STATISTICAL ASSESSMENT OF REGIONAL IMPARITIES IN THE DEVELOPMENT OF UTTAR PRADESH

THESIS

SUBMITTED TO

BABASAHEB BHIMRAO AMBEDKAR UNIVERSITY
(A CENTRAL UNIVERSITY)
LUCKNOW

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Enrolment No. - 723/18

Under the joint supervision of

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Dedicated

To

My Beloved Parents

DECLARATION

I, **Vishwajeet Singh**, Enrolment No. 723/18, hereby declare that the work which is being presented in the thesis entitled **"Statistical Assessment of Regional Imparities in the Development of Uttar Pradesh"** in fulfillment of the requirements for the award of the degree of Doctor of Philosophy and submitted in the Department of Statistics, Babasaheb Bhimrao Ambedkar University (A Central University), Lucknow (U.P.), India, is an authentic record of my own work carried out during the research period under the joint supervision of Dr. Subhash Kumar Yadav, Associate Professor and Prof. Madhulika Dube, Professor, Department of Statistics, School of Physical & Decision Sciences, Babasaheb Bhimrao Ambedkar University (A Central University), Lucknow (U.P.), India.

The matter presented in this thesis has not been submitted by me for the award of any other degree or diploma to this or any other Institute. I also declare that the thesis is essentially free from all kinds of plagiarism.

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CERTIFICATE

This is to certify that the thesis titled **"Statistical Assessment of Regional Imparities in the Development of Uttar Pradesh"** submitted by **Mr. Vishwajeet Singh** is an original research work and has not been previously submitted in part or full for the award of any other degree or diploma to this or any other university.

The thesis submitted to Babasaheb Bhimrao Ambedkar University, Lucknow satisfies all the requirements as stipulated in the *Master of Philosophy (M. Phil.) / Doctor of Philosophy (Ph.D.) regulations* amended in *2017* and it is fit for submission and evaluation for the award of the degree of Doctor of Philosophy of the University.

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Head of the Department

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(Vishwajeet Singh)

LIST OF RESEARCH PAPERS

1. LIST OF PUBLISHED / COMMUNICATED PAPERS

1. Dube, M., Yadav, S. K. and Singh, V. (2020). Agricultural Development in Uttar Pradesh: A Statistical Evaluation. *International Journal of Agricultural and Statistical Sciences*. 16 (supplement), 1033–1040. Docid: https://connectjournals.com/03899.2020.16.1033

2. Dube, M., Singh, V. and Yadav, S. K. (2020). Assessment of the Regional Disparities in Development of Agricultural Sector in Uttar Pradesh: A Statistical Analysis. *International Journal of Agricultural and Statistical Sciences* . 16 (2), 617–624.
   Docid: https://connectjournals.com/03899.2020.16.167.

3. Dube, M., Singh, V. and Yadav, S. K. (2022). An Application of Multivariate Method for Evaluation of Regional Disparities in Infrastructural Development: A Case Study. *International Journal of Ecological Economics and Statistics*. 43 (1), 1–11.

4. Dube, M., Yadav, S. K. and Singh, V. (2022). Uncovering Regional Disparities in Infrastructural Development of Uttar Pradesh: An Exploratory Factor Analysis. *Journal of Reliability and Statistical Studies*. 15(1), 1-16. doi:10.13052/jrss0974-8024.1512

5. Dube, M., Singh, V. and Yadav, S. K.. Dynamics of Spatio–temporal Development in Uttar Pradesh. (Likely to be Communicated).

6. Dube, M., Singh, V. and Yadav, S. K.. Regional Disparities in Socio-economic Development of Uttar Pradesh: A Multivariate Analysis. (Likely to be Communicated).

2. LIST OF PAPERS PRESENTED IN CONFERENCE

1. Presented a paper entitled “Assessment of the Regional Disparities in Development of Agricultural Sector in Uttar Pradesh: A statistical Anaslysis” in the “24$^{\mathbf{th}}$International Conference of International Academy of Physical Sciences on Innovations in Physical Sciences” organized by Department of Statistics, CCS University, Meerut from August 09-11, 2019.

2. Presented a paper entitled “ Uncovering Regional Disparities in Infrastructural Development of Uttar Pradesh: A Multivariate Approach ” in the “International Conference on Recent Trends in Theoretical and Applied Statistics” sponsored by UGC and organized by Department of Statistics, Dibrugarh University, Assam from September 18-20, 2020.

3. Presented a paper entitled “Regional Disparities Evaluation of Infrastructural Development in Uttar Pradesh: A Statistical View” in the “1st International Conference , International Conference On Advances in Mathematics, Science and Technology (ICAMST-2020)” organized by department of Mathematics, Rajiv Gandhi University, Arunachal Pradesh from September 01-03, 2020.

LIST OF TABLES

LIST OF FIGURES

CONTENTS

Chapter 1

Introduction

1.1 Introduction

The notion of development refers to a multi-faceted, long-term continuous process that improves the quality of life of any region. Provision of accurate and substantial information about the developmental process of any region is indispensable for appropriately allocating funds and subsidies so that a uniform balanced development of the entire region is achieved. Owing to its qualitative nature, it becomes very difficult to exactly define and quantify "development". However, several ideas have been forwarded over the years to appropriately define and precisely measure it. In simple terms, various indicators pertaining to various dimensions contributing to the "development" are combined in such a way so as to get an index of development. Computation of such an index for different regions may be used as a yardstick for comparison of their development.

Generally, a region is considered to be developed if it is fares well economically. However, over the years, it has been emphasized emphatically that the developmental process of any region depends not only on economic but several non-economic factors as well. Also, the holistic development of any region is possible only when an ample growth in all the contributing dimensions of development is achieved. Thus, a comprehensive index of development should be based on a vari-

ety of indicators that pertain to region's agricultural, infrastructural, industrial and socioeconomic status. The concept of balanced development is used to achieve the harmonious and simultaneous growth of a region's agricultural, infrastructural, and socioeconomic sectors. Thus, several indicators that pertain to the development of agricultural, infrastructural, and socio-economic sectors such as food grain production, irrigation facilities, easy access to good quality health care and education facilities, position of females in the society, better transportation facilities, and optimal technology absorption in agricultural and industrial sectors all contribute significantly to the overall developmental endeavors.

It is important to point out that different parts of a regions have diverse demographic, historic, economic, socio-cultural, and environmental characteristics and hence cannot maintain the same momentum of development. Due to these inevitable differences, wide disparities in the development in different parts of the region are bound to occur. Such uneven regional development is the major cause of concern and hence, the efforts should be made to trace the extent of these regional disparities in terms of various infrastructural, industrial, agricultural, and socioeconomic parameters, so that to the administrators and policy makers can pay appropriate attention to less and least developed areas of the region.

Uttar Pradesh, India's "Hindi-Speaking Heartland," is one of the most populous states, located in the 'Indo-Gangetic' plain of northern India. Uttar Pradesh is bounded by Uttarakhand and Nepal in the north, Haryana in west, Rajasthan in south-west, Madhya Pradesh in south and Bihar in east. With reference to the diverse agro-climatic variations and soil conditions, the state is divided into four regions viz. Western region, Central region, Bundelkhand region and Eastern region. The state is predominately rural and agrarian. According to the 2011 census, Uttar Pradesh's total population is 19.98 crore, with a sex ratio of 912. The state accounts for 7.3 percent of the country's total territory, covering 2.41 lakh square kilometers, an average population density of

829 persons per square kilometer and a literacy rate of 67.68 percent, which is lower than the national average.

Uttar Pradesh may be considered as the country's agricultural powerhouse. The state's economy is heavily affected by agriculture, which provides a living for about 65 percent of the state's population. Since the late 1960s, the state has become a major producer of food grains such as rice, wheat, millets, gramme, barley, sugarcane, mustard, potato, lentil, and peas in the country. This achievement may be owed to the introduction of high-yielding wheat and rice seed varieties, increased fertilizer availability, and increased irrigation use. Sugarcane is the state's main commercial crop, which is primarily grown in the state's western and central belts. In addition to the food grains, UP is also a big producer of fruits and vegetables. Despite this, the condition of farmers in the state is not very good and the majority of farmers are having small and marginal land holdings. The pressure of population on land is quite heavy and per capita cultivated land is only about 0.13 hectares (Narain et al. 2001). The sad state of agricultural farmers in Uttar Pradesh requiring a conscientious effort.

The state of Uttar Pradesh is rated among the least developed states in terms of infrastructural development though it should be noted that not all its districts are least developed. Interestingly, if we look at the overall development, few districts in Uttar Pradesh stand among the highly developed in terms of infrastructure while few others in agriculture and socioeconomic development. Thus, the government requires a conscientious effort to evaluate and determine where one district stands in comparison to another in the state. In view of this, reckoning the assessment and quantification of the spatial and temporal development in various districts of the state of Uttar Pradesh is the need of the hour. Considering the above facts, the amount of development in various districts of the state of Uttar Pradesh have been assessed and quantified in the present study. In order to achieve this, an attempt has been made in the present work to construct a composite

index of development for all the seventy-five districts of Uttar Pradesh, taking into account various agricultural, infrastructural, and socioeconomic indicators over different time periods. The study also aims to provide an insight into the linkages between various sectors of development that may aid in the identification of potential variables generating regional imbalance in various districts of Uttar Pradesh state.

1.2 Review of Literature

Several studies have sought to measure and analyze regional development using empirical methods. Earlier attempts to quantify regional disparities relied solely on per capita income as an indicator of level of development. Later, development was viewed as a broad concept that encompassed changes in all aspects of human life, necessitating the adoption of complex procedures as well as the utilization of a huge number of indicators.

Earliest attempt in this direction were reported by Mc Granahan (1966) who studied 73 indicators including economic and social features and developed a composite index based on 18 core variables, including 9 social and 9 economic indicators, through a process of elimination. The analysis discovered that the indicators had a significant degree of inter-correlation. He also discovered that the resulting index had a strong relationship with GNP per capita.

Mc Granahan (1970) developed a weighted composite index of development to measure socio-economic development. Varying indicators were given different weights based on their relative importance. The relevance of an indicator was determined by its coefficient of correlation with other indicators. According to the research, the most heavily weighted indicator was the one that was most closely connected with the others and could best predict the others. A general index based on this weighing principle, on the other hand, would best correlate and forecast the scores

on the specific indicators.

For the examination of cultural variations in Israel, Lipshitz and Raveh (1994, 1998) advocated the use of a Co-plot methodology. In 1994, they looked at the socio-economic disparities between 40 Israeli cities using ten socio-economic factors, and in 1998, they looked at the socio-economic differences between 83 cities using five socio-economic factors.

Using "Covariance Structure Analysis" Cziraky et al. (2002a) proposed a multivariate statistical methodology for assessing regional development levels of 545 Croatian municipalities. Data on economic, structural, and demographic factors were employed in the investigation. To begin, the variables were empirically grouped using the principal component method of factor analysis. The implied structure of confirmatory factor analysis methods was then tested using the maximum likelihood technique. A recursive structural equation model was used to create a joint model that included all three dimensions (economic, structural, and demographic) and their covariances.

Soares et al. (2003) classified the level of socio-economic development in 275 Portuguese continental territories using a combination of factor and cluster analysis. Thirty-three indicators were included in the investigation, including demographic, economic, health, education, employment, and cultural development. The principal component method of factor analysis was used to identify nine factors (axes of socioeconomic factors). The territorial units were classified using factor scores. Ward's hierarchical technique was initially used to determine the number of municipal clusters. To fine-tune the outcomes of the best cluster solution generated by the hierarchical approach, a non-hierarchical (K-mean) cluster technique was applied, with the cluster centres of the best hierarchical solution as initial seed points.

The sensitivity and uncertainty of the development index were investigated by Perisic and Wagner (2015). This information is then used to develop relevant recommendations for future im-

provements. The methodology of the Croatian regional development index has been scrutinized, exposing multicollinearity issues and the presence of outliers. For weight selection, an empirical and significantly more objective multivariate methodology has been developed. Monte Carlo simulations and variance-based techniques were used to conduct the uncertainty and sensitivity analysis. An alternative confidence interval methodology was investigated instead of a single point estimate for the development level of territorial units.

Using classical and robust principal component analysis Bulut and Oner (2016) assessed the socioeconomic development of 26 Turkish development agencies. In this work, PCA based on classical and robust location and scatter estimators is employed first, and then the Robust method for Principal Component Analysis (ROBPCA) approach is utilized to investigate the socioeconomic growth of regions. In the literature, the robust estimators employed in the analysis are known as the minimum covariance determinant (MCDM) and S estimators.

Stamenkovic and Savic (2017) suggested a multivariate statistical methodology for assessing the economic development of Serbian districts and categorizing them into homogeneous groups using five economic variables. First, factor analysis was used to establish a new composite indicator for gauging economic development level (IED), and then the districts were categorized based on the IED values. The non-hierarchical clustering approach was used to assess the structural quality of the thus created groupings.

The impact of regional organizational environment assessed by regional development, on small and medium-sized firm's (SMEs) capital structure was investigated by Pietro et al. (2017). The conventional firm-factor determinants, as well as the firm's business sector, are also included. To this purpose, a sample of 6,560 Spanish enterprises from 2007 were examined, including all regions of Spain and all industries except the financial system.

Salvati et al. (2017) observed the regional differences in Italy in light of territorial changes caused by urbanization, industrial decentralization, agricultural intensification, and land abandonment by conducting an exploratory analysis of 133 indicators assessing seven thematic areas. According to the findings, latitude, elevation, and urban gradients in Italy have shaped a complicated spatial pattern in socioeconomic and environmental variables. The proposed technique provides an overall assessment of the intensity of regional disparities on a regional scale for each thematic domain, as well as intra-region spatial heterogeneity for each indicator, serving as a decision-making tool for policies aimed at achieving long-term, spatially balanced development.

In order to examine the development disparities in both spatial and temporal dimensions Rana et al. (2017) proposed a methodology to study the socioeconomic and infrastructure development disparities among five city districts in Pakistan's Punjab province. The data variables and time periods (2002, 2007, and 2012) were chosen to reflect the nearest actual situation based on the policy programmes implemented by the governments. Analyses indicated that disparities in development persisted, with the province capital (Lahore) remaining the most developed. The proposed method was found to be useful and robust enough to be applied in a different regional scenario.

Stanickova and Melecky (2018) presented an outline of a concept as well as a review of research papers on establishing territorial CIs, shedding light on some of the underlying features of regional resilience. The study presents an overview and comparison of regional resilience literature as well as empirical evidence of existing CIs, with the goal of quantifying the resilience of EU NUTS-2 areas by creating their own index. The development of CIs entails a number of procedures that must be completed, as well as the selection of appropriate procedures. The study also recommends that sub-indicator selection, normalization procedures, weighting schemes, and aggregation algorithms are crucial.

Hryhoruk et al. (2019) developed a method for analyzing economic progress that relies on a complete index, which is a convolution of original indicators. The model employs a set of absolute indicators as well as a set of relative measurements of dynamics. In each group of indicators, a unique data normalization and convolution approach were used to estimate a new partial comprehensive index. Weighted multiplicative convolution of partial comprehensive indexes yields the evaluation's result. The level of economic development of Ukraine's regions has been assessed based on 2017 statistics. The regions of Ukraine were divided into three categories: those with above-average economic development, those with average economic development, and those with below-average economic development.

For analyzing the level of rural development in Wuhan city, China, Jiang et al. (2020) established an index system that included rural settlement, land, industry, and human settlement environment. The study also investigates the geographic differentiation, correlation and categorizes the types of rural development using exploratory spatial data analysis, principal component analysis, and cluster analysis. The five categories of new urban areas were identified: ecological leisure, classical farming, sustainable development, industrial-and-agricultural mixed type, and industrial promotion type development.

In Indian perspective, an initial work was carried out by Mitra (1961). Using a large number of indicators, he divided 327 districts into four stages of development using a large number of metrics and a simple rating mechanism. The study also discovered a correlation between indicator variables and the level of progress. Pande Committee (1968), working on the initiative of the Planning Commission, proposed six criteria for identifying backward states: total per capita income, per capita income from industry and mining, number of workers in registered factories, per capita annual consumption of electricity, length of surfaced road in relation to population and area, and railway mileage in relation to population and area. Andhra Pradesh, Assam, Bihar, Hi-

machal Pradesh, Jammu and Kashmir, Madhya Pradesh, Nagaland, Orissa, Rajasthan, and Uttar Pradesh, as well as all union territories save Delhi, Chandigarh, and Pondicherry, were recognized as industrially backward states by the committee. On the basis of six parameters, the committee has categorized 238 districts in India as industrially backward.

Rao (1973) analyzed the economic disparities between Indian regions. Over the early 1950s and early 1960s, a composite index of development based on covariance in numerous measures of development was established for 14 important states in the country. The states were divided into three groups: the most developed, not so developed, and the least developed. A comparison of the early fifties and early sixties found that the groups contained roughly the same states, implying that regional imparities had not been addressed during the planning process.

Using census data from 1961 and 24 development factors, Dasgupta (1971) categorized the districts of 15 different Indian states. To begin, a smaller collection of variables was obtained by inspecting the correlation matrix and eliminating variables that were not significant from further research. Second, a principal component analysis was performed on this smaller set of variables as well as the original set, and the districts were divided into four development groups based on the principal component values.

Pal (1975) used principal component analysis to choose 17 variables at the district level. These factors were separated into four groupings, each of which was further separated into agricultural and non-agricultural sectors. The study quantifies the agricultural and non-agricultural labour productivities to the general labour productivities of Indian states in the respective sectors.

Sharma (1975) used 22 indices of economic development to look at the geographical inequality of several economic sectors in Rajasthan. The study found that during the 1960s, regional differences in each sector and the economy as a whole had greatly lessened.

Rao (1977) identified backward regions in India as well as patterns in regional imbalance. For the years 1961 to 1965, she used 24 variables from four distinct sectors — agriculture, industry, education, and banking – in 14 Indian states. The study found a general decrease in regional disparities in all sectors except agriculture, which was attributed to less developed states growing at a quicker rate than developed states.

Several papers dealt with various districts of a specific state, Iyengar et al. (1981) created a composite index of development in the form of a weighted average to measure the development of districts in Karnataka state, with weights that were inversely proportional to the coefficient of variation. In a multi-dimensional sense, the study found that economically weaker districts can grow quicker than high-income districts. Later Iyengar and Sudarshan (1982) showed how to classify regions based on multivariate data. The data was based on 21 development indices for 21 districts in Andhra Pradesh in 1978-79. On the basis of quantile categorization from an assumed Beta distribution of the mean of the composite indices, different districts were classified as highly developed, developed, developing, poorly developed, and very poorly developed. The Taxonomic technique was used by Rangacharyulu and Rao (1986) to calculate the basic village amenity index for 21 states of India. Farming, livestock farming, transportation, credit, potable water, education, power, healthcare, and marketing were among the 22 indicators included in the basic amenity index. The optimal graph was used to identify clusters made up of different states.

Bhargava (1987) studied inter-district variations in development levels in Rajasthan at two different time points viz. 1971 and 1981. The industrial sector's index of development was calculated using the principal component method of factor analysis, and these indices were then used to calculate the composite index of development.

Analyzing Principal Components Dadibhavi and Vaikunthe (1990) classified 17 major Indian

states into four groups based on the rural development infrastructure index for 1983-1984. For classification, the first principal component of the variables chosen was used. The study reveals that in rural areas, there are significant regional variations in the access to infrastructure services.

Goel and Haque (1990) looked at regional differences in infrastructure and crop production efficiency in various states of India. The disparities between states were examined using numerical taxonomic methodologies, as well as the feasibility of regrouping the states based on commonalities in numerous key resource inputs. On the basis of numerical indices produced by the analysis, twenty-two Indian states were grouped into 18 states groups with respect to 26 infrastructural and 13 other relevant production efficiency characteristics, forming two sets of parameters. After that, using Sneath and Sokal's weighted pair group approach (1973), the similarity indices were utilized to cluster the states into regions.

Goel and Vasisht (1992) attempted to separate out prominent discriminating agro-economic development variables accountable for the greatest variations between and among tribal areas in the country's north east hilly and plain regions. The research employed seven indices based on data on agro-economic development indicators for each of the eight centres from 1978 to 1986. The differences between pair of means (of respective centres) for those linear combinations of components that had highest variation between pairs of centres relative to the pooled variance within centres for the same linear combination were maximized using Generalized Mahalanobis D2 statistics (1936).

During April 1982, the Planning Commission of India and the State Planning Institute of Uttar Pradesh jointly conducted a symposium to draw scientists, economists, policymakers, and administrators' attention towards the challenge of quantification of development level. The Indian Agricultural Statistics Research Institute (IASRI) recognized the seriousness and importance of

the problem of estimating degree of development and performed a series of research studies in this area.

In a series of publications, Narain et al. (1991, 92, 93, 94, 95, 96, 99) critically reviewed data on socio-economic factors from 17 major states of India during the time periods 1971-72 and 1981-82 in various parts of the country. They also used a composite index based on the best combination of economic variables to rank the districts based on their economic development indices in Orissa, Kerala, Uttar Pradesh, Maharashtra, Andhra Pradesh, Karnataka, Tamil Nadu, and Madhya Pradesh.

