MCW, Ph, WM,
17.	Dibai	HC, Bnk	---	KR,	Disp, Rly,	EAU	C, FPC, VH	---	MCW, CSS, ACS	----

* Facility likely to be most preferred for establishment in the block concerned in case of its bracketed priority order for more than one block.

** The abbreviations used for Social facilities refer to text-table No. 5.01.

APPENDIX - XXI

DISTRICT BULANDSHAHR : 1971

BLOCK-WISE LOCATION CODE NUMBERS (AS PER 1971 DISTRICT CENSUS HANDBOOK) OF SETTLEMENTS THAT REQUIRE ESTABLISHMENTS OF SOCIAL FACILITIES

Sl. No.	Facility	Block-wise Location Code Numbers of Settlements Requiring Facility establishment	Total
(A)	EDUCATIONAL :		
1.	Primary School	Dankaur - 247, 251, 258, 279, 288, 318; Sikandrabad - 331, 373, 375, 382, 390, 402; Gulaothi - 1, 3, 14, 137, 139, 148, 153, 155; Bulandshahr - 42, 45, 48, 51, 52, 61, 65, 68, 74, 79, 83, 87, 95, 96, 97, 102, 113, 114, 120, 123, 128, 129; B.B. Nagar - 163; Siyana - 207; Lakhaoti - 239, 258, 259, 270, 300, 311; Shikarpur - 345, 366, 374, 380, 381, 404; Jewar - 10, 44, 67, 75, 84, 102; Khurja - 157, 171, 183, 195; Arniya - 200, 206, 224, 234, 255; Pahasu - 273, 294, 324, 325, 340, 353, 365, 370, 372; Unchagaon - 40, 41, 47, 65, 71, 73, 75, 82, 85, 86; Jahangirabad - 18, 24, 104, 146; Anupshahr - 179, 195, 197, 202, 245; Danpur - 285, 311, 316, 318, 323, 329; Dibai - 358, 380	112
2.	Junior High School	B.B. Nagar - 181, 186; Siyana - 302, 216, 223, 228, 231; Jewar - 57, 26; Unchagaon - 35, 41, 46, 52; Danpur - 266, 270.	15

Appendix - XXI (Cent'd...)

3.	Higher Secondary School	B.B. Nagar - 172; Lakhaoti - 272; Unchagaon - 31.	3
4.	College	Siyana - 19/2/VII (Siyana town); Jahangirabad - 19/4/IV (Jahangirabad town)	2
(B)	HEALTH :		
5.	Dispensary	Siyana - 19/2/XII (Bugrasi town); Lakhaoti - 272; Jewar - 11	3
6.	Family Planning Centre	Gulaothi - 19/2/VIII (Gulaothi town); Siyana - 19/2/XII (Bugrasi town); Lakhaoti - 272; Shikarpur - 19/2/VI (Shikarpur town); Jewar - 11, 77; Unchagaon - 71; Anupshahr - 19/4/IX (Anupshahr town)	8
7.	Maternity & Child Welfare Centre	Dankaur - 19/1/XI (Dankaur town); Sikandrabad - 19/1/III (Sikandrabad town); Gulaothi - 19/2/VIII; Bulandshahr - 19/2/I (Bulandshahr town); Siyana - 19/2/XII; 19/2/VII; Shikarpur - 19/2/VI; Jewar - 11; Khurja - 19/3/II (Khurja town); Pahasu - 19/3/XIII (Pahasu town); Unchagaon - 71; Jahangirabad - 19/4/IV; Anppshahr - 19/4/IX; Dibai- 19/4/V (Dibai town)	14

Appendix - XXI (Cont'd....)

8.	Hospital	Siyana - 19/2/XII; Lakhaoti - 272; Jewar - 11	3
9.	Health Centre	Sikandrabad - 19/1/III; Gulaothi - 19/2/VIII; Siyana - 19/2/VII; Shikarpur - 19/2/VI; Jewar - 11; Khurja - 19/3/II; Pahasu - 19/3/XIII; Jahangirabad - 19/4/IV; Anupshahr - 19/4/IX; Dibai - 19/4/V	10
(c)	COMMUNICATION :		
10.	Branch Post Office	Dankaur - 258, 286; Sikandrabad - 111, 402; B.B. Nagar - 162, 186; Siyana - 210, 223; Lakhaoti - 265; Jewar - 26, 57; Pahasu - 300; Unchagaon - 41.	13
11.	Unmetalled (kachcha) Road	Siyana - 217; Jewar - 6, 21, 25, 53, 65, 74, 75, 76; Khurja - 110, 112, 116, 117, 150; Arniya - 222, 224, 283, 284, 287; Pahasu - 273, 274, 309, 324, 325, 343, 353, 372; Unchagaon - 32, 35, 37, 40, 41, 44, 47, 51, 53, 63, 65, 71, 72, 75, 84, 87, 96; Jahangirabad - 2, 99, 102, 104; Anupshahr - 156, 164, 168, 176, 179, 197, 200, 202, 209, 213, 235, 236, 240; Dibai - 389.	62

Appendix - XXI (Cont'd...)