For the year 1994-95, Narain et al. (1997, 2003) used a composite index based on thirty-nine economic indicators for district-wise and thirty-two indicators for taluka-wise to study the level of development of various districts and talukas in Karnataka. The study found that the districts of Balgaum, Bangalore, Chitradurga, Hassan, Kolar, Shimoga, Mandya, and Mysore were better developed than the other districts in the state in terms of overall socio-economic development.

Narain et al. (2001) worked on the level of agricultural growth in Uttar Pradesh in terms of rice and wheat productivity in all tehsils. Ranking of tehsils were performed using agricultural development composite indices, which revealed significant differences in rice and wheat production between them.

In Andhra Pradesh, Mallikarjun (2002) attempted to quantify regional differences at the sub-regional level. Three alternative techniques for constructing a composite index of development were employed, with fifty development indicators separated into nine sectors considered. Significant differences were measured using statistical approaches such as ANOVA and discriminant analysis between districts in each sub-region as well as across sub-regions in the state. It was observed that there were significant differences across districts in each sub region but intra-regional

differences were significant.

Rai and Bhatia (2004) investigated the level of development in Assam using a composite index based on the best combination of 48 development indicators in 2001 at district level. The level of development in the agricultural, industrial, and infrastructural sectors, as well as the overall economic sector, was estimated.

In Uttar Pradesh, Bhatia and Rai (2004) assessed agricultural development, infrastructure facilities, and general socioeconomic growth. Model blocks were determined for fixing up the prospective targets of different indicators for low developed blocks based on levels of development based on various socio-economic indicators. The study also assessed the level of development at the block level in terms of agricultural development, infrastructural, and overall socio-economic development.

For the nine Hilly states viz. Arunachal Pradesh, Assam, Himachal Pradesh, Jammu and Kashmir, Meghalaya, Mizoram, Nagaland, Sikkim, Tripura, and Uttarakhand the socio-economic development has been assessed by Narain et al. (2004). For the time-period 2000-2001, data on seventeen socioeconomic indicators for hilly states were used. In hilly areas, Mizoram was ranked first and Arunachal Pradesh was ranked lowest in terms of overall socio-economic development, but in Kerala, the district of Thrissur was ranked first and the district of Wayanad was ranked last.

Narain et al. (2005) determined the level of development of Kerala using a composite index based on the best possible combination of thirty-nine socio-economic variables. The level of development in the agricultural, industrial, and infrastructural sectors, as well as the overall socio-economic sector, were calculated independently. In terms of socio-economic development, the district of Thrissur was placed best, while the district of Wayanad was ranked bottom. Wide regional imparities were also observed in the level of development among different districts.

The role of economic and social infrastructure facilities in economic development across Indian states over the last quarter-century was investigated by Ghosh and De (2005). Using Principal component analysis, they developed indices for infrastructure services. The authors also investigated the level of infrastructural development for different time spans and using it constructed a comparative static framework for investigating the nature of the movement of the development trajectory in the income infrastructure plane over different time spans, a comparative static framework was constructed. The study's findings were statistically significant enough to justify new regional strategies within the context of globalization in order to address rising regional disparities in infrastructure and income.

From 1991 to 2005, Narain et al. (2007) conducted a statistical analysis of the socio-economic development of 282 districts in 14 Indian states. The study uses data based on various development indicators in the agriculture, infrastructure, and industrial sectors. For all of the states studied, districts in various stages of development, such as highly developed, moderately developed, and least developed, had been identified. They also investigated the relationship between the level of development in the agricultural sector and the overall socio-economic sector.

Nayak and Ray (2010) investigated the magnitude and challenges of imbalanced human development in Meghalaya using the Human development index. For this, some key economic and human development metrics were chosen. The study found considerable differences in human development across the state's seven districts, as well as discrepancies between rural and urban areas and male and female populations.

Narain et al. (2011) observed the level of development in various districts across West Bengal. The level of development for agricultural, infrastructural, and socioeconomic sectors was analyzed separately, and districts were classified into four categories: highly developed, high mid-

dle developed, low middle developed, and low developed. There were significant differences in the level of development throughout the state's districts. Important indicators potential targets have been estimated for low developed districts.

Using structural equation modelling with latent variables and a composite index of development on 36 development indicators of various tehsils and districts in Haryana, Sheoran et al. (2012) investigated the level of development of agricultural, infrastructural, socio-economic sectors. For the agricultural sector, structural equation models were developed using the maximum likelihood methodology, using five latent factors. For the goal of studying levels of development, scores for latent variables from the best-fitted model were produced, and K-means cluster analysis was performed.

Pietro et al. (2017) investigated the impact of regional organizational environment, as assessed by regional development, on small and medium-sized firm's (SMEs) capital structure. The conventional firm-factor determinants, as well as the firm's business sector, are also included. To this purpose, a sample of 6,560 Spanish enterprises from 2007 were examined, including all regions of Spain and all industries except the financial system.

Zali et al. (2013) investigated the development discrepancies in the region of East Azerbaijan. In this study, 44 indicators were chosen for comparison between counties, and the areas were ranked using Numeric Taxonomic and Cluster Analysis methodologies. Filly, the study discusses the counties' investment priorities in order to attain social justice. According to the findings of this study, the province's west part is prosperous, while the east has a low level of development.

Using "Wroclaw Taxonomic methodology" Ohlan (2013) examined the pattern of disparities in socio-economic development at the district level in India, based on the optimal combination of selected socio-economic development indicators. To obtain a clear picture of regional socioeco-

nomic imparity, the level of development for agriculture, industry, and infrastructure is examined independently, and districts are categorized into four development groups based on the values of the constructed development indices. Model districts for disadvantaged areas have been defined, and possible targets for various social facilities have been estimated, in order to achieve uniform regional development and improve quality of life. A comparison of the levels of socio-economic development in various regions of India has also been attempted in the study.

Dube et al. (2014) build a composite index of agricultural development based on information from thirteen development indicators for three different periods (1991-92(I), 2001-02(II), and 2008-09(III) in seventeen major States of the country. States were divided into five groups, ranging from the most developed to the most backward. There were significant variations in the level of development among the states. With the aim to achieve uniform regional development, potential targets of developmental indicators were also estimated for backward/very backward States in order to achieve uniform regional development.

Chotia and Rao (2014) examined the interconnections between regional infrastructural imparities, economic development, and poverty in 21 important states of India. Using the Principal Component Analysis methodology, each Indian state's Composite Infrastructure Index (CII) is calculated. The estimated CII is used to rank states in order to analyze regional infrastructure differences.

Jena (2014) investigated the status of agricultural development in Odisha by 2010. According to the conclusions of the study, 7 of Odisha's 30 districts are classified as backward, indicating that the state's agricultural development levels are highly disparate across the state. The study reveals that agricultural development is highest in Kendrapara and lowest in Jharsuguda districts.

Using "Principal component Analysis" in Uttar Pradesh Tanwar et al. (2016) assessed the

recent dynamics of development of districts in Eastern Uttar Pradesh in three dimensions: agriculture, social, and infrastructure. The research finds significant differences in the socio-economic development of districts in Eastern Uttar Pradesh. Individual indicators should be assessed to bring them up to level with their values in developed districts, according to the research, in order to achieve uniform development across Eastern Uttar Pradesh.

Shee and Maiti (2017) used CI to compare the level of agricultural development between project and non-project areas of JSW Bengal Steel Ltd. in the Sundra Basin of the Salboni block in West Bengal. The level of development is examined separately for the agricultural sector, infrastructural sector, and socioeconomic sector utilizing Composite indices of development in order to gain a comprehensive picture of regional disparities (CI). The study reveals that after land acquisition, there is a significant decline in the amount of agricultural development in the project regions.

1.3 Proposed Work

It has been the continuous endeavor of governments and planners to measure the level of development in different districts of Uttar Pradesh in order to identify where a given district stands in relation to others. So, the present study is an attempt to construct the composite indices of development of different districts of Uttar Pradesh. In order to capture the development differentials in different districts of Uttar Pradesh over time, the methods of composite indices given by Narain et al. (1991) have been utilized. Based on the levels of development, various districts of Uttar Pradesh have been classified into: highly developed, developed, developing, less developed, and least developed areas. In the present study, Potential targets for less and least developed districts have been estimated which is indeed quintessential for future planning. In the last chapter, we have

proposed an 'Exploratory Factor Analytic Model (EFA)' using Principal Component Analysis to uncover the principal factors or dimensions responsible for the disparities in development for each sector.

The developmental disparities of the Uttar Pradesh, with its large size, diverse structure, and socio-cultural and environmental disparities, are better understood and interpreted when studied at the regional level. To compute and analyze changes over time, the time period under consideration is divided into three sub-periods: Period I (2000-01), Period II (2010-11), and Period III (2017-18).

Chapters II to V of the present study are devoted to estimating the differences in the levels of development over time in all seventy-five districts of the Uttar Pradesh state in various sectors such as agriculture, infrastructure, socioeconomic development, and overall development. Chapter VI is devoted to quantifying the principal dimensions or latent constructs of agricultural, infrastructural, and socioeconomic characteristics, as well as homogeneous grouping of all seventy-five districts of Uttar Pradesh into a few clusters in terms of different levels of development, using multivariate statistical methods such as Exploratory Factor Analysis (EFA) and Cluster Analysis.

In Chapters II to V, districts were used as the unit of analysis, and data for different districts of Uttar Pradesh throughout various time periods on sixty-five indicators were used. Out of the total sixty-five indicators, twenty-two are directly concerned with agricultural development, twenty-two indicators depict the progress of development in the infrastructure & service sector and the rest twenty-one indicators present the level of development in socio-economic sector. The sixty-five indicators taken together represent overall development. Indicators common to all the districts have been used in the analysis.

1.4 Methodology

In order to compute and analyze regional development disparities in different sectors of economy viz agriculture, infrastructure and socio-economic sectors, the data on all the seventy-five districts of Uttar Pradesh on sixty-five indicators have been utilized for three time periods i.e., Period I (2000-01), Period II (2010-11) and Period III (2017-18). The sector wise sixty-five indicator variables are listed below:

Agriculture:

1. Percentage of gross irrigated area to gross area sown
2. Percentage of net area sown to cultivated land
3. Percentage of cultivable land to total reporting area
4. Productivity of total food grains (Quintals/ Hectare)
5. Percentage of net irrigated area by canal to total net irrigated area
6. Percentage of net irrigated area by government tube wells to total net irrigated area
7. Cropping intensity
8. Distribution of Nitrogen per hectare of gross area sown (Kg.)
9. Number of regulated mandis per lakh hectare of net area sown
10. Availability of gross area sown per Tractor (Hectare)
11. Productivity of Wheat (Quintals/Hectare)
12. Productivity of Rice (Quintals/Hectare)

13. Productivity of Oilseeds (Quintals/Hectare)

14. Productivity of Sugarcane (Quintals/Hectare)

15. Per capita production of food grains (Kg.)

16. Per capita production of Pulses (Kg.)

17. Percentage of area under commercial crops to gross sown area

18. Production of Fish in departmental area of Fisheries (Kg.)

19. Per Capita Milk availability (Kg.)

20. Percentage share of area under Kharif crops

21. Percentage share of area under Rabi crops

22. Distribution of Phosphate per hectare of gross area sown (Kg.)

Infrastructure:

1. Number of hospitals/dispensaries per lakh of population.

2. Number of beds per lakh of Population.

3. Number of Veterinary hospitals per lakh of population.

4. Number of Higher Senior schools per lakh of population.

5. Number of Polytechnic's per lakh of population.

6. Number of villages with distance 5 km. or more from Railway Stations/Halts.

7. Number of villages with distance 5 km. or more from Bus stations/Stops.

8. Total length of Pucca roads per thousand square km.

9. Per capita electricity consumption (KWH.).

10. Percentage of electricity consumption in industry to total consumption.

11. Percentage of electrified villages to total inhibited villages.

12. Number of L.P.G. consumers per lakh of population.

13. No. of post offices per lakh of population.

14. A.I. centers/subcenters per lakh of population.

15. Number of villages with distance 5 km. or more from Industrial/Grameen/Co-operative banks.

16. Number of villages with distance 5 km. or more from Co-operative Milk collection centers.

17. Number of industrial areas per lakh of population.

18. Number of small-scale industries per lakh of population.

19. Number of registered working factories per lakh of population.

20. Number of scheduled commercial banks per lakh of population.

21. Livestock development centres per lakh of population.

22. No. of primary agricultural credit societies per lakh of rural population.

Socio-economic:

1. Infant Mortality Rate (per thousand).

2. Child Mortality Rate (per thousand).

3. Sex Ratio.

4. No. of Family Welfare Centres.

5. Percentage decennial growth of population.

6. Population density (per Sq. Km.).

7. Percentage of urban population to total population (Urbanization).

8. Schedule caste as percentage of total schedule caste.

9. Livestock density.

10. Male Literacy Rate.

11. Female Literacy Rate.

12. SC literacy Rate.

13. Rural Literacy Rate.

14. Urban Literacy Rate.

15. Literacy gap between male & female.

16. Pupil teacher ratio at higher secondary schools.

17. No. of employees in registered working factories per lakh of population.

18. District wise employment in public sector.

19. Per Capita Credit (Rs.).

20. Per Capita Deposits (Rs.).

21. District wise police stations/police post.

The data required for the study on the above-mentioned development indicators have been drawn from 'District Wise Development Indicators of Uttar Pradesh' published annually by the Economics and Statistics Division, State Planning Institute, Planning Department (UPDES), Government of Uttar Pradesh.

1.4.1 Estimation of Composite Indices of Development

The statistical approach proposed by Narain et al. (1991) has been used to build composite indices of development for each district of Uttar Pradesh in each sector. They created a composite index while keeping the indicator's direction (sign) in mind, after observing that different indicators have varying impacts on the level of development. For example, it is hypothesized that a higher proportion of agricultural workers in the total labor force, a larger area covered per medical institution, a higher population density, a higher decennial growth rate of population, a higher infant mortality rate, and a higher number of persons per bank all contribute negatively to development, whereas higher values of other indicators contribute positively in the level of development.

Suppose there are n districts and p indicators are taken into account for a particular sector k then X_{ijk} $(i= 1,\ 2,\ \ldots.\ ,n\ ;\ j= 1,\ 2,\ \ldots,p$ and $\mathrm{k} = 1,\ 2,\ldots..\mathrm{m})$ is the value of j^{th} indicator for the i^{th} district, in the k^{th}sector. Since the developmental indicators in the analysis are measured in different units, our objective is to look at a single composite index relating to the dimension in question. As a result, standardization of the indicators is required. Let the standardized indicator for i^{th}district in the k^{th} sector be

$$Z_{ijk} = \frac{(X_{ijk} - \overline{X}_{jk})}{s_{jk}}; \quad i = 1,2.....n, \;\; j = 1,2,..... p \; and \; k = 1,2,...m \tag{1.4.1}$$

where,

$\overline{X}_{jk} = \sum_{i=1}^{n} \frac{X_{ijk}}{n}$ *and* $s_{jk}^2 = \sum_{i=1}^{n} \frac{\left(X_{ijk} - \overline{X}_{jk}\right)^2}{n}$ are the mean and the variance of j^{th} indicator in the k^{th}sector.

Let $\left[Z_{ijk}\right]$, for fixed *k,* denotes the matrix of standardized indicators in the k^{th} sector. This matrix has been used to identify the best district for each indicator, with the maximum/minimum standardized value depending on the direction of the indicator. This serves as the foundation for calculating the deviations in values for each district for all indicators in the k^{th} sector using

$$u_{ik} = \left[\sum_{j=1}^{l} \left(Z_{ijk} - Z_{0jk}\right)^2\right]^{1/2} \tag{1.4.2}$$

where Z_{0jk} is the standardized value of the j^{th} indicator of the best district in the k^{th}sector and u_{ik} is the root mean squared deviation from best district. This will depict the pattern of development of the i^{th} district in k^{th}sector. From this an average pattern of development and variation in the development are computed for various districts and for each sector have been obtained using the formula suggested by Narain *et al.* (1991)

$$C_{ik} = \frac{u_{ik}}{\overline{u}_k + 2s_k} \quad ; \; i = 1,2.....n \tag{1.4.3}$$

where, $\overline{u}_k = \frac{1}{n}\sum u_{ik}$ and $s_k^2 = \frac{1}{n}\sum_{i=1}^{n}\left(u_{ik} - \overline{u}_k\right)^2$. This composite index has a non-negative value that ranges between 0 and 1. The value of index closer to zero indicates the higher level of development while the value of index closer to 1 indicates otherwise.

1.4.2 Normalized and Weighted Mean Development Index

Let C_{ik} denote the value of the composite index for i^{th} district and k^{th} sector where $i = 1,2,\ldots,n$ & $k = 1,2,\ldots,m$. Following Iyengar and Sudarshan (1982), we define

$$Y_{ik} = \frac{C_{ik} - Min\ (C_{ik})}{Max\,(C_{ik}) - Min(C_{ik})} \tag{1.4.4}$$

where the maximum and minimum are taken over the districts. If, on the other hand, C_{ik} is negatively associated to development, as the composite indices derived in our case are, then the transformed variant Y_{ik} as defined below, is positively related to development and also lies between 0 and 1.

$$Y_{ik} = \frac{Max(C_{ik}) - C_{ik}}{Max\,(C_{ik}) - Min(C_{ik})} \tag{1.4.5}$$

Values of normalized composite indices also lie between 0 and 1 and increase or decrease in the direction of the development. These normalized indices are then used to categorize the districts into different stages of development. To obtain an overall view of development, the weighted mean of these normalized indices is calculated across all sectors. In the present case weighted mean of normalized indices of agricultural infrastructural and that of socio-economic indicators will be taken. For this purpose, a matrix of the transformed indices $Y = [Y_{ik}]$ is constructed. Using a weighted average, a measure for overall development level is now constructed, taking into account all of the sectors under consideration for the various districts.

$$\overline{Y}_i = \sum_{k=1}^{m} w_k Y_{ik} \tag{1.4.6}$$

where $w_k$are weights attached with the different sectors' indices and $0 \leq w_k \leq 1$ with $\sum_{k=1}^{m} w_k = 1$. In case when all sectors are considered equally important then $w_k = w,\ \forall\ k = 1,2\ldots,m$, i.e., all the weights are assumed to be equal. However, a more reasonable assumption would be that the

weights vary inversely as the variation in the respective sectors i.e., the weights are taken as

$$w_k = \frac{w}{\sqrt{Var(Y_{ik})}}\ ; \qquad w = \left[\sum_{k=1}^{m} \frac{1}{\sqrt{Var(Y_{ik})}}\right]^{-1} \tag{1.4.7}$$

1.4.3 Probability Distribution of Weighted Mean of the Indices and Classification of Districts

Several studies have been conducted to classify districts using a simple ranking of districts based on composite indices. For example, if thirty districts have to be categorized into five groups based on development, the first six occupying top ranks on the basis of composite index will be classified as "highly developed"; the next six as "developed"; next six as "developing" and so on. However, as proposed by Iyengar and Sudarshan (1982), a useful characterization of different stages of development would be in terms of appropriate quantile classification from an assumed distribution of the mean of the indices. For normalized indices $y_{ik};\ i = 1,2\ldots,n$ and $k = 1,2,\ldots,m$, the mean of indices is given by $\overline{Y}_k = \frac{1}{n}\sum_{i=1}^{n} y_{ik}$ for the k^{th} sector as the normalized indices lies between (0, 1), this index has Beta distribution of first kind. This distribution is often skewed and is relevant for characterizing the positive valued random variable lying within the interval (0,1). The distribution of $\overline{y}_k$ is, therefore, given by

$$f(\overline{y}_k) = \frac{1}{B(a,b)}\left(\overline{y}_k{}^{(a-1)}(1-\overline{y}_k)^{(b-1)}\right);\quad 0 \le \overline{y}_k \le 1\ ,\ a>0,\ b>0 \tag{1.4.8}$$

where *B (a, b)* is the beta function.

Based on the levels of development, let us divide the interval (0, 1) into five sub-intervals $\left(0,\ \overline{y}_k^{(1)}\right)$, $\left(\overline{y}_k^{(1)},\ \overline{y}_k^{(2)}\right)$, $\left(\overline{y}_k^{(2)},\ \overline{y}_k^{(3)}\right)$, $\left(\overline{y}_k^{(3)},\ \overline{y}_k^{(4)}\right)$ and $\left(\overline{y}_k^{(4)},\ 1\right)$ $;k = 1,2,\ldots.,l$. These subintervals are chosen in such a way that each interval has the same probability level to characterize the various stages of development. Following this approach, a district is categorized as:

Least developed if $0 < \overline{Y}_k < \overline{y}^{(1)}$

Less Developed if $\overline{y}_k^{(1)} < \overline{Y}_k < \overline{y}_k^{(2)}$

Developing if $\overline{y}_k^{(2)} < \overline{Y}_k < \overline{y}_k^{(3)}$

Developed if $\overline{y}_k^{(3)} < \overline{Y}_k < \overline{y}_k^{(4)}$; and

Highly developed if $\overline{y}_k^{(4)} < \overline{Y}_k < 1$.

The parameters a and b in the assumed Beta distribution can be obtained by solving the matrix equation $AP = B$;

Where,

$$A = \begin{bmatrix} 1-\overline{Y}_k & -\overline{Y}_k \\ \overline{Y}_k - \mathrm{m}_2 & -\mathrm{m}_2 \end{bmatrix} \ , \mathrm{P} \begin{bmatrix} a \\ b \end{bmatrix} \ , \text{and } \mathrm{B} = \begin{bmatrix} 0 \\ \mathrm{m}_2 - \overline{Y}_k \end{bmatrix} \tag{1.4.9}$$

where $\overline{Y}_k$ in the above matrix equation is the overall mean of the ith district indices for sector k and m_2 is given by $m_2 = s^2_{\overline{y}_k} + \overline{y}_k{}^2$ where $s^2_{\overline{y}_k}$ is the variance of ith district indices and the cut-off points $\overline{y}_k^{(1)}$ to $\overline{y}_k^{(4)}$ can be obtained from the tables of Incomplete Beta function or using the table of F-distribution with (2a, 2b) degrees of freedom described as:

If $F_{2a,2b,p}$ is the value of F-statistic with degrees of freedom (2a, 2b) corresponding to probability p, i.e., $\Pr\left(F \leq F_{2a,\ 2b,\ p}\right) = p$, then

$$F_{2a,\ 2b,p} = \frac{2b}{2a} \frac{1 - z_p}{z_p}$$

Where z_p is the p^{th} fractile of the corresponding Beta distribution and is given a

$$z_p = \frac{1}{1 + \frac{b}{a} F_{2a,\ 2b,p}} \tag{1.4.10}$$

After calculating the cut-off points $(z_1\ to\ z_4)$, we opt the following criterion for classificatory purpose as

Least developed if $0 < \overline{Y}_k < z_1$

Less Developed if $z_1 < \overline{Y}_k < z_2$

Developing if $z_2 < \overline{Y}_k < z_3$

Developed if $z_3 < \overline{Y}_k < z_4$ and

Highly developed if $z_4 < \overline{Y}_k < 1$

1.4.4 Identification of Model Districts for Fixation of Potential Targets

One of the most essential aspects of this study is determining the model states/districts for less and least developed districts so that planners and policymakers may devote appropriate attention to these districts while keeping the model districts in mind. This is accomplished by utilizing the standardized variates Z_{ijk} specified in 1.4.1. Using it, the distance between i^{th} *and* p^{th} state for k^{th} sector is given by

$$d_{ipk} = \left[\sum_{j=1}^{k} \left(Z_{ijk} - Z_{pjk}\right)^2\right]^{1/2} ; \quad \forall\, i \neq p \quad and \quad i, p = 1, 2 \ldots\ldots n \tag{1.4.11}$$

Clearly for fixed k $d_{iik} = 0,$ and $d_{ipk} = d_{pik}$, $\forall\, i \neq p$. These distances for particular sector are arranged in a matrix called the distance matrix D which is constructed as follows

$$D = \begin{pmatrix} 0 & d_{12} & \cdots & d_{1n} \\ d_{21} & 0 & \cdots & d_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ d_{n1} & d_{n2} & \cdots & 0 \end{pmatrix} \tag{1.4.12}$$

From the distance matrix *D,* the minimum distance for each row say $d_{(i)}$ $; i = 1, 2, \ldots n$ is obtained where $d_{(i)} = \min\left(d_{(i1)},\, d_{(i2)}, \ldots, d_{(in)}\right) ; \quad i = 1, 2, \ldots n.$

With the help of these $d'_{(i)}s$ we find average minimum distance and their standard deviations

as follows

$$\overline{d} = \frac{1}{n}\sum_{i=1}^{n} d_{(i)} \quad \text{and} \quad s_d = \frac{1}{n}\sum_{i=1}^{n} (d_{(i)} - \overline{d}\,)^2 \tag{1.4.13}$$

Using these, the critical distances may be computed as

$$C.D. = \overline{d} + s_d \tag{1.4.14}$$

which provides the upper and lower limits for identifying model states. This critical distance serves as measure to identify model states falling within Mean $\pm$ S. D. of distances will serve as model states/districts for less and least developed states. Identification of model states helps in fixing.

For determining potential targets, for a specific less/least developed district, the average value of the indicator of 'model' districts will be referred to as potential target for district for a given indicator, and this process is done for each indicator separately.

1.4.5 Changes in Development Pattern Over Different Periods of Time

In order to examine the statistical significance of changes in the level of development over three different time periods with respect to agriculture, infrastructure, socio-economic and overall development the Kruskal-Wallis test has been applied. In order to test the null hypothesis that there is no significant change in the development of various sectors over three different period of time the "Kruskal-Wallis" test statistic H is given as:

$$H = \frac{12}{n(n+1)}\sum_{j=1}^{k}\frac{R_j^2}{n_j} - 3(n+1) \tag{1.4.15}$$

Here, n_j denotes the total number of districts over the j^{th} period of time, k is the number of periods and R_j^2 denotes the square of the sum of ranks of j^{th} period for all the districts and $n = \sum_{j=1}^{k} n_j$.

1.4.6 Inter Relationship between Various Sector of Development

In order to enhance the quality of life of people in any district or region, it is quite essential and important that different sectors of the economy should flourish together and their relative impact on development should be in positive direction, Thus, to assess the overall development level over different periods of time it is necessary to examine the extent of relationship among all the sectors of development. To, achieve this, pairwise Spearman's rank correlation coefficient has been calculated between agricultural, infrastructural, socio-economic and overall development of Uttar Pradesh over three different periods of time and their statistical significance has also been checked

Chapter 2

Regional Disparities in Agricultural Sector in Uttar Pradesh

2.1 Introduction

A balanced regional development is of paramount importance for the harmonious and concurrent growth of a state. It indicates the utilization of development potential of all areas as per its capacity so that the benefit of overall economic growth is reaped by the inhabitants of all the regions of a state. As per census 2011, 77.73 percent of the population of UP resides in rural areas and agriculture is the foremost means of livelihood. Blessedly located in the Gangetic plains, Uttar Pradesh grows a large variety of crops owing to its wide agroclimatic variability. Since independence agricultural development of the state has always remained a cherished goal by the government and policymakers. Though the Green Revolution helped to drastically improve the agricultural sector, disparities in agricultural development are the outcome of lopsided regional development owing to several factors related to the demographic, historic, economic, socio-cultural, and environmental characteristics. Undoubtedly, the emphasis of government should be an answering reduction in regional disparity in the pace of development in every district of the state. This is, what has impelled us to carry out work to evaluate spatiotemporal disparities in agricultural development in

the state of Uttar Pradesh.

The estimation of the regional disparities of any state is a complicated procedure and cannot be easily understood by a single indicator. In view of this, Iyenger and Sudershan (1982) proposed a methodology to compute a composite index for measuring the spatial differentials in the level of development. Later, Narain et al. (1991) developed a methodology for the estimation of the Composite Development Index. Since then, several studies have been conducted to estimate the level of development in different sectors of the economy for different states taking districts as a unit of analysis for some particular time period. Using forty-seven indicators in all the districts of Haryana state, Dube et al. (2012) quantified the developmental efforts for agricultural, industrial, infrastructural, and socio-economic sectors. Nizamuddin (2014) quantified the levels of development using an optimum combination of twenty-two socio-economic and environmental sustainability indicators for different states of India. Singh and Mehala (2016) estimated the level of agricultural development of seventeen different states of India with the help of a composite index on the optimum combination of eight agricultural development indicators. Using Principal Component and Canonical Correlation Analysis, Hooda et al. (2017) attempted to measure the strength of the relationship between Socio-economic and Agricultural sectors in Haryana. Ghosh et al. (2017) studied that Spatio-temporal variations and links between irrigation and the agricultural sectors were delineated in the districts of West Bengal. Dhali et al. (2018) studied the Spatio-temporal growth of urban sub-Centre of North 24 Parganas districts of West Bengal using Shannon's Entropy Model and the Principal Component Method.

Owing to the enormous size of the state, disproportionate development in various districts of the state of Uttar Pradesh are expected to exist in agricultural development. In order to carry out work in this direction, this chapter is devoted to assess the overall scenario of agricultural development in all the seventy-five districts of Uttar Pradesh. The following is the outline for

this chapter: Section 2.2 presents a statistical analysis of various agricultural variables, measuring inter-district variations, computing agricultural development indices, and ranking the districts in terms of agricultural development. The Section 2.3 is devoted to classification of districts in view of their agricultural development. Section 2.4 examines the relative share of area and population affected by different levels of agricultural development, and Section 2.5 identifies model districts for less/least developed districts and potential targets for these districts in order to examine the extent of improvement required for less and least developed districts in order to achieve a balanced regional development. Finally, in Section 2.6, some concluding remarks are given.

2.2 Statistical Analysis of Agricultural Development

Given the huge size, diversified terrain, topography, and climate of the state, the status of development in Uttar Pradesh may be understood and comprehended readily when it is evaluated at the district level. Therefore, to compute and analyze disparities in agricultural sector, the data on all the seventy-five districts of Uttar Pradesh on twenty-two indicators depicting the progress of development in agricultural sector have been utilized for three different points of time i.e., Period I (2000-01), Period II (2010-011), and Period III (2017-18). The study includes the indicator variables that are common to all districts. Except for the variable "Availability of gross area sown per Tractor (in hectare)," all of variables considered in this analysis contribute positively to the level of agricultural development in Uttar Pradesh. Before estimating composite indices of development, let us first examine the inter-district imparities in the availability of various agricultural indicators using the various statistical approaches discussed in Chapter I.

2.2.1 Inter-District Variability of Agricultural Indicators

The inter-district variability in various indicators obtained over time has been obtained in this section. To achieve this, firstly standardized indicators have been obtained to make the indicators unit free. The inter-district variability is captured by computing and comparing the coefficients of variation for various standardized indicators across districts. Table 2.1 gives an account of inter-district variability of agricultural indicators over the considered periods in Uttar Pradesh.

The table shows that these regional disparities have decreased marginally between 2000-01 and 2017-18 for most of the indicators. However, a good number of indicators, such as percentage of net area sown to cultivated land, the productivity of total food grains, percentage of the net irrigated area by canal to the total net irrigated area, percentage of net irrigated area by tube wells to total net irrigated area, cropping intensity, Number of regulated mandis per lakh hectare of net area sown, the productivity of oilseeds, per capita production of food grains, per capita production of pulses, inter-district disparities, have shown an increase over the considered time period. Other agricultural indicators where inter-district disparities, decreased significantly are the percentage of gross irrigated area to gross area sown, availability of gross area sown per tractor, the productivity of wheat, rice, percentage of area under commercial crops to gross area sown, percentage share of area under rabi crops.

Table 2.1: Inter-District Variability of Agricultural Indicators

Sr No.	**Indicators**		**Periods**		
			I (2000-01)	**II (2010-11)**	**III (2017-18)**
1.	Percentage of gross irrigated area to gross area sown	Max.	99.99	100	100
		Min.	22.77	19.52	26.17
		CV	29.69	25.02	22.68
2.	Percentage of net area sown to cultivated land	Max.	97.96	98.28	99.43
		Min.	66.23	54.57	56.92
		CV	8.47	9.60	9.40
3.	Percentage of cultivable land to total reporting area	Max.	89.58	89.86	88.84
		Min.	37.81	43.03	41.57
		CV	9.97	9.82	9.93
4.	Productivity of total food grains Qtls. /Hect.	Max.	39	40.88	43.99
		Min.	7.68	11.07	13.25
		CV	2.65	20.47	19.83
5.	Percentage of net irrigated area by canal to total net irrigated area	Max.	91.97	84.96	85.53
		Min.	0	0	0
		CV	89.72	91.23	96.13
6.	Percentage of net irrigated area by government tube wells to total net irrigated area	Max.	37.54	63.81	43.89
		Min.	0	0	0
		CV	118.75	190.67	165.76
7.	Cropping Intensity	Max.	183.68	196.97	214.4
		Min.	110.54	108.68	112.68
		CV	10.34	10.93	10.64

8.	Distribution of total fertilizers per hectare of gross area sown (Nitrogen in Kg.)	Max.	178.85	544.7	168.42
		Min.	12.03	24.9	80.87
		CV	43.87	53.49	15.07
9.	No. of regulated mandis per lakh hectare of net area sown	Max.	7.58	9.21	6.25
		Min.	0.58	0.76	0.34
		CV	43.98	43.91	55.87
10.	Availability of gross area sown per tractor (Hectare)	Max.	611.76	143.48	825.55
		Min.	4.99	5.06	3.85
		CV	116.89	71.15	55.73
11.	Productivity of Wheat (Qtls. /hect.)	Max.	40	44.66	47.37
		Min.	12.09	18.55	23.45
		CV	21.83	16.20	14.38
12.	Productivity of Rice (Qtls. /hect.)	Max.	28.18	29.11	31.67
		Min.	8.65	5.75	6.47
		CV	23.60	17.47	16.75
13.	Productivity of Oilseeds (Qtls. /hect.)	Max.	14.12	16.89	19.75
		Min.	1.93	2.19	3.76
		CV	34.56	38.20	38.46
14.	Productivity of Sugarcane (Qtls. /hect.)	Max.	712.92	677.24	843.4
		Min.	324.52	394.05	380.35
		CV	14.59	11.56	16.28
15.	Per capita production of food grains	Max.	529.64	601.43	625.21
		Min.	90.87	71.92	34.22
		CV	35.07	38.86	42.35
16.	Per capita production of Pulses	Max.	117.95	207.16	195.82
		Min.	0	0.5	0.38
		CV	154.90	213.49	211.28
17.	Percentage of area under commercial crops to gross sown area	Max.	63.65	69.71	68.66
		Min.	3.39	3.14	2.87
		CV	76.48	73.95	66.78

18.	Production of Fish per hectare in departmental area of Fisheries	Max.	3071	4400	5983
		Min.	1678	0	3195
		CV	10.10	17.22	7.84
19.	Per capita Milk availability	Max.	11.54	9.38	0.76
		Min.	0	0	0
		CV	132.43	105.576	119.43
20.	Percentage share of area under Kharif crops	Max.	75.92	69.48	69.52
		Min.	15.82	17.84	26.13
		CV	27.99	19.96	18.96
21.	Percentage share of area under Rabi crops	Max.	78.18	77.17	73.16
		Min.	6.61	27.79	27.62
		CV	22.94	19.48	18.89
22.	Distribution of Phosphate per hectare of gross area sown	Max.	70.57	180.38	67.14
		Min.	6.39	15	31.7
		CV	40.53	56.08	14.81

2.2.2 Composite Development Indices

For all the seventy-five districts of Uttar Pradesh the composite indices of agricultural development have been computed as per procedure explained in Section 1.5.1 of Chapter I. The values of composite indices (C.I.) of various districts along with their ranks are presented in Table(2.2).

Table 2.2: Composite Development Indices and Ranking of Districts

Districts	**Periods**								
	Period-I (2000-01)			**Period-II (2010-11)**			**Period-III (2017-18)**		
	C.I.	**N. I.**	**Rank**	**C.I.**	**N. I.**	**Rank**	**C.I.**	**N. I.**	**Rank**
Agra	0.7505	0.6989	32	0.8472	0.6395	28	0.8468	0.7543	21
Amroha	0.7494	0.7010	31	0.8696	0.5787	42	0.8373	0.7868	15
Aligarh	0.6597	0.8741	3	0.8543	0.6203	34	0.8504	0.7421	23

Auraiya	0.7638	0.6733	34	0.8055	0.7529	12	0.8329	0.8018	12
Allahabad	0.7858	0.6308	39	0.8358	0.6706	25	0.9111	0.5358	53
Ayodhya	0.7324	0.7338	22	0.8242	0.7021	18	0.8812	0.6374	38
Ambd. Ngr.	0.7786	0.6447	37	0.8190	0.7162	17	0.8444	0.7625	19
Amethi	0.8753	0.4583	60	0.9794	0.2803	71	0.8565	0.7214	28
Azamgarh	0.8740	0.4608	59	0.9318	0.4096	66	0.9162	0.5184	54
Barabanki	0.7358	0.7272	23	0.8296	0.6874	23	0.8671	0.6854	32
Bahraich	0.8095	0.5852	47	0.9236	0.4320	64	0.8905	0.6059	44
Balrampur	0.9342	0.3447	69	0.8699	0.5778	43	0.9275	0.4799	62
Basti	0.7441	0.7113	29	0.8600	0.6046	36	0.9191	0.5084	56
Balia	0.8388	0.5287	51	0.8875	0.5301	51	0.8653	0.6915	31
Banda	0.9694	0.2768	70	0.9858	0.2627	73	0.9930	0.2574	72
Badayun	0.7068	0.7833	14	0.8525	0.6252	33	0.8563	0.7219	27
Bareily	0.7401	0.7190	27	0.8639	0.5943	39	0.8833	0.6302	39
Baghpat	0.6859	0.8235	9	0.8020	0.7623	9	0.8089	0.8831	4
Bulndshr.	0.5944	1	1	0.8288	0.6895	21	0.7936	0.9352	2
Bijnor	0.7760	0.6498	36	0.8622	0.5986	37	0.8262	0.8244	9
Chandauli	0.8699	0.4686	58	0.9165	0.4512	62	0.9319	0.4650	63
Chitrakoot	0.9962	0.1615	74	0.9962	0.1163	74	0.9982	0.0000	75
Deoria	0.7231	0.7518	19	0.8428	0.6515	26	0.9258	0.4858	61
Etawah	0.7540	0.6921	33	0.7815	0.8182	5	0.8392	0.7802	17
Etah	0.7021	0.7922	11	0.8095	0.7420	14	0.8478	0.7509	22
Farukhbd.	0.6741	0.8461	6	0.7466	0.9130	2	0.8529	0.7338	26
Fatehpur	0.7936	0.6158	43	0.8841	0.5391	49	0.9808	0.2987	69
Firozabad	0.7376	0.7237	26	0.8674	0.5847	40	0.8626	0.7007	30
G.B. Ngr.	0.8407	0.5249	52	0.7776	0.8287	4	0.7746	1	1
Gorakhpur	0.7790	0.6439	38	0.8841	0.5391	48	0.9409	0.4343	64
Gonda	0.8616	0.4846	57	0.8519	0.6267	32	0.8383	0.7835	16
Ghaziabad	0.6697	0.8547	5	0.7146	1	1	0.8286	0.8163	10
Ghazipur	0.7756	0.6506	35	0.8731	0.5690	44	0.8928	0.5980	47
Hapur	0.7418	0.7157	28	0.8278	0.6923	20	0.8523	0.7358	25
Hathras	0.7129	0.7714	15	0.8273	0.6937	19	0.8425	0.7691	18
Hardoi	0.7975	0.6082	44	0.8742	0.5662	45	0.8797	0.6425	37
Hamirpur	0.9952	0.1781	72	0.9635	0.3235	68	0.9171	0.5153	55
Jalaun	0.9201	0.3719	66	0.9037	0.4860	57	0.8948	0.5911	48
Jaunpur	0.7867	0.6292	40	0.9231	0.4333	63	0.8966	0.5849	50

Jhansi	0.9232	0.3659	68	0.9066	0.4780	58	0.9231	0.4949	60
Kasganj	0.7163	0.7648	17	0.8597	0.6056	35	0.8078	0.8871	3
Kannauj	0.6806	0.8338	8	0.7841	0.8111	7	0.9105	0.5379	52
Kanpur (D)	0.7324	0.7339	21	0.8055	0.7530	11	0.8344	0.7966	13
Kanpur (N)	0.7469	0.7058	30	0.8048	0.7548	10	0.8887	0.6118	42
Kheri	0.7987	0.6059	45	0.8799	0.5507	47	0.8744	0.6606	34
Kausambi	0.9225	0.3672	67	0.9136	0.4591	61	0.8949	0.5908	49
Kushingr	0.7876	0.6273	41	0.8788	0.5536	46	0.9223	0.4975	57
Lalitpur	0.9942	0.2290	71	0.9658	0.3172	69	0.9875	0.2759	71
Lucknow	0.8212	0.5625	49	0.8481	0.6371	29	0.9453	0.4196	65
Mathura	0.7022	0.7921	12	0.8340	0.6755	24	0.8363	0.7900	14
Mainpuri	0.6754	0.8438	7	0.7971	0.7756	8	0.8444	0.7624	20
Mahoba	0.9958	0.1626	73	0.9840	0.1489	72	0.9839	0.2884	70
Mau	0.8143	0.5758	48	0.8894	0.5248	54	0.8924	0.5992	46
Mahrajganj	0.8034	0.5969	46	0.8694	0.5792	41	0.8895	0.6091	43
Meerut	0.6589	0.8756	2	0.7835	0.8127	6	0.8139	0.8663	5
Mirzapur	0.8960	0.4184	64	0.9553	0.3458	67	0.9942	0.2533	73
Moradabad	0.7263	0.7457	20	0.8088	0.7440	13	0.8510	0.7402	24
Mzfr. Ngr.	0.6670	0.8600	4	0.8185	0.7176	16	0.8322	0.8040	11
Pratapgarh	0.8883	0.4332	62	0.8997	0.4967	56	0.9807	0.2990	68
Pilibhit	0.7195	0.7587	18	0.8184	0.7179	15	0.8881	0.6140	41
Rampur	0.7157	0.7661	16	0.8882	0.5281	52	0.8151	0.8621	6
Raebareli	0.8496	0.5079	54	0.8894	0.5248	53	0.9646	0.3538	67
Sahjhnpur	0.7365	0.7258	24	0.8294	0.6879	22	0.8721	0.6684	33
Sharanpur	0.6969	0.8023	10	0.8634	0.5956	38	0.8170	0.8556	8
Sambhal	0.8499	0.5073	55	0.9094	0.4705	59	0.8868	0.6184	40
Sidd. Ngr	0.8479	0.5111	53	0.8940	0.5124	55	0.8911	0.6039	45
Sitapur	0.8299	0.5458	50	0.8848	0.5374	50	0.8755	0.6569	36
Shamli	0.7370	0.7250	25	0.8483	0.6365	30	0.8154	0.8610	7
Shrawasti	0.8888	0.4323	63	0.9685	0.3098	70	0.9472	0.4130	66
Sonbhadra	0.9972	0.0000	75	0.9952	0.0000	75	0.9972	0.1294	74
S.K. Nagar	0.8524	0.5023	56	0.9101	0.4684	60	0.9224	0.4974	58
SRD. Nagar	0.7928	0.6172	42	0.8462	0.6423	27	0.8754	0.6573	35
Sultanpur	0.8805	0.4482	61	0.8517	0.6274	31	0.9024	0.5653	51
Unnao	0.9100	0.3913	65	0.9250	0.4281	65	0.9225	0.4971	59

Varanasi	0.7048	0.7870	13	0.7548	0.8908	3	0.8582	0.7158	29
Mean	**0.7974**			**0.8685**			**0.8862**		
C.V.	**12.701**			**7.569**			**6.4155**		

A composite index closer to unity indicates that an extensive attention should be paid towards various agricultural indicators to ensure higher agricultural development in the state. From table 2.2, we observe that in UP, the districts of Bulandsahar, Ghaziabad & G.B. Nagar occupy the top ranks respectively, in all the considered time periods. However, the districts of Sonbhadra and Chitrakoot remain the lowest in agricultural rankings. It may further be noticed that Sonbhadra, Chitrakoot, Mahoba, Banda, and Hamirpur lagged much behind the other districts of the state during the periods I & II while, districts of Chitrakoot, Sonbhadra, Mirzapur, and Banda lagged much behind the other districts of the state in period III, and require due attention of governments to give impetus and genuine support for proper development of these districts. Interestingly, however, among the districts disparities in agricultural development have declined as indicated by a decrease in the coefficient of variation.