12.	Metalled (Pucca) Road	Dankaur - 220, 234, 238, 255, 256, 286, 290, 291, 297, 313; Sikandrabad -339, 342, 367, 373, 388, 401, 407, 408, 411, 417, 424, 429, 433, 437; Gulaothi - 6, 10, 11, 17, 35, 138, 144, 147, 149, 153, 154; Bulandshahr - 87, 90, 95, 100, 122, 131, 132, 134; B.B. Nagar - 161, 162, 167, 173, 177, 181, 186, 192, 194, 196, 198, 251, 252, 253; Siyana - 199, 202, 209, 210, 212, 214, 215, 216, 220, 222, 225, 231, 232; Lakhaoli - 242, 252, 253, 256, 257, 258, 289, 315; Shikarpur - 316, 332, 338, 348, 350, 368, 369, 393, 396, 402, 404, 405; Jewar - 6, 7, 8, 10, 15, 21, 25, 26, 27, 53, 57, 59, 67, 71, 74, 75, 82, 83, 97, 101; Khurja - 110, 112, 116, 117, 126, 150, 178; Arniya - 201, 202, 203, 213, 224, 251, 260, 261, 267, 269, 271; Pahasu - 273, 274, 292, 294, 300, 309, 319, 329, 340, 343, 364, 370, 372; Unchagaon - 31, 32, 35, 37, 38, 39, 40, 41, 44, 46, 47, 51, 53, 58, 63, 69, 75, 82, 84, 89, 96; Jahangirabad - 2, 6, 12, 26, 99, 102, 113, 118, 130, 132, 139, 219; Anupshahr - 150, 152, 156, 164, 168, 176, 179, 180, 200, 223, 235, 236, 237, 240, 241, 242, 244, 247; Danpur - 257, 259, 261, 263, 267, 282, 285, 293, 297, 303, 320; Dibai - 333, 334, 394, 398, 412, 418, 211

Appendix - XXI (Cont'd...)

13.	Railway	Dankaur - 19/1/XI; Sikandrabad - 19/1/III; B.B. Nagar - 195, 172; Siyana - 19/2/VII, 19/2/XII; Lakhaoti - 272; Shikarpur - 19/2/VI; Jewar - 11, 51, 77; Pahasu - 19/3/XIII; Unchagaon - 31; Jahangirabad - 19/4/IV; Anupshahr - 19/4/IX; Dibai - 19/4/V.	16

(D) Market :

14.	Weekly Market	Dankaur - 19/1/XI; Gulaothi - 30, 19/2/VIII; Bulandshahr - 19/2/I; B.B. Nagar - 172; Siyana - 19/2/VII, 19/2/XII; Shikarpur - 19/2/VI; Jewar - 51; Dibai - 362.	10
15.	Fair-Market	Siyana - 19/2/XII; Jewar - 11; Pahasu - 19/3/XIII; Unchagaon - 31	4
16.	Regulated Market	Jewar - 11; Unchagaon - 31	2

(E) AGRO-ECONOMIC :

17.	Agricultural Seed Store	Sikandrabad - 367; B.B. Nagar - 195; 202.	3
18.	Cooperative Seed Store	Sikandrabad - 19/1/III; Siyana - 19/2/XII; Shikarpur - 19/2/VI; Jewar - 51; Khurja - 19/3/II; Unchagaon - 31; Anupshahr - 19/4/IX.	8

Appendix - XXI (Cont'd...)