2.3 Classification of Districts

In Section 2.2, various districts of the state have been ranked using a simple ranking based on composite indices of agricultural development. It may, however, be noted that a simple ranking does not provide a meaningful picture of the difference between the levels of development in districts. As explained in section 1.4.3, a meaningful characterization of different levels of development may be obtained through fractile classification from an assumed distribution of the mean of the normalized indices (N.I.). As the index lies between 0 and 1, we assume that it follows a Beta distribution of the first kind. The Beta distribution of the first kind is generally skewed which is

relevant to characterize the positive valued random variables lying in the interval (0, 1). Based on the levels of development, we divide the interval (0, 1) into five sub-intervals. Here subintervals are chosen in such a way that each interval has an equal probability level to characterize the various stages of development. Using the Beta distribution of the first kind, the fractile for classification of districts over different time periods have been obtained and are given in Table(2.3).

Table 2.3: Values of Fractiles for Classification

Fractile	**Probability**	**I (2000-01)**	**II (2010-11)**	**III (2017-18)**
$\overline{Y}_1^{(1)}$	0.20	0.022	0.017	0.018
$\overline{Y}_1^{(2)}$	0.40	0.163	0.171	0.148
$\overline{Y}_1^{(3)}$	0.60	0.458	0.520	0.435
$\overline{Y}_1^{(4)}$	0.80	0.814	0.883	0.797

Using these values of the fractile, the districts are categorized into five categories viz highly developed, developed, developing, less developed and least developed districts and are presented in the Table 2.4

Table 2.4: Classification of Districts

Level of development	**Districts**		
	Period I (2000-01)	**Period II (2010-11)**	**Period III (2017-18)**
Highly developed	Aligarh, Bulandsahar, Baghpat, Farrukhabad, Ghaziabad, Kannauj, Meerut, Muzaffar Nagar, Mainpuri	Farrukhabad, Ghaziabad, Varanasi	Auraiya, Baghpat, Bulandsahar, Bijnor, G.B. Nagar, Ghaziabad, Kasganj. Meerut, Muzaffar Nagar, Rampur, Shamli, Sharanpur

Developed	Agra, Amroha, Ambedkar Nagar, Auraiya, Ayodhya, Azamgarh, Bareily, Barabanki, Bahraich, Badayun, Baliya, Basti, Bijnor, Chandauli, Deoria, Etah, Etawah, Firozabad, Fatehpur, G.B. Nagar, Ghazipur, Gorakhpur, Gonda, Hardoi, Hapur, Hathras, Jaunpur, Kushi Nagar, Kasganj, Kanpur (D), Kanpur (N), Kheri, Lucknow, Mahrajganj, Mau, Mathura, Moradabad, Prayagraj, Pilibhit, Rampur, Raebareli, Shahjahanpur, Shamli, S.R.D. Nagar, Sitapur, Siddharth Nagar, Sambhal, S.K. Nagar, Saharanpur, Varanasi	Agra, Aligarh, Amroha, Ambedkar Nagar, Auraiya, Ayodhya, Baghpat, Badayun, Balrampur, Barabanki, Basti, Bareily, Bulandsahar, Bijnor, Deoria, Etah, Etawah, Fatehpur, Firozabad, G. B. Nagar, Ghazipur, Gorakhpur, Gonda, Hapur, Hathras, Hardoi, Meerut, Kasganj, Kannauj, Kanpur (N), Kanpur (D), Kheri, Kushi Nagar, Lucknow, Moradabad, Mainpuri, Mahrajganj, Mau, Pilibhit, Muzaffar Nagar, Mathura, Prayagraj, Rampur, Raebareli, Saharanpur, S. R. D. Nagar, Shamli, Sultanpur, Sitapur, Shahjahanpur	Aligarh, Agra, Amroha, Ambedkar Nagar, Amethi, Ayodhya, Azamgarh, Badayun, Bahraich, Bareily, Baliya, Barabanki, Balrampur, Basti, Chandauli, Deoria, Etawah, Etah, Farrukhabad, Firozabad, Ghazipur, Gonda, Hardoi, Hapur, Hamirpur, Hathras, Jalaun, Jaunpur, Jhansi, Kannauj. Kanpur (D), Kanpur (N), Kausambi, Kheri, Kushi Nagar, Mahrajganj, Mathura, Mainpuri, Mau, Moradabad, Prayagraj, Pilibhit,Shahjahanpur, S. R. D. Nagar, Sitapur, Sambhal, Sidharth Nagar,Sultanpur, S. K. Nagar, Unnao,Varanasi
Developing	Amethi, Banda, Balrampur, Hamirpur, Jalaun, Jhansi, Kausambi, Lalitpur, Mirzapur,	Amethi, Azamgarh, Banda, Bahraich, Chandauli, Hamirpur, Kausambi, Jalaun, Jaunpur, Jhansi,	Banda, Fatehpur, Gorakhpur, Lalitpur Lucknow, Mahoba, Pratapgarh, Raebareli, Shrawasti

	Pratapgarh, Sultanpur, Shrawasti, Unnao	Lalitpur, Mirzapur, Pratapgarh, Sambhal, S. K. Nagar, Shrawasti, Sidharth Nagar, Unnao	
Less developed	Mahoba	Chitrakoot, Mahoba	Mirzapur, Sonbhadra
Least developed	Chitrakoot, Sonbhadra	Sonbhadra	Chitrakoot

The above table gives quite interesting results and needs a deeper contemplation by the respective districts. It is observed that most of the districts that were classified into developed/developing categories, remained in the same category continuously throughout the period under study. Let us now explore the districts which are advanced in terms of agricultural development. The districts of Auraiya, Bijnor, Kasganj, Rampur, Shamli, and Saharanpur were in the developed category in the first two periods but improved their status by shifting to the highly developed category in the most recent period 2017-18. A different story has been depicted in the districts of Amethi, Hamirpur, Jalaun, Jhansi, Kausambi, and Unnao. In the first two periods, these districts were classified as developing, but in the third period, they improved their status by shifting to the developed category. Sultanpur, on the other hand, was in the developing category in the first period but improved its status in the last two periods by moving into the developed category.

The districts of Chitrakoot and Sonbhadra has fallen in the least development category in period I and the district of Sonbhadra remained in the least developed category in period II as well. While Chitrakoot remained in the least developed category of agricultural development in Period III. It is also observed that Mirzapur, which was in the developing stage has fallen in the less developed category in period III. The districts which remained in the lower stage of development throughout the period under study are Chitrakoot, Sonbhadra. Clearly, these districts need immense attention, planning, and most importantly political will to improve in the agricultural

sector.

2.4 Area & Population Under Different Levels of Development

One of the most essential aspects of the present study is to determine the total area and population of the state at various stages of development almost over the last three decades. As a result, the purpose of this section is to determine the percentage share of area and population affected under the various grade of development in the state. The following table provides information on the area and population covered by different districts at various stages of development over the periods.

Table 2.5: Percentage of Area and Population

Level of Development	**Periods**					
	I (2000-01)		**II (2010-11)**		**III (2017-18)**	
	Area	**Population**	**Area**	**Population**	**Area**	**Population**
Highly Developed	10.06	11.76	2.03	5.13	12.22	15.53
Developed	64.96	73.63	67.75	73.91	68.26	70.79
Developing	19.48	12.77	24.22	19.10	13.50	11.01
Less Developed	1.30	0.45	2.63	0.93	4.70	2.17
Least Developed	4.20	1.39	2.87	0.93	1.32	0.50

The above table indicates that the area and population covered by the highly developed category reduced in Period II but reached a higher value in Period III, since most of the districts of western Uttar Pradesh, the state's most agriculturally developed region, are in this category. The positive aspects of the findings are that the area and population covered by the least developed category decreased significantly over time. In Period I, these statistics was around 4.20 percent and 1.39 percent, respectively, and in Period III, they were 1.32 percent and 0.50 percent. This is primarily owing to the fact that the district of Sonbhadra altered its status from least developed to less developed during the Period III. Surprisingly, while the area covered by the developed category has improved, the percentage of the population covered by this category has decreased in the last

period. This might be owing to the fact that the rural population has migrated to highly developed metropolitan areas in quest of greater work opportunities and other socio-economic amenities. Despite the existence of a high level of disparities in the agricultural sector in various districts of Uttar Pradesh, a positive shift in agricultural development in the state is being noticed and a large portion of the state has progressed successfully in the agricultural sector.

2.5 Identification of Model Districts and Fixation of Potential Targets

The most important feature of this study is that we have determined the model district for all least and less developed districts of the latest time period so that suitable attention should be given by the planners and policymakers to these districts keeping in mind the model districts. This is done by using the approach given by Rai and Bhatia (2004) explained in Section 1.4.4. Now, for setting up the potential targets, for particular least/less developed districts, the average value of the indicators of 'model' districts will be referred to as the potential target for the district for a given indicator and is repeated for all the indicators separately.

2.5.1 Model Districts For Less & Least Developed Districts

The model districts for less and least developed districts have been identified for the agricultural sector based on composite index of development and the developmental distances between different districts for the latest period (2017-18). For this purpose, firstly the root mean squared distances between the districts were computed over all the agricultural indicators using the methodology as explained in Section 1.3.4. Using it, the distance matrix for the agricultural sector has been obtained and the model districts for less/least developed districts are identified as the districts which lie in the interval (3.60, 6.50). Thus, the list of model districts identified for various less

and least developed districts is given below in Table 2.6.

Table 2.6: Model Districts For Less & Least Developed Districts

Sr. No.	Name of the Less/ Least Developed Districts	Model Districts for Less/ Least Developed Districts
1.	Chitrakoot	Agra, Ayodhya, Azamgarh, Banda, Baliya, Balrampur, Firozabad, Farrukhabad, Gorakhpur, Ghazipur, Hardoi, Hamirpur, Jalaun, Jhansi, Jaunpur, Kausambi, Kannauj, Kanpur (D), Kanpur (N), Mau, Pratapgarh, Prayagraj, Raebareli, Sultanpur, Shrawasti, S. K. Nagar, Unnao
2.	Mirzapur	Agra, Aligarh, Ambedkar Nagar, Amethi, Auraiya, Ayodhya, Azamgarh, Badayun, Bareily, Basti, Baliya, Banda, Barabanki Balrampur, Deoria, Farrukhabad, Firozabad, Ghazipur, Gonda,Gorakhpur, Hardoi, Hathras, Jaunpur, Jhansi, Kannauj, Kanpur (D), Kanpur (N), Kushi Nagar, Mau, Moradabad, Mathura, Mahrajganj, Mahoba, Pilibhit, Sambhal, Sitapur, Sultanpur, Shrawasti, Sidharth Nagar, S. K. Nagar, Sharanpur
3.	Sonbhadra	Prayagraj, S. R. D. Nagar, Varanasi

2.5.2 Potential Targets For Less & Least Developed Districts

The potential targets are the extent of improvement required in different indicators of least/less developed districts. It will also provide direction to bring out uniform regional agricultural development in UP. Such knowledge may assist planners and administrators in reallocating resources to address disparities in development throughout the state's districts. The potential target for all the twenty-two indicators for agricultural development in respect of less/least developed districts have been calculated as the average value of the indicator of model districts and are presented in Table 2.7

Table 2.7: Potential Targets For Less & Least Developed Districts

Sr. NO.	Indicators	Potential Targets		
		Chitrakoot	Mirzapur	Sonbhadra
1	Percentage of gross irrigated area to gross area sown	73.83 (41.32)	79.42 (71.03)	82.65(26.17)
2	Percentage of net area sown to cultivated land	84.74(76.13)	88.99(75.74)	80.95(56.92)
3	Percentage of cultivable land to total reporting area	81.23(67.13)	81.73(61.43)	79.01(41.57)
4	Productivity of total food grains (Qt./Hect.)	26.24(16.47)	27.52(23.46)	26.75(18.34)
5	Percentage of net irri. area by canal to total net irri. Area	20.23(6.27)	14.3(55.36) *	27.25(36.12) *
6	Percentage of net irrigated area by govt. tube wells to total net irrigated area	3.88(0)	3.12(4) *	22.29(43.89) *
7	Cropping intensity	154.0(112.68)	160.9(141.58)	153.4(126.6)
8	Dist. of Nitrogen per hect. of gross area sown	104.28(99.32)	110.3(90.89)	100.4(98.91)
9	Regulated mandis /lac hect. of net area sown	1.51(1.15)	1.42(0.95)	1.21(1.24) *
10	Avail. of gross area sown per Tractor (Hect.)	26.77(24.74)	26.18(40) *	44(12.75)
11	Productivity of Wheat (Qt./Hect)	34.38(30.96)	35.17(24.08)	32.29(24.08)
12	Productivity of Rice (Qt./Hect.)	23(20.7)	23.45(26.4) *	26.69(25.96)
13	Productivity of Oilseeds (Qt./Hect.)	9.64(5.8)	10.30(4.73)	8.54(3.92)
14	Productivity of Sugarcane (Qt./Hect.)	592.8(429.5)	622.7(726.6) *	704.2(726.6) *
15	Per capita production of food grains (Kg.)	280(274.5)	286.7(218)	148(141)
16	Per capita production of Pulses (Kg.)	22.8(72.5) *	12.1(16.5) *	6 .0 (18.16) *

17	Percentage of area under commercial crops to gross sown area	20.07(30.37) *	22.8(25.19) *	9.84(18.95) *
18	Prod. of Fish in dpt. area of Fisheries (Kg.)	4379(3728)	4387(3986)	4401(4473) *
19	Per Capita Milk availability (Kg.)	0.07(0.02)	0.10(0.02)	0.09(0.02)
20	Percentage share of area under Kharif crops	41.60(31.93)	45.40(39.33)	44.61(46.96) *
21	Percentage share of area under Rabi crops	55.5(67.9) *	50.6(60.4) *	53.2(52.9)
22	Distribution of Phosphate per hectare of gross area sown (Kg.)	41.02 (39.7)	43.18(35.3)	39.21(38.55)

It is to be mentioned that in the above table the figures within brackets denote actual achievement and the asterisk (*) marked values depict the cases where actual achievement is better than the potential target. It has been observed that some of the indicators have an actual value is more than that of potential targets. The potential targets for various indicators listed in the table indicate that all of the indicators in Chitrakoot need to be improved, except per capita production of pulses (kg), percentage of area under commercial crops to grow sown area, and percentage share of area under Rabi crops. Almost all indicators in the Mirzapur district need to be improved, except the percentage of the net irrigated area by canal to the total net irrigated area, percentage of net irrigated area by government tube wells to total net irrigated area, availability of gross area sown per tractor, the productivity of Rice, Sugarcane, per capita production of pulses, percentage of area under commercial crops to the sown area and percentage share of area under Rabi crops. The district of Sonbhadra needs improvement in almost all the indicators except the indicators like percentage of the net irrigated area by canal to the total net irrigated area, percentage of net irrigated area by government tube wells to total net irrigated area, number of regulated mandis per lac hectare of

net area sown, the productivity of Sugarcane, per capita production of pulses, percentage of area under commercial crops to the sown area, production of fisheries in departmental area of fisheries and percentage share of area under Kharif crops.

2.6 Some Conclusive Remarks

The variations in different agricultural indicators in seventy-five districts are quantified using various approaches of development measurement, and the ranking of the districts in agricultural development is obtained over a time span of twenty-eight years. The study also suggested model districts for less-developed and least-developed districts, as well as potential targets of agricultural indicators for less-developed and least-developed districts of Uttar Pradesh. The important conclusions and policy implications emerging from the present study are as follows:

1. Wide disparities in level of overall agricultural development are seen among all districts.

2. Though, out of all, 63 districts of UP ranked in either developed or highly developed category, the values of C.I. for most of the districts are found to be closer to 1 clearly indicating that the agricultural sector still needs a more attention to achieve higher development.

3. It was noticed that the districts of Bulandshar, Ghaziabad, Farrukhabad, Meerut, Baghpat, Shamli, Saharanpur, Mathura, Varanasi, Etawah, Kasganj etc. are found to be highly developed/developed in all the time periods under study. The performance of these districts is found to be remarkably high as compared to other districts.

4. The saddest state of affairs is that of Chitrakoot, Mirzapur and Sonbhadra which remained in less and least developed category in agricultural sector. However, Mahoba which was in Less/Least Developed category has jumped to developing category in the latest period III

(2017-18).

5. As Chitrakoot, Mirzapur and Sonbhadra are the Less/ Least developed districts in Uttar Pradesh, the study has also attempted to find few Model districts on the basis of the developmental distances between different districts. This will certainly help the planners and policy makers to give appropriate attention keeping in mind the indicators in the model districts.

Overall, the regional variations in agriculture in various districts have tended, over time, to decrease slightly. The decline in disparities is nonetheless very modest, that is why there are still regional disparities in agricultural development in several districts of Uttar Pradesh.

Chapter 3

Regional Disparities in Infrastructural Sector in Uttar Pradesh

3.1 Introduction

Development of Infrastructural sector is the key driver for overall development of a region and is accorded the highest priority by the government. In general, infrastructure refers to the basic physical and organizational structures required for the operation of a society or industry, as well as the services and amenities required for an economy to function. In a broader sense, infrastructure is the physical components of interconnected systems and elements that create a foundation for sustaining a comprehensive structure of commodity and service development to enable, sustain, or improve social existence. The capacity of infrastructure rises in lockstep with economic activity. However, its economic impact is multifaceted and complex, as it directly affects both production and consumption. It has positive and negative spillover effects, and entails a substantial amount of expenditure. A region is developed if it has a healthy and robust infrastructure requiring not only the advancement in infrastructural services of public sectors, such as production and distribution of electricity, availability of pucca roads, transport facilities, banks, telecommunication, sanitation, water supply, market yards, schools and health centers etc., along with enabling a congenial

environment for industrial development. Owing to several historic, topographical and ecological conditions and various other factors, various districts of Uttar Pradesh present a huge disparity in infrastructural development. This is, what has motivated us to evaluate spatio-temporal disparities in the pace of infrastructural development at district level in the state of Uttar Pradesh.

While constructing a composite index of development Iyengar and Sudershan (1982) and Narain *et al*. (1991) observed huge developmental disparities in various sectors of economy in different states of India. Using different statistical techniques, researchers have directed their efforts towards working out on disparities in Infrastructural & Agricultural development in various regions over the years [see; e.g., Perrings (2006), Sahoo and Dash (2009), Almudi and Sanchez (2009), Dube *et al.* (2012), Das *et al.* (2012), Dube *et al.* (2014), Chotia and Rao (2015), Rana *et al*. (2017), Dube *et al.* (2020) among others and references cited therein].

Significant progress has been made in the infrastructure sector during the previous seven decades since independence, but the rate of advancement has not been consistent throughout all districts in Uttar Pradesh. Keeping in mind the importance of infrastructure and service facilities in improving the state's overall level of development, this Chapter is devoted to drawing the general picture of development and determining disparities in various infrastructural indicators in different districts of the state.

The following is the outline for this chapter: Section 3.2 presents a statistical analysis of various infrastructural variables, measuring inter-district variations, computing infrastructural development indices, and ranking the districts in terms of infrastructural development. The Section 3.3 is devoted to classification of districts in view of their agricultural development. Section 3.4 examines the relative share of area and population affected by different levels of agricultural development, and Section 3.5 identifies model districts for less/least developed districts and potential

targets for these districts in order to examine the extent of improvement required for less and least developed districts and to achieve a balanced regional development. Finally, in Section 3.6, some concluding remarks are given.

3.2 Statistical Analysis of Infrastructural Development

The infrastructural development differentials of Uttar Pradesh; with its large size, high population density and socio-economic imparities are well understood and well interpreted when studied at the district level. In order to compute and analyze changes in infrastructural sector, the data on all the seventy-five districts of Uttar Pradesh on twenty-two indicators depicting the progress of development in infrastructure sector have been utilized and are collected at three points of time i.e., Period-I (2000-01), Period II (2010-011) and Period -III (2017-18). The study includes the indicator variables that are common to all districts. All of the twenty-two variables considered in this analysis contribute positively to the level of infrastructural development in Uttar Pradesh. Before estimating composite indices of development, let us first examine the inter-district imparities in the availability of various agricultural indicators using the various statistical approaches discussed in Chapter I.

3.2.1 Inter-District Variability of Infrastructural Indicators

To accelerate the process of infrastructural development by updating and upgrading long-term development plans, we must examine the inter-district variations in the availability of infrastructural indicators throughout different time periods, as shown in Table 3.1. This is captured by estimating coefficients of variation for various standardized indicators across the districts.

The table demonstrates that regional disparities have decreased marginally for the majority

of the indicators between 2000-01 and 2017-18. However, some of the indicators, such as No. of villages with distance 5 Km. or more from railway stations, No. of villages with distance 5 Km. or more from bus stations/stops, No. of villages with distance 5 Km. or more from co-operative milk centres, have shown an increase in inter-district disparities over time. While inter-district disparities have decreased for percentage of electricity consumption in industry to total consumption, No. of veterinary hospitals per lakh of population, livestock development centres per lakh of livestock population, No. of industrial areas per lakh of population, No. of small-scale industries per lakh of population, and number of registered working factories per lakh of population. It is interesting to note that in Period III, 100 percent of all inhibited villages were electrified, which is commendable work.

Table 3.1: Inter-District Variability of Infrastructural Indicators

Sr No.	**Indicators**		**Periods**		
			I (2000-01)	**II (2010-11)**	**III (2017-18)**
1.	No. of villages with distance 5 Km. or more from Railway station	Max.	3395	3395	3395
		Min.	143	143	110
		CV	59.92	59.92	60.15
2.	No. of villages with distance 5 Km. or more from Bus station/stops	Max.	2247	2247	2252
		Min.	24	24	20
		CV	70.29	70.29	78.90
3.	No. of Hospitals/dispensaries per lakh of pop'n.	Max.	5.1	4.43	4.2
		Min.	0.07	1.23	1.20
		CV	31.16	27.05	26.50
4.	No. of higher secondary schools per lakh of pop'n.	Max.	55	21.94	41.97
		Min.	0	0	4.88

		CV	125.91	49.24	46.52
5.	No. of Polytechnic per lakh of pop'n.	Max.	0.14	0.24	0.20
		Min.	0	0	0.02
		CV	84.80	76.14	50.12
6.	Total length of Pucca roads per thousand sq. Km.	Max.	2663.77	2663.77	5268.87
		Min.	186.95	186.95	426.60
		CV	60.45	60.87	57.11
7.	Per capita electricity consumption (KWH)	Max.	1400	1986.01	2380.21
		Min.	0	30.32	105.82
		CV	116.25	107.64	79.97
8.	Percentage of electricity consumption in industry to total consumption	Max.	97.56	68.20	59.95
		Min.	2.66	2.24	2.27
		CV	88.668	63.24	76.04
9.	No. of beds in hospitals per lakh of pop'n.	Max.	126.16	87.89	90.63
		Min.	10	20	19.9
		CV	74.22	28.76	28.38
10.	Percentage of electrified villages to total inhibited villages	Max.	100	100	100
		Min.	42	54.79	100
		CV	19.87	20.28	0
11.	No. of LPG consumers per lakh of pop'n.	Max.	126671	21878	33640
		Min.	3744	417	7792.87
		CV	93.20	70.79	27.57
12.	No. of Veterinary hospitals per lakh of pop'n.	Max.	7.8	9.39	13.45
		Min.	0	0	1.41
		CV	44.40	38.39	46.65
13.	A.I. centres/subcentres per lakh of pop'n.	Max.	74.74	42.44	51.06
		Min.	5	6	9.55
		CV	49.61	33.48	33.82

14.	No. of post offices per lakh of pop'n.	Max.	22.7	18.21	17.34
		Min.	0	1	2.36
		CV	40.53	47.43	31.78
15.	Livestock development centres per lakh of livestock	Max.	16.94	10.15	12.49
		Min.	1.00	0.71	0.53
		CV	58.20	45.91	52.13
16.	No. of industrial areas per lakh of pop'n.	Max.	0.42	0.36	0.51
		Min.	0	0	0
		CV	140.99	126.03	129.49
17.	No. of small-scale industries per lakh of pop'n.	Max.	46.39	44.71	280.07
		Min.	3.29	3.84	6.63
		CV	50.02	44.18	107.17
18.	No. of registered working factories per lakh of pop'n.	Max.	169.67	159.4	185.56
		Min.	0	0	0.08
		CV	286.99	281.91	299.75
19.	No. of scheduled commercial banks per lakh of pop'n.	Max.	8.12	17.84	23.91
		Min.	0	3	3.99
		CV	31.88	39.03	38.09
20.	No. of villages with distance 5 Km. or more from Industrial/Grameen/co-operative banks	Max.	1616	1616	1577
		Min.	54	54	49
		CV	58.18	58.19	56.92
21.	No. of villages with distance 5 Km. or more from co-operative milk centres	Max.	3354	3354	3343
		Min.	40	40	3
		CV	77.25	77.26	84.40
22.	No. of primary agricultural credit societies per lakh of pop'n.	Max.	14.35	6.94	7.26
		Min.	0	0	2.48

		CV	46.26	33.55	21.94

3.2.2 Composite Development Indices

For all the seventy-five districts of Uttar Pradesh the composite indices of infrastructural development have been computed as per procedure explained in Section 1.5.1 of Chapter 1. The values of composite indices (C.I.) of various districts along with their ranks are given in table 3.2 .

Table 3.2: Composite Indices of Development and Ranking of Districts

Districts	**Periods**								
	Period-I (2000-01)			**Period-II (2010-11)**			**Period-III (2017-18)**		
	C.I.	**N. I.**	**Rank**	**C.I.**	**N. I.**	**Rank**	**C.I.**	**N. I.**	**Rank**
Agra	0.7970	0.5472	9	0.8102	0.3926	21	0.8198	0.6814	12
Aligarh	0.7943	0.5538	8	0.7922	0.4331	18	0.8514	0.6029	22
Allahabad	0.8661	0.3792	40	0.8353	0.3359	31	0.8836	0.5230	36
Ambedkar Nagar	0.8656	0.3804	38	0.8904	0.2113	53	0.8825	0.5285	35
Amethi	0.9443	0.1891	70	0.9604	0.0532	72	0.8149	0.7241	11
Amroha	0.8750	0.3575	45	0.7872	0.4444	15	0.8964	0.4998	42
Auraiya	0.8141	0.5055	13	0.8159	0.3797	25	0.8201	0.6872	13
Ayodhya	0.8372	0.4493	24	0.8357	0.3349	32	0.8674	0.5656	28
Azamgarh	0.9640	0.1413	72	0.9403	0.0987	71	0.9972	0.2312	73
Badayun	0.8911	0.3184	50	0.9124	0.1617	60	0.9847	0.2897	70
Baghpat	0.8113	0.5123	12	0.7407	0.5495	6	0.8128	0.7088	10
Bahraich	0.9057	0.2830	58	0.9264	0.1300	65	0.9838	0.2726	69
Balia	0.8324	0.4612	23	0.8136	0.3848	22	0.8815	0.5352	33
Balrampur	0.9419	0.1950	69	0.9219	0.1402	62	0.9650	0.2924	63
Banda	0.8799	0.3457	48	0.8375	0.3308	36	0.9181	0.4277	47
Barabanki	0.8619	0.3894	36	0.8181	0.3748	27	0.8615	0.5817	27
Bareily	0.8482	0.4226	27	0.8361	0.3341	33	0.9268	0.4349	51
Basti	0.9186	0.2515	66	0.8457	0.1995	55	0.9326	0.4144	52
Bijnor	0.8945	0.3101	52	0.8833	0.2274	51	0.9603	0.3386	62

Bulandsaher	0.8192	0.4932	15	0.7834	0.4530	14	0.8112	0.7087	9
Chandauli	0.8549	0.4064	32	0.8369	0.3322	35	0.9378	0.3824	56
Chitrakoot	0.9091	0.2745	60	0.8724	0.2520	48	0.9329	0.4211	53
Deoria	0.8506	0.4168	28	0.8464	0.3099	39	0.8841	0.5244	37
Etah	0.8927	0.3146	51	0.9100	0.1671	59	0.7695	0.8094	5
Etawah	0.8303	0.4662	22	0.7783	0.4645	13	0.8201	0.6732	13
Farukkhabad	0.8657	0.3802	39	0.8217	0.3666	28	0.9015	0.4806	45
Fatehpur	0.8442	0.4325	25	0.8395	0.3263	37	0.8824	0.5254	34
Firozabad	0.8287	0.4702	20	0.8154	0.3807	24	0.8751	0.5617	30
G.B. Nagar	0.6107	1	1	0.5413	1	1	0.6878	1	1
Ghaziabad	0.6689	0.8586	2	0.6793	0.6882	3	0.7875	0.7327	7
Ghazipur	0.8614	0.3906	34	0.8805	0.2338	50	0.9461	0.3813	63
Gonda	0.9181	0.2528	65	0.9371	0.1058	70	0.9687	0.3263	66
Gorakhpur	0.8704	0.3686	43	0.8242	0.3609	29	0.8869	0.5171	38
Hamirpur	0.8246	0.4800	18	0.7911	0.4358	16	0.8341	0.6503	15
Hapur	0.9170	0.2555	64	0.8620	0.2756	45	0.8414	0.5934	18
Hardoi	0.9036	0.2879	62	0.9017	0.1858	56	0.9660	0.3255	64
Hathras	0.7991	0.4155	11	0.7584	0.5096	10	0.8594	0.5909	24
Jalaun	0.7749	0.6009	6	0.7759	0.4700	12	0.8471	0.6114	20
Jaunpur	0.8786	0.3488	46	0.9099	0.1674	58	0.9774	0.3102	67
Jhansi	0.7913	0.5470	10	0.7915	0.4347	17	0.8385	0.6209	17
Kannauj	0.9048	0.2850	57	0.8718	0.2533	47	0.8907	0.5178	41
Kanpur Dehat	0.7791	0.5907	7	0.7498	0.5290	8	0.7569	0.8281	4
Kanpur Nagar	0.6851	0.8193	3	0.7017	0.6377	4	0.7168	0.9349	2
Kasganj	0.9978	0	75	0.9715	0.0281	74	0.9686	0.3350	65
Kausambi	0.8616	0.3901	35	0.8056	0.4030	19	0.8798	0.5535	32
Kheri	0.9208	0.2462	67	0.9230	0.1377	63	0.9950	0.2360	72
Kushinagar	0.9144	0.2617	63	0.9282	0.1260	66	0.9437	0.3872	59
Lalitpur	0.8586	0.3974	33	0.8555	0.2903	42	0.9197	0.4561	48
Lucknow	0.7123	0.7531	4	0.6362	0.7857	2	0.7238	0.9071	3
Mahoba	0.8669	0.3773	41	0.8363	0.3335	34	0.8994	0.4297	43
Mahrajganj	0.9089	0.2752	59	0.9259	0.1313	64	0.9202	0.4822	49
Mainpuri	0.8795	0.3466	47	0.8140	0.3840	23	0.8610	0.5904	26
Mathura	0.7991	0.5420	11	0.7437	0.5428	7	0.8102	0.6912	8
Mau	0.8546	0.4071	31	0.8506	0.3012	40	0.8602	0.5897	25
Meerut	0.7314	0.7066	5	0.7143	0.6092	5	0.7862	0.7404	6

Mirzapur	0.9125	0.2663	61	0.8916	0.2086	54	0.9983	0.2094	74
Moradabad	0.8220	0.4865	16	0.8343	0.3381	30	0.8385	0.5542	16
Muzaffar Nagar	0.8283	0.4710	19	0.7536	0.5203	9	0.8498	0.6073	21
Pilibhit	0.8746	0.3584	44	0.8611	0.2776	44	0.9226	0.4230	50
Pratapgarh	0.8654	0.3809	37	0.8409	0.3232	38	0.8441	0.5920	19
Raebareli	0.8291	0.4691	21	0.8534	0.2950	41	0.8692	0.5701	29
Rampur	0.8466	0.4266	26	0.8637	0.2716	46	0.9363	0.3970	54
Sambhal	0.9956	0.0466	74	0.9840	0	75	0.9577	0.3117	61
Sant Kabir Nagar	0.9030	0.2895	54	0.9089	0.1695	57	0.8790	0.5491	31
Sant Ravidas Nagar	0.9034	0.2884	55	0.8846	0.2244	52	0.9893	0.2708	71
Shahjahanpur	0.8989	0.2995	53	0.8734	0.2497	49	0.9375	0.3848	55
Shamli	0.9932	0.0701	73	0.9296	0.1242	67	0.8876	0.5243	39
Sharanpur	0.8510	0.4158	29	0.7738	0.4747	11	0.9014	0.4891	44
Shrawasti	0.9396	0.2006	68	0.9659	0.0408	73	0.9424	0.4090	58
Siddharth Nagar	0.9530	0.1678	71	0.9329	0.1153	69	0.9399	0.3920	57
Sitapur	0.9137	0.2635	62	0.9317	0.1181	68	0.9775	0.3081	68
Sonbhadra	0.8880	0.3260	49	0.9125	0.1615	61	0.9992	0	75
Sultanpur	0.8180	0.4960	14	0.8172	0.3768	26	0.8527	0.5440	23
Unnao	0.8704	0.3687	42	0.8608	0.2781	43	0.8906	0.5094	40
Varanasi	0.8227	0.4847	17	0.8085	0.3963	20	0.9118	0.4569	46
Mean	**0.8677**			**0.8429**			**0.8573**		
C.V.	**8.0907**			**9.3124**			**9.5625**		

The first thing, we notice from the above Table is that the developmental Indices for Infrastructural sector are closer to 1, indicating a low level of Infrastructural Development in the state of UP. We also observe from the above Table that the district of G.B. Nagar occupied the first position in all the three different time points as far as the Infrastructural Development is concerned. While Ghaziabad occupies second position in the periods I, the districts Lucknow and Kanpur Nagar moves up and occupies second position in Infrastructural Development in period II & III

respectively. In Infrastructural Development, Kasganj occupied last position in period I while, districts Sambhal and Sonbhadra occupied last position in period II and Period III respectively. It may be further observed that the districts Sonbhadra, Mirzapur, Azamgarh, Kheri & Sant Ravidas Nagar lagged much behind the other districts of the state in period III.

It is also worth mentioning here that the increase in the coefficient of variation of Infrastructural Development indices over the considered periods is indicative of the high regional disparities and calls for plentiful efforts of the government to get a balanced regional infrastructural development of the state.

3.3 Classification of Districts

A simple ranking does not provide a meaningful picture of the difference between the levels of development in different districts. As explained in section (1.4.3), the meaningful characterization of different levels of development has been obtained through fractile classification from an assumed distribution of the mean of the normalized indices (N.I.), which are given in table 3.2. This index has Beta distribution of first kind and is generally skewed which is relevant to characterize the positive valued random variables lying in the interval (0,1). Based on the levels of development, we divide the interval (0, 1) into five sub-intervals. Here subintervals are chosen in the sense that each interval has the equal probability level to characterize the various stages of development. The probabilities are given in Table 3.3

Table 3.3: Values of Fractiles For Classification

Fractile	**Probability**	**I (2000-01)**	**II (2010-11)**	**III (2017-18)**
$\overline{Y}_1^{(1)}$	0.20	0.173	0.170	0.246
$\overline{Y}_1^{(2)}$	0.40	0.379	0.316	0.440
$\overline{Y}_1^{(3)}$	0.60	0.620	0.495	0.573
$\overline{Y}_1^{(4)}$	0.80	0.872	0.793	0.856

Using these values of the fractile, the districts are categorized into five categories viz highly developed, developed, developing, less developed and least developed districts and are presented in the Table 3.4

Table 3.4: Classification of Districts

Level of development	**Districts**		
	Period I (2000-01)	**Period II (2010-11)**	**Period III (2017-18)**
Highly developed	G. B. Nagar	G. B. Nagar	G. B. Nagar, Lucknow, Kanpur Nagar
Developed	Ghaziabad, Kanpur Nagar, Lucknow, Meerut	Baghpat, Ghaziabad, Hathras, Kanpur Nagar, Kanpur Dehat, Lucknow, Mathura, Meerut, Muzaffar Nagar	Agra, Amethi, Auraiya, Baghpat, Bulandsahar, Etah, Etawah, Ghaziabad, Kanpur Dehat, Mathura, Meerut
Developing	Agra, Aligarh, Ambedkar Nagar, Auraiya, Ayodhya, Baghpat, Baliya, Barabanki, Bareily, Bulandsahar, Chandauli, Deoria, Etawah, Farrukhabad, Fatehpur, Firozabad, Ghazipur, Hathras, Hamirpur, Jalaun, Jhansi, Kanpur Dehat, Kausambi, Lalitpur, Mathura, Mahoba, Mau, Moradabad,	Agra, Aligarh, Amroha, Auraiya, Ayodhya, Baliya, Banda, Barabanki, Bareily, Bulandsahar, Chandauli, Etawah, Farrukhabad, Fatehpur, Firozabad, Gorakhpur, Hamirpur, Jalaun, Jhansi,Kausambi, Mahoba, Mainpuri, Moradabad, Pratapgarh, Prayagraj, Varanasi, Saharanpur, Sultanpur	Aligarh, Amroha, Ambedkar Nagar, Ayodhya, Baliya, Barabanki, Deoria, Fatehpur, Farrukhabad, Firozabad, Gorakhpur, Hapur, Hathras, Hamirpur, Jalaun, Jhansi, Kannauj, Kausambi, Mainpuri, Mau, Mahoba, Moradabad, Muzaffar Nagar, Pratapgarh, Prayagraj, Raebareli,
	Muzaffar Nagar, Prayagraj, Pratapgarh, Raebareli, Rampur, Saharanpur, Sultanpur, Varanasi.		Sant Kabir Nagar, Shamli, Sharanpur, Sultanpur, Unnao, Varanasi

Less developed	Amethi, Amroha, Badayun, Banda, Balrampur, Bahraich, Basti, Bijnor, Chitrakoot, Etah, Gonda, Gorakhpur, Hapur, Hardoi, Jaunpur, Kannauj, Kheri, Kushi Nagar, Mainpuri, Mahrajganj, Mirzapur, Pilibhit, Shahjahanpur, Sant Kabir Nagar, Sant Ravidas Nagar, Shrawasti, Sitapur, Sonbhadra, Unnao	Ambedkar Nagar, Basti, Bijnor, Chitrakoot, Deoria, Ghazipur, Hardoi, Hapur, Kannauj, Lalitpur, Mau, Mirzapur, Pilibhit, Raebareli, Rampur, Sant Ravidas Nagar, Shahjahanpur, Unnao	Badayun, Bahraich, Balrampur, Bareily, Bijnor, Banda, Basti, Chandauli, Chitrakoot, Ghazipur, Gonda, Hardoi, Jaunpur, Kasganj, Kushi Nagar, Lalitpur, Mahrajganj, Pilibhit, Rampur, Sant Ravidas Nagar, Sambhal, Shahjahanpur, Shrawasti, Sitapur, Siddharth Nagar
Least developed	Azamgarh, Kasganj, Sambhal, Shamli,Siddharth Nagar	Amethi, Azamgarh, Badayun, Bahraich, Balrampur, Etah, Gonda, Jaunpur, Kasganj, Kheri, Kushi Nagar, Mahrajganj, Sambhal, Sant Kabir Nagar, Shamli, Shrawasti, Sitapur, Siddharth Nagar, Sonbhadra	Azamgarh, Kheri, Sonbhadra, Mirzapur

The findings of Table 3.4 are quite interesting and need a deeper introspection by the respective districts. The first important thing, we notice is that, for the time period 2000-01 & 2010-11, G. B. Nagar is the only district which is classified into highly developed category. Here it is worth mentioning that G.B. Nagar is the top ranked districts during this time period which means that for this time period highly developed category is more developed in infrastructural sector as compared to other categories. For the latest time period 2017-18, G.B. Nagar, Lucknow & Kanpur

Nagar are classified under highly developed category which are the top three ranked districts during this interval of time. The districts which have remained continuously in the same category are G.B. Nagar as highly developed; Ghaziabad as developed; Aligarh, Ayodhya, Baliya, Barabanki, Farukkhabad, Fatehpur, Firozabad, Hamirpur, Jalaun, Jhansi, Kausambi, Mahoba, Moradabad, Prayagraj, Pratapgarh, Saharanpur, Sultanpur & Varanasi as developing; Chitrakoot, Hardoi, Pilibhit & Shahjahanpur as less developed and Azamgarh as least developed districts throughout the period under study.