19.	Veterinary Hospital	Siyana - 19/2/XII; Lakhaoti - 272; Jewar - 11.	3
20.	Agricultural Credit Society	Siyana - 19/2/VII; Jewar - 51	2
21.	Large scale Service Society	Bulandshahr - 19/2/I; Siyana - 19/2/VII; Shikarpur - 19/2/VI; Jewar - 11; Khurja - 19/3/II; Anupshahr - 19/4/IX; Dibai - 19/4/V.	7
22.	Bank	Siyana - 19/2/VII	1
23.	Electricity for Agricultural usage	Dankaur - 158, 176, 178, 179, 219, 220, 221, 224, 234, 238, 240, 241, 242, 247, 248, 249, 254, 255, 261, 275, 282, 283, 284, 286, 287, 288, 289, 290, 291, 306; Sikandrabad - 362, 366, 367, 373, 375, 376, 383, 389, 390, 391, 394, 411, 416, 436, 437, 444; Gulaothi - 3, 4, 5, 6, 7, 8, 9, 10, 11, 14, 15, 16, 17, 18, 20, 21, 23, 26, 28, 33, 35, 37, 40, 147; Bulandshahr - 42, 43, 44, 49, 51, 55, 56, 57, 59, 61, 62, 65, 66, 67, 68, 70, 71, 78, 79, 80, 81, 82, 83, 84, 86, 87, 88, 91, 93, 95, 96, 97, 98, 99, 100, 113, 129; B.B. Nagar - 175,	

Appendix - XXI (Cont'd...)

185, 190; Siyana - 204, 210, 211, 212, 214, 223; Lakhaoti - 244; Shikarpur - 366; Jewar - 6, 7, 8, 10, 21, 26, 27, 28, 29, 30, 31, 34, 35, 44, 47, 49, 53, 57, 58, 61, 63, 64, 65, 67, 69, 70, 71, 73, 74, 75, 82, 84, 87, 88, 90, 92, 95, 97, 102, 103, 106; Khurja - 117, 132, 136, 143, 154, 157, 161, 164, 165, 167, 168, 169, 170, 171, 172, 191, 195, 196, 198; Arniya - 203, 206, 210, 213, 218, 219, 220, 221, 222, 224, 229, 234, 236, 244, 251, 254, 255, 256, 260, 261, 264, 269, 283, 287, 288; Pahasu - 280, 292, 294, 300, 302, 303, 304, 356, 357, 359, 360, 362, 363, 364, 365, 367, 370, 371, 372; Unchagaon - 37, 39, 40, 47, 71, 72, 84, 85, 86, 88; Anupshahr - 150, 156, 176, 177, 178, 179, 193, 194, 197, 199, 208, 212, 213, 214, 216, 217; Danpur - 318, 327, 328; Dibai - 342, 349, 350, 357, 358, 359, 366, 367, 375, 376, 378, 380, 382, 385, 388, 398, 399, 404, 411, 412, 418, 419, 421. 279

(F) PUBLIC ADMINISTRATION :

24.	Nyay-Panchayat Centre	Dankaur - 246, 319 (but both these are town areas); Sikandrabad - 402; B.B. Nagar - 181, 184 (T.A.); 196; Siyana - 210, 228; Lakhaoti - 265, 315; Shikarpur - 401; Jewar - 11 (T.A.), 51 (T.A.), 57; Unchagaon - 35, 38, 46, 80; Jahangirabad - 220; Anupshahr - 241; Danpur - 270, 281; Dibai - 334, 362, 370, 392. 26

Appendix - XXI (Cont'd...)

25.	Police Station	Jewar - 11	1
26.	Block H. Qrs.	Jewar - 11	1
27.	Pargana H. Qrs.	Gulaoth - 19/2/VIII; Jahangirabad - 19/4/IV.	2#

(G) LEISURE TIME AMENITIES

28.	Temple	B.B. Nagar - 182; Siyana - 202; Jahangirabad - 2, 219; Danpur - 271; Dibai - 411, 362	7
29.	Mosque	B.B. Nagar - 172, 195; Dibai - 411.	3

Appendix XXII

Results of the Best Fit Equation of Multiple Regression

$$Y = a + b_1 X_1 + b_2 X_2 + b_7 X_7 + e$$

	X_1	X_2	X_7
Regression coefficient	0.002*	0.007*	0.301*
Standard Error	0.0002	0.00024	0.043
T Values	9.141	28.147	7.006

Intercept = -4.04296

e = Error Term

Standard Error of Estimate = 21.966

Coefficient of Determination $(R)^2 = (.7739509)^{2**} = .599$

Total Variance Explained $R^2 \times 100$ = 59.9 per cent

F - value for Analysis of variance = 689.081

X_1 = Size of Settlement (Persons)

X_2 = Density of Population (Persons/sq. km.)

X_3 = Percentage of non-primary work force to total work force

* Significant at 1 per cent level

** Significant at 2 per cent level