Fortunately, several districts have moved up the ladder of infrastructure development. For instance, Lucknow and Kanpur Nagar have moved from developing to highly developed status, whereas Agra, Amethi, Auraiya, Baghpat, Bulandsahar, Etawah, Kanpur Dehat, and Mathura have turned into developed from developing status. During the period of study, the following districts remained in the lower web of infrastructure development: Badayun, Banda, Balrampur, Bahraich, Basti, Bijnor, Chitrakoot, Gonda, Hardoi, Jaunpur, Kheri, Kushi Nagar, Mahrajganj, Mirzapur, Pilibhit, Shahjahanpur, Sant Ravidas Nagar, Shrawasti, Sitapur, Sonbhadra, Azamgarh, Kasganj, Sambhal, Siddharth Nagar. There has been no significant change in the status and number of districts in the less/least developed category from Period I to Period III, which is alarming and need of special attention to be taken care of. It is also worth noting that, after unexpectedly increasing from Period I to Period II, the number of districts in the least developed category has fallen again in Period III, implying that the government did not devote enough attention to infrastructure development in Period II. Clearly, districts that stay in the least/least developed category require a great deal of attention, planning, and, most importantly, political attention will to enhance their infrastructure.

3.4 Area and Population Under Different Levels of Development

One of the most essential aspects of this study is determining the total area and population of the state at various stages of development almost over the last three decades. As a result, the purpose of this section is to determine the percentage share of area and population affected under various grade of development in the state. The following table provides information on the area and population covered by different districts at various stages of development over different periods.

Table 3.5: Percentage of Area and Population

Level of Development	**Periods**					
	I (2000-01)		**II (2010-11)**		**III (2017-18)**	
	Area	**Population**	**Area**	**Population**	**Area**	**Population**
Highly Developed	0.62	0.66	0.53	0.82	2.89	5.41
Developed	4.18	8.48	9.53	14.33	11.09	13.23
Developing	47.76	50.24	41.53	41.55	40.15	41.67
Less Developed	43.67	36.27	22.43	20.16	36.23	33.19
Least Developed	3.77	4.35	25.98	23.14	9.64	6.50

The Table 3.5 shows that the area and population covered by the highly developed group peaks in Period III, because this category includes the state's most infrastructural developed districts, such as G. B. Nagar, Lucknow, and Kanpur Nagar. The findings include some positive aspects, such as the fact that the developed category's area and population expanded markedly in Period-III. These figures were around 4.18 percent and 8.48 percent in Period I and 11.09 percent and 13.23 percent in Period-III, respectively. This is primarily owing to the fact that most of the districts lying in the developing category in Period-I altered their status from developing to developed category during Period-III. This is primarily due to the fact that during Period-III, the majority of the districts that were in the developing category during Period I changed their status from developing to developed.

It is also worth noticing that, after rising unexpectedly from Period-I to Period-II, the percentage share of area and people in the least developed group has declined again in Period-III, implying that the government didn't give enough attention to the least developed category in Period-II. Despite the existence of disparities in districts, the distribution of total area and population in the highly developed and developed categories suggests that a smaller portion of the state has made significant development in the infrastructure sector.

3.5 Identification of Model Districts and Fixation of Potentials Targets

The most important feature of this study is that, we have determined the model district for all least and less developed districts of latest time period so that the suitable attention may be given by the planners and policy makers to these districts keeping in mind the model districts. This is done by using the approach given by Rai and Bhatia (2004) explained in Section 1.4.4. Now, for setting up the potential targets, for particular least/less developed districts, the average value of the indicators of 'model' districts will be referred to as potential target for district for a given indicator and is repeated for all the indicators separately.

3.5.1 Model Districts for Less and least Developed Districts

Model districts for less and least developed districts have been identified for infrastructural sector on the basis of composite index of development and the developmental distances between different districts for the latest period (2017-18). The list of model districts identified for various less and least developed districts is given in the Table 3.6.

Table 3.6: Model Districts for Less and least Developed Districts

Sr. No.	Less/ Least Developed Districts	Model Districts for Less/ Least Developed Districts
1.	Badayun	Sharanpur, Muzaffar Nagar, Shamli, Moradabad, Meerut, Hapur, Aligarh, Hathras, Mathura, Agra, Firozabad, Mainpuri, Etawah, Auraiya, Unnao, Raebareli, Kanpur Dehat, Barabanki, Jalaun, Jhansi, Lalitpur, Hamirpur, Mahoba, Pratapgarh, Kausambi, Ayodhya, Sultanpur, Sant Ravidas Nagar, Gorakhpur, Dewaria, Azamgarh, Mau, Baliya.
2.	Bahraich	Shamli, Moradabad, Meerut, Hathras, Agra, Mainpuri, Etawah, Unnao, Raebareli, Kanpur Nagar, Fatehpur, Jalaun, Jhansi, Mahoba, Pratapgarh, Ayodhya, Ambedkar Nagar, Sultanpur, Sant Kabir Nagar.
3.	Balrampur	Muzaffar Nagar, Shamli, Moradabad, Meerut, Hapur, Aligarh, Hathras, Mathura, Agra, Mainpuri, Unnao, Raebareli, Kanpur Dehat, Jalaun, Jhansi, Mahoba, Ambedkar Nagar, Sultanpur, Sant Kabir Nagar, Gorakhpur, Mau, Baliya.
4.	Bareily	Sharanpur, Muzaffar Nagar, Shamli, Moradabad, Hapur, Aligarh, Hathras, Mathura, Agra, Firozabad, Mainpuri, Farukkhabad, Etawah, Auraiya, Unnao, Raebareli, Kanpur Dehat, Barabanki, Jalaun, Hamirpur, Pratapgarh, Kausambi, Prayagraj, Ambedkar Nagar, Sultanpur, Sant Kabir Nagar, Gorakhpur, Dewaria, Mau, Baliya.
5.	Bijnor	Saharanpur, Muzaffar Nagar, Shamli, Hapur, Aligarh, Hathras, Mathura, Agra, Farukkhabad, Etawah, Unnao, Raebareli, Fatehpur, Barabanki, Jalaun, Jhansi, Hamirpur, Mahoba, Chitrakoot, Pratapgarh, Kausambi, Prayagraj, Ayodhya, Ambedkar Nagar, Sultanpur, Gorakhpur, Dewaria, Azamgarh, Mau.
6.	Banda	Muzaffar Nagar, Shamli, Amroha, Meerut, Hapur, Aligarh, Hathras, Mathura, Agra, Mainpuri, Kannauj, Etawah, Auraiya, Unnao, Raebareli, Kanpur Dehat, Barabanki, Jalaun, Jhansi, Mahoba, Pratapgarh, Prayagraj, Ayodhya, Sultanpur, Sant Kabir Nagar, Gorakhpur, Dewaria, Mau, Baliya.
7.	Basti	Shamli, Moradabad, Meerut, Hapur, Aligarh, Mathura, Agra, Mainpuri, Etawah, Auraiya, Kanpur Dehat, Kanpur Nagar, Jalaun, Jhansi, Hamirpur, Mahoba, Pratapgarh, Sultanpur, Gorakhpur, Dewaria, Mau, Baliya.

8.	Chandauli	Moradabad, Meerut, Hapur, Hathras, Mathura, Agra, Mainpuri, Etawah, Auraiya, Kanpur Dehat, Kanpur Nagar, Jalaun, Jhansi, Hamirpur, Mahoba, Pratapgarh, Ayodhya, Sultanpur, Amethi, Sant Kabir Nagar, Gorakhpur, Dewaria, Mau, Baliya.
9.	Chitrakoot	Muzaffar Nagar, Moradabad, Meerut, Hapur, Aligarh, Hathras, Mathura, Agra, Firozabad, Mainpuri, Etawah, Auraiya, Unnao, Raebareli, Jalaun, Jhansi, Mahoba, Pratapgarh, Ayodhya, Ambedkar Nagar, Sultanpur, Sant Kabir Nagar, Gorakhpur, Dewaria, Azamgarh, Mau, Baliya.
10.	Ghazipur	Sharanpur, Muzaffar Nagar, Shamli, Amroha, Baghpat, Hapur, Hathras, Mathura, Firozabad, Mainpuri, Farukkhabad, Kannauj, Etawah, Unnao, Raebareli, Barabanki, Jalaun, Jhansi, Hamirpur, Pratapgarh, Kausambi, Prayagraj, Ambedkar Nagar, Sultanpur, Sant Kabir Nagar, Gorakhpur, Dewaria, Mau, Baliya.
11.	Gonda	Sharanpur, Muzaffar Nagar, Moradabad, Amroha, Meerut, Hapur, Bulandsahar, Aligarh, Hathras, Mathura, Firozabad, Mainpuri, Farukkhabad, Kannauj, Etawah, Unnao, Raebareli, Fatehpur, Barabanki, Jalaun, Jhansi, Mahoba, Pratapgarh, Kausambi, Prayagraj, Ayodhya, Ambedkar Nagar, Sultanpur, Sant Kabir Nagar, Gorakhpur, Dewaria, Azamgarh, Mau.
12.	Hardoi	Muzaffar Nagar, Shamli, Moradabad, Meerut, Hapur, Aligarh, Hathras, Mathura, Agra, Mainpuri, Etawah, Auraiya, Unnao, Kanpur Dehat, Jalaun, Jhansi, Mahoba, Pratapgarh, Sultanpur, Sant Kabir Nagar, Gorakhpur, Dewaria, Mau, Baliya.
13.	Jaunpur	Sharanpur, Muzaffar Nagar, Shamli, Moradabad, Amroha, Meerut, Hapur, Aligarh, Hathras, Mathura, Firozabad, Mainpuri, Kannauj, Unnao, Raebareli, Fatehpur, Jalaun, Jhansi, Mahoba, Pratapgarh, Kausambi, Prayagraj, Ayodhya, Ambedkar Nagar, Sultanpur, Sant Kabir Nagar, Gorakhpur, Mau, Baliya.
14.	Kasganj	Sharanpur, Muzaffar Nagar, Shamli, Moradabad, Amroha, Meerut, Hapur, Aligarh, Mathura, Firozabad, Mainpuri, Kannauj, Etawah, Unnao, Raebareli, Kanpur Nagar, Barabanki, Jalaun, Jhansi, Mahoba, Chitrakoot, Pratapgarh, Kausambi, Prayagraj, Ayodhya, Ambedkar Nagar, Sultanpur, Sant Kabir Nagar, Dewaria, Azamgarh, Mau, Baliya.

15.	Kushi Nagar	Muzaffar Nagar, Shamli, Moradabad, Amroha, Meerut, Hapur, Aligarh, Mathura, Firozabad, Mainpuri, Kannauj, Etawah, Unnao, Raebareli, Kanpur Nagar, Fatehpur, Jalaun, Jhansi, Mahoba, Pratapgarh, Kausambi, Ayodhya, Ambedkar Nagar, Sultanpur, Sant Kabir Nagar, Mau, Baliya.
16.	Lalitpur	Muzaffar Nagar, Shamli, Moradabad, Meerut, Baghpat, Hapur, Aligarh, Mathura, Agra, Auraiya, Unnao, Lucknow, Raebareli, Kanpur Dehat, Kanpur Nagar, Jalaun, Hamirpur, Sant Kabir Nagar, Mau, Baliya.
17.	Mahrajganj	Muzaffar Nagar, Shamli, Moradabad, Amroha, Meerut, Hapur, Aligarh, Hathras, Mathura, Agra, Etah, Auraiya, Unnao, Raebareli, Kanpur Dehat, Barabanki, Jalaun, Jhansi, Hamirpur, Mahoba, Pratapgarh, Sultanpur, Gorakhpur.
18.	Pilibhit	Shamli, Moradabad, Meerut, Baghpat, Aligarh, Hathras, Agra, Mainpuri, Auraiya, Lucknow, Kanpur Dehat, Kanpur Nagar, Hamirpur, Mahoba, Pratapgarh, Amethi, Baliya.
19.	Rampur	Saharanpur, Muzaffar Nagar, Shamli, Moradabad, Amroha, Ghazipur, Hapur, Aligarh, Hathras, Mathura, Agra, Firozabad, Mainpuri, Farukkhabad, Kannauj, Etawah, Auraiya, Unnao, Lucknow, Raebareli, Kanpur Nagar, Fatehpur, Barabanki, Jhansi, Mahoba, Chitrakoot, Pratapgarh, Kausambi, Ayodhya, Ambedkar Nagar, Sultanpur, Sant Kabir Nagar, Gorakhpur, Azamgarh, Mau.
20.	Sant Ravidas Nagar	Sharanpur, Muzaffar Nagar, Shamli, Moradabad, Amroha, Meerut, Hapur, Aligarh, Hathras, Mathura, Agra, Firozabad, Mainpuri, Farrukhabad, Kannauj, Etawah, Unnao, Raebareli, Barabanki, Jalaun, Jhansi, Mahoba, Chitrakoot, Pratapgarh, Kausambi, Prayagraj, Ayodhya, Ambedkar Nagar, Sultanpur, Sant Kabir Nagar, Gorakhpur, Dewaria, Azamgarh, Mau, Baliya.
21.	Sambhal	Muzaffar Nagar, Shamli, Moradabad, Meerut, Ghaziabad, Hapur, Aligarh, Hathras, Mathura, Agra, Mainpuri, Etawah, Auraiya, Unnao, Lucknow, Raebareli, Kanpur Dehat, Kanpur Nagar, Barabanki, Jalaun, Mahoba, Pratapgarh, Sultanpur, Sant Kabir Nagar, Gorakhpur, Dewaria, Mau, Baliya.
22.	Shahjahanpur	Muzaffar Nagar, Shamli, Moradabad, Meerut, Ghaziabad, Hapur, Aligarh, Hathras, Mathura, Agra, Mainpuri, Etawah, Auraiya, Unnao, Lucknow, Raebareli, Kanpur Dehat, Kanpur Nagar, Sultanpur, Sant Kabir Nagar, Gorakhpur, Dewaria, Azamgarh, Mau, Baliya.

23.	Shrawasti	Muzaffar Nagar, Shamli, Moradabad, Meerut, Baghpat, Hapur, Aligarh, Mathura, Agra, Auraiya, Unnao, Lucknow, Kanpur Dehat, Kanpur Nagar, Jalaun, Hamirpur, Sant Kabir Nagar, Mau, Baliya.
24.	Sitapur	Muzaffar Nagar, Shamli, Moradabad, Meerut, Hapur, Aligarh, Hathras, Mathura, Agra, Mainpuri, Etawah, Auraiya, Unnao, Kanpur Dehat, Jalaun, Jhansi, Mahoba, Pratapgarh, Sultanpur, Sant Kabir Nagar, Gorakhpur, Baliya.
25.	Siddharth Nagar	Shamli, Moradabad, Meerut, Baghpat, Aligarh, Hathras, Agra, Mainpuri, Auraiya, Lucknow, Kanpur Dehat, Kanpur Nagar, Pratapgarh, Amethi, Baliya.
26.	Azamgarh	Muzaffar Nagar, Shamli, Moradabad, Amroha, Meerut, Hapur, Aligarh, Mathura, Firozabad, Mainpuri, Kannauj, Etawah, Unnao, Raebareli, Kanpur Nagar, Fatehpur, Pratapgarh, Kausambi, Ayodhya, Ambedkar Nagar, Sultanpur, Sant Kabir Nagar, Mau, Baliya.
27.	Kheri	Sharanpur, Muzaffar Nagar, Shamli, Amroha, Baghpat, Hapur, Hathras, Mathura, Firozabad, Mainpuri, Farukkhabad, Kannauj, Etawah, Unnao, Raebareli, Barabanki, Jalaun, Jhansi, Hamirpur, Pratapgarh, Kausambi, Prayagraj, Gorakhpur, Dewaria, Mau, Baliya.
28.	Mirzapur	Sharanpur, Muzaffar Nagar, Moradabad, Amroha, Meerut, Hapur, Bulandsahar, Aligarh, Hathras, Mathura, Firozabad, Mainpuri, Farukkhabad, Kannauj, Etawah, Unnao, Raebareli, Fatehpur, Barabanki, Jalaun, Jhansi, Mahoba, Pratapgarh, Kausambi, Prayagraj, Ayodhya, Ambedkar Nagar, Sultanpur, Gorakhpur, Dewaria, Azamgarh, Mau.
29.	Sonbhadra	Muzaffar Nagar, Shamli, Amroha, Meerut, Hapur, Aligarh, Hathras, Mathura, Agra, Mainpuri, Kannauj, Etawah, Auraiya, Unnao, Raebareli, Kanpur Dehat, Barabanki, Jalaun, Jhansi, Mahoba, Pratapgarh, Prayagraj, Ayodhya, Sultanpur, Sant Kabir Nagar, Gorakhpur, Mau, Baliya.

3.5.2 Potential Targets for Less and Least Developed Districts

Potential targets are the extent of improvement required in different indicators of least/less developed districts. It will also provide direction to bring out uniform regional infrastructural develop-

ment in UP. Such knowledge may assist planners and administrators in reallocating resources to address disparities in development throughout the state's districts. The potential target for all the twenty-two indicators for infrastructural development in respect of less/least developed districts have been calculated as the average value of the indicator of model districts and are presented in Table 3.7 .

Table 3.7: Potential Targets for Less and Least Developed Districts

1. No. of hospitals/dispensaries per lakh of population.							
Badayun	Bahraich	Balrampur	Bareily	Bijnor	Banda	Basti	Chandauli
2.89	3.25	2.86	2.78	3.03	2.78	2.94	2.89
(2.10)	(1.57)	(1.91)	(1.71)	(1.82)	(3.03)*	(3.09)	(2.71)
Chitrakoot	Ghazipur	Gonda	Hardoi	Jaunpur	Kasganj	Kushi Nagar	Lalitpur
2.96	2.93	3.05	2.87	3.20	2.85	2.93	2.88
(3.31) *	(2.32)	(2.07)	(2.08)	(2.56)	(2.70)	(2.15)	(2.70)
Mahrajganj	Pilibhit	Rampur	Sant Ravi-das Nagar	Sambhal	Shahjahanpur	Shrawasti	Sitapur
3.08	2.75	2.42	2.89	2.42	2.98	3.01	2.84
(2.54)	(2.41)	(1.74)	(2.11)	(2.20)	(2.17)	(3.13)*	(1.63)
Siddharth Nagar	Azamgarh	Kheri	Mirzapur	Sonbhadra			
3.21	3.30	2.56	2.89	2.56			
(3.27)*	(2.88)	(2.00)	(2.57)	(2.06)			
2. No. of beds in hospitals per lakh of Population.							
Badayun	Bahraich	Balrampur	Bareily	Bijnor	Banda	Basti	Chandauli
45.01	46.94	54.89	45.67	44.18	52.85	57.42	40.33
(33.04)	(27.57)	(34.22)	(33.32)	(26.53)	(46.56)	(55.87)	(33.78)
Chitrakoot	Ghazipur	Gonda	Hardoi	Jaunpur	Kasganj	Kushi Nagar	Lalitpur
60.03	44.53	55.87	50.07	57.65	49.22	55.97	50.21
(56.25)	(29.57)	(37.79)	(36.37)	(31.34)	(20.82)	(41.04)	(53.11) *
Mahrajganj	Pilibhit	Rampur	Sant Ravi-das Nagar	Sambhal	Shahjahanpur	Shrawasti	Sitapur
54.89	53.16	44.18	55.87	42.24	57.65	60.19	57.56
(34.37)	(40.36)	(42.57)	(34.82)	(30.07)	(37.24)	(38.75)	(34.29)

Siddharth Nagar 55.35 (39.95)	Azamgarh 52.05 (46.90) *	Kheri 52.32 (28.49)	Mirzapur 41.01 (43.44) *	Sonbhadra 52.21 (29.44)			
3. No. of Veterinary hospitals per lakh of population.							
Badayun 3.05 (2.29)	Bahraich 3.01 (2.49)	Balrampur 3.21 (3.01)	Bareily 4.43 (3.55)	Bijnor 4.21 (3.58)	Banda 3.08 (2.66)	Basti 4.98 (5.07)*	Chandauli 3.34 (3.18)
Chitrakoot 3.84 (1.84)	Ghazipur 4.02 (4.51)	Gonda 3.76 (3.23)	Hardoi 3.50 (3.19)	Jaunpur 4.02 (3.06)	Kasganj 4.21 (1.44)	Kushi Nagar 4.87 (3.22)	Lalitpur 3.65 (2.93)
Mahrajganj 6.80 (5.97)	Pilibhit 4.21 (3.77)	Rampur 4.46 (2.91)	Sant Ravidas Nagar 5.34 (2.53)	Sambhal 4.78 (2.67)	Shahjahanpur 5.64 (3.35)	Shrawasti 4.68 (2.67)	Sitapur 4.05 (2.91)
Siddharth Nagar 3.95 (3.80)	Azamgarh 5.32 (4.88)	Kheri 3.80 (2.69)	Mirzapur 4.58 (3.03)	Sonbhadra 3.86 (2.42)			
4. No. of Higher Senior schools per lakh of population							
Badayun 10.04 (6.16)	Bahraich 9.35 (6.05)	Balrampur 9.62 (4.91)	Bareily 10.34 (7.77)	Bijnor 9.67 (8.92)	Banda 11.89 (7.95)	Basti 12.15 (13.06) *	Chandauli 10.25 (10.43) *
Chitrakoot 12.13 (9.06)	Ghazipur 15.31 (24.18) *	Gonda 12.94 (10.70)	Hardoi 15.70 (12.54)	Jaunpur 12.12 (12.53) *	Kasganj 14.01 (13.88)	Kushi Nagar 10.94 (7.16)	Lalitpur 11.06 (7.31)
Mahrajganj 10.36 (6.14)	Pilibhit 9.85 (6.84)	Rampur 10.25 (7.44)	Sant Ravidas Nagar 12.53 (10.08)	Sambhal 9.02 (7.61)	Shahjahanpur 11.23 (10.09)	Shrawasti 13.32 (10.33)	Sitapur 11.48 (7.33)
Siddharth Nagar 12.08 (5.65)	Azamgarh 12.35 (14.01) *	Kheri 12.00 (5.81)	Mirzapur 13.65 (10.73)	Sonbhadra 11.87 (8.72)			

5. No. of Polytechnics per lakh of population.							
Badayun	Bahraich	Balrampur	Bareily	Bijnor	Banda	Basti	Chandauli
0.10	0.14	0.11	0.10	0.11	0.14	0.10	0.12
(0.05)	(0.07)	(0.04)	(0.04)	(0.05)	(0.10)	(0.07)	(0.14)*
Chitrakoot	Ghazipur	Gonda	Hardoi	Jaunpur	Kasganj	Kushi Nagar	Lalitpur
0.15	0.9	0.09	0.08	0.11	0.12	0.12	0.12
(0.14)	(0.03)*	(0.05)	(0.02)	(0.02)	(0.13)*	(0.05)	(0.14)*
Mahrajganj	Pilibhit	Rampur	Sant Ravi-das Nagar	Sambhal	Shahjahanpur	Shrawasti	Sitapur
0.09	0.12	0.10	0.11	0.13	0.12	0.14	0.10
(0.07)	(0.09)	(0.08)	(0.06)	(0.04)	(0.09)	(0.19)*	(0.04)
Siddharth Nagar	Azamgarh	Kheri	Mirzapur	Sonbhadra			
0.11	0.09	0.11	0.13	0.13			
(0.07)	(0.04)	(0.04)	(0.11)	(0.14)*			
6. No. of villages with distance 5 Km. or more from Railway Stations/Halts.							
Badayun	Bahraich	Balrampur	Bareily	Bijnor	Banda	Basti	Chandauli
956	856	686	712	718	552	1123	923
(1320)	(1162)	(882)	(1481)	(1708)	(614)	(2903)	(1211)
Chitrakoot	Ghazipur	Gonda	Hardoi	Jaunpur	Kasganj	Kushi Nagar	Lalitpur
654	1099	892	758	769	784	699	559
(1485)*	(1940)	(1489)	(1608)	(2354)	(1496)*	(1258)	(623)
Mahrajganj	Pilibhit	Rampur	Sant Ravi-das Nagar	Sambhal	Shahjahanpur	Shrawasti	Sitapur
875	785	785	785	645	890	796	882
(1006)	(1004)	(962)	(712)	(724)	(1862)	(506)*	(1907)
Siddharth Nagar	Azamgarh	Kheri	Mirzapur	Sonbhadra			
750	620	785	714	732			
(2152)	(3393)	(1502)	(1781)	(1278)			
7. No. of villages with distance 5 Km. or more from Bus Stations/Stops.							
Badayun	Bahraich	Balrampur	Bareily	Bijnor	Banda	Basti	Chandauli
256	299	235	365	204	245	364	395
(478)	(920)	(655)	(838)	(574)	(278)	(2252)	(499)

Chitrakoot 304 (369)	Ghazipur 364 (391)	Gonda 295 (131)*	Hardoi 275 (362)	Jaunpur 385 (838)	Kasganj 289 (197)*	Kushi Nagar 368 (682)	Lalitpur 456 (110)*
Mahrajganj 324 (336)	Pilibhit 402 (605)	Rampur 254 (309)	Sant Ravi-das Nagar 204 (372)	Sambhal 210 (192) *	Shahjahanpur 256 (376)	Shrawasti 234 (104)	Sitapur 285 (631)
Siddharth Nagar 280 (690)	Azamgarh 195 (909)	Kheri 205 (483)	Mirzapur 284 (327)	Sonbhadra 274 (279)			
8. Total length of Pucca roads per thousand square Km.							
Badayun 1208.98 (800.54) *	Bahraich 1188.23 (915.95)	Balrampur 1400.56 (859.89)	Bareily 1398 (1597.09)*	Bijnor 1568.04 (1243.91)	Banda 1656.04 (729.96)	Basti 1582.81 (1444.88)	Chandauli 1780.54 (1417.67)
Chitrakoot 1478.09 (524.87)	Ghazipur 1768.54 (1397.9)	Gonda 1854.71 (1077.80)	Hardoi 1692.77 (747.08)	Jaunpur 1745 (1837) *	Kasganj 1425.54 (1311.51)	Kushi Nagar 1845.21 (1606.32)	Lalitpur 1235.42 (426.6)
Mahrajganj 1764.52 (1176.73)	Pilibhit 1597.09 (917.25)	Rampur 1675.24 (1111.53)	Sant Ravi-das Nagar 1908.35 (2161.06) *	Sambhal 1668.35 (1035.21)	Shahjahanpur 17065.04 (1109.16)	Shrawasti 1762.45 (1068.24)	Sitapur 1792.77 (1194.5)
Siddharth Nagar 1846.90 (1248.70)	Azamgarh 1762.34 (1654.91)	Kheri 1325.45 (583.98)	Mirzapur 1789.32 (1204.22)	Sonbhadra 1540.21 (1008.69)			
9. Per capita electricity consumption (KWH.).							
Badayun 365.30 (195.56)	Bahraich 314.32 (120.76)	Balrampur 299.84 (105.82)	Bareily 398.26 (309.32)	Bijnor 384.21 (463.98) *	Banda 378.56 (274.77)	Basti 320.71 (198.91)	Chandauli 310.4 (323.53)*
Chitrakoot 325.71 (240.68)	Ghazipur 359.62 (280.88)	Gonda 284.23 (152.49)	Hardoi 334.02 (148.41)	Jaunpur 337.20 (255.19)	Kasganj 350.54 (184.41)	Kushi Nagar 297.50 (123.51)	Lalitpur 341.02 (250.93)
Mahrajganj	Pilibhit	Rampur	Sant Ravi-das Nagar	Sambhal	Shahjahanpur	Shrawasti	Sitapur

318.15 (154.08)	310.23 (164.61)	402.32 (354.58)	314.47 (259.64)	339.21 (260.27)	385.46 (221.18)	284.56 (115.42)	338.45 (127)
Siddharth Nagar 289.74 (112.45)	Azamgarh 318.42 (240.26)	Kheri 305.21 (172.64)	Mirzapur 370.25)(385.49)	Sonbhadra 384.14 (290.31)			
10. Percentage of electricity consumption in the industry to total consumption.							
Badayun 15.06 (5.36)	Bahraich 19.15 (11.78)	Balrampur 14.11 (2.57)	Bareily 20.31 (15.96)	Bijnor 20.07 (7.45)	Banda 18.05 (2.66)	Basti 16.45 (6.49)	Chandauli 22.25 (28.44) *
Chitrakoot 19.13 (2.98)	Ghazipur 17.52 (4.75)	Gonda 18.94 (7.76)	Hardoi 21.2 (16.95)	Jaunpur 19.57 (6.41)	Kasganj 21.32 (14.42)	Kushi Nagar 17.48 (5.41)	Lalitpur 17.82 (5.64)
Mahrajganj 17.32 (9.97)	Pilibhit 20.31 (12.91)	Rampur 22.21 (18.55)	Sant Ravi-das Nagar 17.85 (7.69)	Sambhal 21.4 (18.14)	Shahjahanpur 22.24 (13.58)	Shrawasti 18.45 (2.27)	Sitapur 22.04 (14.63)
Siddharth Nagar 16.08 (4.66)	Azamgarh 17.25 (5.52)	Kheri 19.20 (4.14)	Mirzapur 19.41 (13.12)	Sonbhadra 21.79 (36.59) *			
11. No. of L.P.G. consumers per lakh of population.							
Badayun 15620.65 (7792.87)	Bahraich 16232.15 (9529.06)	Balrampur 14563.11 (8794.64)	Bareily 15982.45 (15096.4) (15096.4)	Bijnor 16235.21 (13851.28)	Banda 11980.56 (9765.41)	Basti 16852.30 (13514.50)	Chandauli 14890.25 (11728.77)
Chitrakoot 12874.84 (8750.79)	Ghazipur 17899.21 (10094.60)	Gonda 17854.94 (11562.48)	Hardoi 15374.02 (9442.87)	Jaunpur 14852.36 (10007.23)	Kasganj 16825.01 (11053.78)	Kushi Nagar 14982 (15662)*	Lalitpur 13587.06 (9119.75)
Mahrajganj 15234.65 (12489.5)	Pilibhit 15098.22 (11917)	Rampur 13589.02 (12192.6)	Sant Ravi-das Nagar 15850.32 (15324.7)	Sambhal 13952.01 (11783.9)	Shahjahanpur 13945..21 (12737.7)	Shrawasti 153256.2 (11276.42)	Sitapur 15514.23 (12610.1)
Siddharth Nagar 14667.89 (12245.71)	Azamgarh 14521.05 (10291.97)	Kheri 15537.26 (11250.02)	Mirzapur 14653.03 (9598.86)	Sonbhadra 13256.34 (8639.32)			

12. No. of post offices per lakh of population.							
Badayun	Bahraich	Balrampur	Bareily	Bijnor	Banda	Basti	Chandauli
8.01	9.15	8.31	9.52	9.07	9.73	9.84	9.25
(7.02)	(6.69)	(7.46)	(5.77)	(7.57)	(10.56) *	(10.94)*	(8.37)
Chitrakoot	Ghazipur	Gonda	Hardoi	Jaunpur	Kasganj	Kushi Nagar	Lalitpur
9.13	8.99	10.94	9.78	10.12	9.01	11.24	10.06
(7.49)	(9.57)*	(9.07)	(7.37)	(8.75)	(6.94)	(5.61)	(11.14) *
Mahrajganj	Pilibhit	Rampur	Sant Ravi-das Nagar	Sambhal	Shahjahanpur	Shrawasti	Sitapur
9.78	10.35	9.64	9.23	8.74	8.95	9.21	9.58
(6.54)	(6.36)	(5.01)	(6.04)	(5.66)	(9.28)*	(9.57) *	(8.31)
Siddharth Nagar	Azamgarh	Kheri	Mirzapur	Sonbhadra			
10.08	9.10	10.04	9.87	10.79			
(7.37)	(7.72)	(8.49)	(7.02)	(6.94)			
13. A.I. Centers/subcentres per lakh of population.							
Badayun	Bahraich	Balrampur	Bareily	Bijnor	Banda	Basti	Chandauli
25.36	27.15	29.11	24.89	26.07	27.51	28.15	25.25
(15.66)	(17.04)	(22.44)	(17.18)	(17.71)	(14.79)	(30.53) *	(19.24)
Chitrakoot	Ghazipur	Gonda	Hardoi	Jaunpur	Kasganj	Kushi Nagar	Lalitpur
27.13	28.99	23.94	28.45	26.35	26.85	28.75	26.06
(10.59)	(25.34)	(17.80)	(23.65)	(18.91)	(9.55)	(30.40) *	(15.79)
Mahrajganj	Pilibhit	Rampur	Sant Ravi-das Nagar	Sambhal	Shahjahanpur	Shrawasti	Sitapur
34.23	22.47	28.45	27.48	27.23	25.41)(18.72)	27.24	26.31
(51.06) *	(25.89)*	(17.8)	(12.79)	(17.06)		(13.4)	(21.21)
Siddharth Nagar	Azamgarh	Kheri	Mirzapur	Sonbhadra			
29.08	28.72	22.60	28.84	29.79			
(33.54) *	(24.17)	(15.33)	(20.72)	(15.77)			
14. Livestock development Centers per lakh of population.							
Badayun	Bahraich	Balrampur	Bareily	Bijnor	Banda	Basti	Chandauli
5.17	5.64	4.89	4.5	5.09	4.48	5.35	5.25
(3.12)	(2.01)	(3.01)	(2.31)	(2.27)	(1.91)	(4.62)	(3.71)
Chitrakoot	Ghazipur	Gonda	Hardoi	Jaunpur	Kasganj	Kushi Nagar	Lalitpur
4.13	4.99	5.04	5.78	5.89	5.11	5.89	4.06

(1.97)	(3.70)	(2.71)	(3.71)	(3.30)	(1.86)	(5.02)	(2.82)
Mahrajganj	Pilibhit	Rampur	Sant Ravi-das Nagar	Sambhal	Shahjahanpur	Shrawasti	Sitapur
5.08	5.87	6.24	4.75	5.74	4.52	5.43	5.47
(4.34)	(4.71)	(2.13)	(1.90)	(3.28)	(3.22)	(2.17)	(5.38)
Siddharth Nagar	Azamgarh	Kheri	Mirzapur	Sonbhadra			
5.08	5.32	5.08	4.89	5.79			
(4.25)	(3.76)	(2.66)	(2.85)	(206)			
15. No. of villages with distance 5 Km. or more from Industrial/Grameen/Co-operative banks.							
Badayun	Bahraich	Balrampur	Bareily	Bijnor	Banda	Basti	Chandauli
452 (748)	389 (725)	322 (540)	456 (853)	310 (886)	340 (372)	512 (1493)	453 (681)
Chitrakoot	Ghazipur	Gonda	Hardoi	Jaunpur	Kasganj	Kushi Nagar	Lalitpur
456 (414) *	498 (715)	520 (1276)	458 (1210)	356 (776)	356 (311) *	594 (632)	489 (530)
Mahrajganj	Pilibhit	Rampur	Sant Ravi-das Nagar	Sambhal	Shahjahanpur	Shrawasti	Sitapur
541 (473) *	452 (679)	390 (325) *	354 (316) *	389 (371) *	321 (1127)	384 (312) *	(456) 1108
Siddharth Nagar	Azamgarh	Kheri	Mirzapur	Sonbhadra			
410	324	329	410	379			
(1151)	(1577)*	(777)	(930)	(978)			
16. No. of villages with distance 5 Km. or more from Co-operative Milk collection centres.							
Badayun	Bahraich	Balrampur	Bareily	Bijnor	Banda	Basti	Chandauli
456 (128) *	652 (1162)	741 (355) *	554 (952)	502 (405) *	521 (554) *	648 (2176)	589 (969)
Chitrakoot	Ghazipur	Gonda	Hardoi	Jaunpur	Kasganj	Kushi Nagar	Lalitpur
589 (453) *	654 (1696)	741 (1800)	568 (243) *	689 (2541)	689 (525) *	725 (1332)	561 (672)
Mahrajganj	Pilibhit	Rampur	Sant Ravi-das Nagar	Sambhal	Shahjahanpur	Shrawasti	Sitapur
458 (74) *	658 (952) *	572 (820)	721 (830)	599 (157) *	548 (1725)	498 (401) *	743 (965)
Siddharth Nagar	Azamgarh	Kheri	Mirzapur	Sonbhadra			
693 (1834)	456 (3343)	562 (808)	695 (1455)	732 (1338)			
17. No. of industrial areas per lakh of population.							
Badayun	Bahraich	Balrampur	Bareily	Bijnor	Banda	Basti	Chandauli
0.04	0.02	0.04	0.09	0.04	0.08	0.06	0.11

(0.02)	(0.00)	(0.00)	0.09	(0.00)	(0.10)	(0.04)	(0.09)
Chitrakoot	Ghazipur	Gonda	Hardoi	Jaunpur	Kasganj	Kushi Nagar	Lalitpur
0.1	0.06	0.07	0.08	0.09	0.10	0.09	0.10
(0.17)*	(0.00)	(0.00)	(0.11)*	(0.00)	(0.00)	(0.00)	(0.07)
Mahrajganj	Pilibhit	Rampur	Sant Ravi-das Nagar	Sambhal	Shahjahanpur	Shrawasti	Sitapur
0.11	0.09	0.06	0.09	0.08	0.11	0.08	0.09
(0.00)	(0.04)	(0.08)*	(0.06)	(0)	(0.09)*	(0)	(0.04)
Siddharth Nagar	Azamgarh	Kheri	Mirzapur	Sonbhadra			
0.08	0.05	0.07	0.07	0.06			
(0.00)	(0.00)	(0.02)	0.07	(0.00)			
18. No. of small-scale industries per lakh of population.							
Badayun	Bahraich	Balrampur	Bareily	Bijnor	Banda	Basti	Chandauli
55.61	30.15	29.11	60.43	52.07	44.84	28.15	42.25
(15.44)	(6.63)	(12.16)	(66.54)	(16.16)	(8.72)	(22.69)	(50.06)
Chitrakoot	Ghazipur	Gonda	Hardoi	Jaunpur	Kasganj	Kushi Nagar	Lalitpur
62.13	25.99	21.94	25.41	34.12	42.01	29.94	42.06
(13.58)	(34.86)	(16.31)	(7.61)	(26.94)	(16.71)	(23.47)	(48.69) *
Mahrajganj	Pilibhit	Rampur	Sant Ravi-das Nagar	Sambhal	Shahjahanpur	Shrawasti	Sitapur
20.04	42.05	54.24	36.48	50.63	48.2	34.21	65.47
(13.5)	(15)	(26.8)	(45.37)	(16.4)	(18.93)	(6.63)	(11.87)
Siddharth Nagar	Azamgarh	Kheri	Mirzapur	Sonbhadra			
32.76	29.05	42.00	33.48	31.09			
(142.94)	(25.73)	(27.13)	(280.07) *	(25.64)			
19. No. of registered working factories per lakh of population.							
Badayun	Bahraich	Balrampur	Bareily	Bijnor	Banda	Basti	Chandauli
8.06	3.15	2.11	9.21	10.07	4.05	3.05	8.25
(0.74)	(1.42)	(1.19)	(6.56)	(4.94)	(0.40)	(0.61)	(6.10)
Chitrakoot	Ghazipur	Gonda	Hardoi	Jaunpur	Kasganj	Kushi Nagar	Lalitpur
3.47	2.09	1.94	5.2	3.12	5.23	1.04	3.06
(0.18)	(0.74)	(0.85)	(1.55)	(1.44)	(0.57)	(0.26)	(0.23)
Mahrajganj	Pilibhit	Rampur	Sant Ravi-das Nagar	Sambhal	Shahjahanpur	Shrawasti	Sitapur

1.72 (0.59)	4.59 (3.20)	7.04 (5.87)	8.42 (6.84)	10.02 (3.32)	9.54 (3.55)	6.52 (0.58)	6.08 (2.48)
Siddharth Nagar 4.08 (0.08)	Azamgarh 4.05 (0.20)	Kheri 5.40 (2.78)	Mirzapur 3.47 (2.9)	Sonbhadra 3.79 (0.72)			
20. No. of scheduled commercial banks per lakh of population.							
Badayun 6.81 (3.99)	Bahraich 6.45 (4.38)	Balrampur 7.32 (5.68)	Bareily 6.87 (7.93)*	Bijnor 9.06 (6.89)	Banda 6.13 (7.02)*	Basti 6.38 (5.99)	Chandauli 5.05 (7.49)*
Chitrakoot 8.25 (6.62)	Ghazipur 7.99 (6.72)	Gonda 7.94 (5.69)	Hardoi	Jaunpur 7.18 (6.73)	Kasganj 8.03 (5.53)	Kushi Nagar 7.46 (4.70)	Lalitpur 7.18 (6.29)
Mahrajganj 6.58 (4.84)	Pilibhit 8.30 (6.40)	Rampur 9.43 (7.60)	Sant Ravidas Nagar 8.01 (7.21)	Sambhal 9.20 (6.31)	Shahjahanpur 8.56 (6.81)	Shrawasti 7.49 (6.54)	Sitapur 7.93 (5.59)
Siddharth Nagar 6.18 (4.72)	Azamgarh 7.84 (6.22)	Kheri 7.95 (5.53)	Mirzapur 7.43 (6.65)	Sonbhadra 7.02 (6.99)			
21. No. of primary agricultural credit societies per lakh of rural population.							
Badayun 3.65 (6.55)*	Bahraich 5.39 (3.46)	Balrampur 6.65 (3.28)	Bareily 4.21 (4.93)*	Bijnor 4.54 (3.55)	Banda 4.64 (3.08)	Basti 5.51 (4.99)	Chandauli 4.91 (4.85)
Chitrakoot 5.24 (4.58)	Ghazipur 6.02 (5.44)	Gonda 6.54 (5.17)	Hardoi 6.07 6.07	Jaunpur 6.24 (5.47)	Kasganj 5.01 (3.05)	Kushi Nagar 6.74 (4.27)	Lalitpur 5.06 (3.92)
Mahrajganj 5.47 (3.76)	Pilibhit 6.02 (4.94)	Rampur 5.58 (3.66)	Sant Ravidas Nagar 5.28 (3.85)	Sambhal 4.29 (2.48)	Shahjahanpur 5.02 (4.77)	Shrawasti 5.29 (4.17)	Sitapur 6.32 (5.16)
Siddharth Nagar 6.08 (5.29)	Azamgarh 5.05 (5.92)*	Kheri 4.08 (3.71)	Mirzapur 4.17 (4)	Sonbhadra 4.79 (4.00)			

Note that in the above table the figures within brackets denote actual achievement and the asterisk (*) marked values depict the cases where actual achievement is better than the potential target. It has been observed that some of the indicators have the actual value is more than that of potential targets.

3.6 Some Conclusive Remarks

The variations in different infrastructural indicators in seventy-five districts are quantified using various approaches of development measurement, and the ranking of the districts in infrastructural development is obtained over a time span of twenty-eight years. The study also suggested model districts for less-developed and least-developed districts, as well as potential targets of infrastructural indicators for less-developed and least-developed districts. The important conclusions and policy implications emerging from the present study are as follows:

1. Wide disparities in level of overall infrastructural development are seen among all districts.

2. The next conclusion of the study supports a well-known fact in Uttar Pradesh that G.B. Nagar, Lucknow, Ghaziabad, and Kanpur Nagar are developing significantly more rapidly than the rest of the state's districts in terms of infrastructure development. The state government and policy makers must deal with this reality in order to decrease the flow of unemployed people to these developed districts by providing jobs and improving health care and education facilities in less and least developed areas.

3. It is evident from the present study that the pattern of regional infrastructural development in UP is quite unequal. Wide infrastructural disparities have been observed among all the

districts.

4. The C.I. values for the majority of the districts are found to be closer to 1, indicating that the infrastructure sector still need more attention to attain higher development.

5. It was found that the districts of G. B. Nagar, Lucknow, Ghaziabad, Kanpur Nagar, Meerut, and others were highly developed/developed during the time periods under study. When compared to other districts, the performance of these districts is remarkably high.

6. In latest period 2017-18, districts like G. B. Nagar, Kanpur Nagar, Lucknow, Kanpur Dehat & Etah are the top five districts with respectively highest level of infrastructural development in the state and their composite index of infrastructural development ranges between 0.6878-0.7695.

7. In latest period 2017-18, districts like Sonbhadra, Mirzapur, Azamgarh, Kheri & Sant Ravidas Nagar are the five districts with respectively lowest level of infrastructural development in the state and their composite index of infrastructural development ranges between 0.9893-0.9992.

8. The district of G.B. Nagar found to be top ranked in all the time periods under study. The performance of this district is remarkably high as compared to other districts.

Overall, the regional variations in infrastructural sector in various districts have tended, over time, to decrease slightly. The decline in disparities is nonetheless very modest, which is why there are still regional disparities in infrastructural development in several districts of Uttar Pradesh.

Chapter 4

Regional Disparities in Socio-economic Sector in Uttar Pradesh

4.1 Introduction

One of the important factors to be considered while evaluating a region's development is socioeconomic development. Socioeconomic development is a multifaceted process that improves a society's living conditions and quality of life, and it can only be achieved by taking a balanced approach on both the economic and social fronts. To be sure, a steady and persistent improvement of the social sector is required to ensure long-term economic progress. As a result, true socio-economic growth necessitates not only observable increases in GDP and national income, but also improvements in basic requirements such as education, food availability, minimum purchasing power, gender equality, and the empowerment of the poor and disenfranchised. The process of economic development in Uttar Pradesh has experienced a paradigm shift throughout the time; yet, social development has been gradual and sluggish. Thus, despite seeing a significant rise in economic development following the economic liberalization, this era was hampered by social upheaval, resulting in inequitable social development across the state. The dismally low level of socio-economic development in Uttar Pradesh calls for to workout disparities in the pace of

socio-economic development of various districts of Uttar Pradesh.

Using different statistical techniques, researchers have directed their efforts towards working out disparities in socio-economic development in various regions over the years. Soares et al. (2003) proposed a new multivariate statistical methodology for the identification of nine-axes of socio-economic characterization in order to support regional development policy in the Portuguese continental territory. Dube et al. (2014) quantified the developmental efforts in the agricultural sector of India on the basis of indices of optimum combination of thirteen development indicators. Stamenkovic & Savic (2017) worked on a multivariate methodology for the assessment of economic development of various districts in Serbia and classify them into homogeneous clusters based on five economic indicators. For the city districts of Punjab in Pakistan Rana et al. (2017) outlines a methodology to examine spatio-temporal disparities using transformation technique of composite indices. Verma et al. (2019) quantified different levels of regional disparities in the development of Odisha using composite indices and PCA and then Cluster analysis was carried out to classify the districts of Odisha into four different clusters. Keeping in mind the importance of socio-economic services and facilities in improving the state's overall level of development, this Chapter is devoted to determining the general picture of development and disparities in various socio-economic indicators in different districts of Uttar Pradesh.

Owing to the enormous size of the state, disproportionate development in various districts of the state of Uttar Pradesh are expected to exist in socio-economic development. The following is the outline for this chapter: Section 4.2 presents a statistical analysis of various socio-economic variables, measuring inter-district variations, computing socio-economic development indices, and ranking the districts in terms of socio-economic development. Section 4.3 is devoted to classification of districts in view of their socio-economic development. Section 4.4 examines the relative share of area and population affected by different levels of socio-economic development, and Sec-

tion 4.5 identifies model districts for less/least developed districts and potential targets for these districts in order to examine the extent of improvement required for less and least developed districts of the state in order to achieve balanced regional development. Finally, in Section 4.6, some concluding remarks are given.

4.2 Statistical Analysis of Socio-economic Development

In order to compute and analyze the regional development disparities in socio-economic sector, the data for all the seventy-five districts of Uttar Pradesh on twenty-one indicators have been utilized for three points of time i.e., Period-I (2000-01), Period II (2010-011) and Period -III (2017-18). The study includes the indicator variables that are common to all districts. For the socio-economic development, it is hypothesized that higher infant and child mortality rates, higher literacy gap between male and female, higher pupil teacher ratio, higher value of per capita credit make a negative effect on development, whereas the higher values of other indicators considered in this analysis contribute positively to the level of socio-economic development in Uttar Pradesh. Before estimating composite indices of development, let us first examine the inter-district imparities in the availability of various agricultural indicators using the various statistical approaches discussed in Chapter I.

4.2.1 Inter-district Variability of Socio-economic Indicators

To speed up the process of socioeconomic development by updating and upgrading long-term development plans, we must look at the inter-district variations in the availability of socioeconomic indicators over time, as indicated in Table 4.1. This is determined by the coefficients of variation across the districts for various standardized indicators. The table depicts that the regional disparities have decreased marginally for the majority of the indicators between 2000-01 and 2017-18.

However, some of the indicators, such as percentage of decennial growth of population, population density, Urbanization, schedule caste as percentage of total percentage of schedule caste, student teacher ratio, Number of employees in registered working factories per lakh of population, livestock density, per capita credit & district wise employment in public sector, have shown an increase in inter-district disparities over time. The inter-district disparities have decreased for infant mortality rate, child mortality rate, no. of family welfare centres, sex ratio, male literacy rate, female literacy rate, literacy gap between male and female, schedule caste literacy rate, rural literacy rate, urban literacy rate, per capita deposit, district wise police station & police post. It is worth noting that regional disparities in various mortality and literacy rates have decreased significantly over time, indicating that there is extreme need of attention for the policy makers so that this gap may be reduced to its least level.

Table 4.1: Inter-district Variability of Socio-economic Indicators

Sr No.	**Indicators**		**Periods**		
			I (2000-01)	**II (2010-11)**	**III (2017-18)**
1.	Infant mortality rate (per thousand)	Max.	146	96	96
		Min.	38	37	37
		CV	25.20	19.65	19.65
2.	Child mortality rate (per thousand)	Max.	205	130	130
		Min.	61	50	50
		CV	21.00	19.71	19.71
3.	No. of family welfare centres	Max.	667	673	373
		Min.	136	150	150
		CV	36.48	35.92	35.92
4.	% of decennial growth of population	Max.	46.89	49.11	49.11
		Min.	12.97	9.92	9.92
		CV	21.07	30.52	30.52

5.	Population density (per sq. Km.)	Max.	2811	3971	3971
		Min.	194	242	242
		CV	49.45	54.05	54.05
6.	Sex Ratio	Max.	1020	1024	1024
		Min.	839	851	851
		CV	5.45	4.67	4.67
7.	% of urban population to total population (Urbanisation)	Max.	67.12	80.44	80.44
		Min.	2.84	3.46	3.46
		CV	69.25	73.80	73.80
8.	Schedule caste as percentage of total schedule caste	Max.	3.25	3.5	3.5
		Min.	0.36	0.36	0.36
		CV	47.65	50.66	50.66
9.	Male literacy rate	Max.	88.06	97.24	105.06
		Min.	57.16	62.32	67.41
		CV	9.41	7.22	5.67
10.	Female literacy rate	Max.	75.05	83.54	89.37
		Min.	34.78	47.25	51.87
		CV	14.34	11.46	9.03
11.	Literacy gap between male & female	Max.	26.93	22.52	20.21
		Min.	8.57	7.50	6.27
		CV	16.04	12.32	10.67
12.	S.C. literacy rate	Max.	73.43	78.35	84.43
		Min.	40.41	46.13	52.32
		CV	11.79	9.64	7.09
13.	Rural literacy rate	Max.	68.52	77.54	84.52
		Min.	31.65	46.1	55.24
		CV	17.10	11.12	8.64
14.	Urban literacy rate	Max.	82.69	85.7	97.8
		Min.	52.18	56	68.79
		CV	10.17	8.67	4.30
15.	Pupil teacher ratio at higher secondary schools	Max.	71	90	107.9
		Min.	21	26.22	16.6

		CV	23.34	25.37	36.20
16.	Livestock density	Max.	840.67	754.54	710.74
		Min.	92.27	88.27	84.75
		CV	38.92	41.04	45.84
17.	No. of employees in registered working factories per lakh of population	Max.	4391.39	12145.01	14909.53
		Min.	1.77	3	1.9
		CV	231.24	339.99	365.40
18.	Per capita credit	Max.	8768.2	103964.41	196297.75
		Min.	419.49	2147.29	1850.99
		CV	95.50	167.93	154.48
19.	Per capita deposit	Max.	372241	251882.83	389982.37
		Min.	1464.24	5000	11998.9
		CV	444.39	169.30	134.23
20.	District wise police station & police post	Max.	51	51	53
		Min.	8	8	10
		CV	41.11	41.11	38.92
21.	District wise employment in public sector	Max.	177305	177305	117549
		Min.	327	327	327
		CV	115.61	115.61	119.75

4.2.2 Composite Development Indices

For the total seventy-five districts of Uttar Pradesh, the composite indices of socio-economic development have been computed as per procedure explained in Section 1.5.1 of Chapter 1. The values of composite indices (C.I.) of various districts of the state along with their ranks are given in Table 4.2.

Table 4.2: Composite Development Indices and Ranking of Districts

Districts	**Periods**								
	Period-I (2000-01)			**Period-II (2010-11)**			**Period-III (2017-18)**		
	C.I.		**Rank**	**C.I.**		**Rank**	**C.I.**		**Rank**
Agra	0.8570	0.6152	14	0.8254	0.56228	9	0.8178	0.5645	9
Aligarh	0.8619	0.5939	16	0.8191	0.58361	7	0.8133	0.5786	7
Ambedkar Nagar	0.9019	0.4196	36	0.8889	0.34732	35	0.8869	0.3475	35
Amethi	0.9149	0.3629	49	0.9263	0.22071	59	0.9368	0.1908	67
Amroha	0.9074	0.3956	40	0.9000	0.30974	42	0.8988	0.3102	44
Auraiya	0.9302	0.2962	54	0.9220	0.23527	57	0.9142	0.2618	54
Ayodhya	0.8830	0.5019	24	0.8406	0.51083	15	0.8403	0.4938	16
Azamgarh	0.8453	0.6662	10	0.8373	0.52200	13	0.8194	0.5594	10
Badayun	0.9336	0.2814	60	0.9279	0.21531	60	0.9237	0.2320	59
Baghpat	0.9724	0.1124	72	0.9512	0.13642	70	0.9514	0.1450	72
Bahraich	0.9322	0.2875	56	0.9189	0.24576	56	0.9268	0.2222	61
Balia	0.9335	0.2819	59	0.8707	0.40893	24	0.8624	0.4244	24
Balrampur	0.9982	0	75	0.9626	0.09783	72	0.9494	0.1513	70
Banda	0.9449	0.2322	63	0.9343	0.19363	64	0.9356	0.1946	66
Barabanki	0.8965	0.4431	34	0.8751	0.39404	26	0.8765	0.3802	29
Bareily	0.8544	0.6265	12	0.8409	0.50981	16	0.8364	0.5061	14
Basti	0.8862	0.4880	29	0.8766	0.38896	28	0.9033	0.2960	47
Bijnor	0.8562	0.6187	13	0.8572	0.45463	21	0.8579	0.4386	21
Bulandsaher	0.9238	0.3241	50	0.9002	0.30907	43	0.8976	0.3139	41
Chandauli	0.9104	0.3825	44	0.9030	0.29959	46	0.8957	0.3199	39
Chitrakoot	0.9580	0.1751	68	0.9456	0.15538	67	0.9507	0.1472	71
Deoria	0.8858	0.4897	28	0.8820	0.37068	29	0.8793	0.3714	31
Etah	0.9086	0.3904	41	0.9135	0.26404	54	0.9232	0.2335	58
Etawah	0.9101	0.3838	42	0.8964	0.32193	38	0.8929	0.3287	37
Farukkhabad	0.9265	0.3124	51	0.9035	0.29790	47	0.9086	0.2794	50
Fatehpur	0.8850	0.4932	26	0.9014	0.30501	44	0.9097	0.2759	51
Firozabad	0.8383	0.6967	8	0.8511	0.47528	18	0.8464	0.4747	17
G.B. Nagar	0.8109	0.8161	6	0.6961	1	1	0.6791	1	1
Ghaziabad	0.7687	1	1	0.7366	0.86289	4	0.7319	0.8342	3
Ghazipur	0.8794	0.5176	20	0.8344	0.53181	11	0.8231	0.5478	11

Gonda	0.9117	0.3769	46	0.8984	0.31516	40	0.8861	0.3500	34
Gorakhpur	0.8597	0.6034	15	0.8179	0.58767	6	0.8142	0.5758	8
Hamirpur	0.9602	0.1655	69	0.9853	0.02098	73	0.9832	0.0452	73
Hapur	0.9106	0.3816	45	0.8753	0.39336	27	0.8467	0.4737	18
Hardoi	0.8867	0.4858	30	0.8658	0.42552	22	0.8682	0.4062	25
Hathras	0.9276	0.3076	52	0.9094	0.27792	51	0.9055	0.2891	49
Jalaun	0.9483	0.2174	66	0.9293	0.21056	62	0.9208	0.2411	57
Jaunpur	0.8667	0.5729	19	0.8487	0.48341	17	0.8500	0.4634	20
Jhansi	0.8808	0.5115	21	0.9072	0.28537	50	0.8948	0.3227	38
Kannauj	0.9332	0.2832	58	0.9023	0.30196	45	0.9018	0.3007	45
Kanpur Dehat	0.9016	0.4209	35	0.8902	0.34292	36	0.9110	0.2719	50
Kanpur Nagar	0.7952	0.8845	5	0.8222	0.57312	8	0.8079	0.5956	6
Kasganj	0.9516	0.2030	67	0.9517	0.13473	71	0.9442	0.1676	69
Kausambi	0.9479	0.2191	65	0.9122	0.26845	52	0.9146	0.2605	55
Kheri	0.8852	0.4923	27	0.8672	0.42078	23	0.8586	0.4364	22
Kushinagar	0.9124	0.3738	47	0.8835	0.36560	32	0.8845	0.3551	32
Lalitpur	0.9460	0.2274	64	0.9295	0.20988	63	0.9301	0.2119	63
Lucknow	0.7705	0.9921	2	0.7097	0.95396	2	0.6950	0.9500	2
Mahoba	0.9835	0.0640	73	0.9869	0.01557	74	0.9976	0	75
Mahrajganj	0.9319	0.2888	55	0.9132	0.26506	53	0.9131	0.2653	53
Mainpuri	0.9031	0.4143	37	0.9044	0.29485	48	0.9026	0.2982	46
Mathura	0.9102	0.3834	43	0.9094	0.27792	49	0.9040	0.2938	48
Mau	0.8871	0.4840	31	0.8538	0.46618	19	0.8493	0.4656	19
Meerut	0.8390	0.6936	9	0.8272	0.55619	10	0.8249	0.5422	12
Mirzapur	0.8120	0.8113	7	0.8932	0.33276	37	0.8883	0.3431	36
Moradabad	0.8528	0.6335	11	0.8395	0.51455	14	0.8387	0.4989	15
Muzaffar Nagar	0.8809	0.5111	22	0.8856	0.35849	33	0.8712	0.3968	26
Pilibhit	0.9295	0.2993	53	0.9390	0.17772	66	0.9329	0.2031	64
Pratapgarh	0.8955	0.4474	33	0.8741	0.39742	25	0.8730	0.3912	28
Prayagraj	0.7774	0.9620	3	0.7696	0.75118	5	0.7780	0.6894	5
Raebareli	0.8660	0.5760	18	0.8828	0.36797	30	0.8787	0.3733	30
Rampur	0.9064	0.4000	39	0.9185	0.24712	55	0.9187	0.2477	56

Sant Kabir Nagar	0.9433	0.2392	62	0.9287	0.21259	61	0.9276	0.2197	62
Shahjahanpur	0.8909	0.4675	32	0.8967	0.32092	39	0.8981	0.3124	43
Sambhal	0.9420	0.2448	61	0.9365	0.18618	65	0.9247	0.2288	60
Shamli	0.9646	0.1464	70	0.9503	0.13947	69	0.9404	0.1795	68
Sharanpur	0.8658	0.5769	17	0.8348	0.53046	12	0.8293	0.5284	13
Shrawasti	0.9920	0.0270	74	0.9915	0	75	0.9916	0.0188	74
Siddharth Nagar	0.9324	0.2867	57	0.8992	0.31245	41	0.8981	0.3124	42
Sitapur	0.8834	0.5002	25	0.8563	0.45768	20	0.8620	0.4257	23
Sonbhadra	0.9688	0.1281	71	0.9479	0.14759	68	0.9330	0.2028	65
Sant Ravi-das Nagar	0.9132	0.3703	48	0.8828	0.36797	31	0.8718	0.3949	27
Sultanpur	0.8809	0.5111	23	0.9252	0.22444	58	0.8967	0.3167	40
Unnao	0.9053	0.4047	38	0.8880	0.35037	34	0.8846	0.3547	33
Varanasi	0.7806	0.9481	4	0.7354	0.8669	3	0.7468	0.7874	4
Mean	0.8982			0.8842			0.8811		
C.V.	5.6638			6.5477			6.7444		

It may be observed that for the time period I, the district of Ghaziabad ranked first followed by Lucknow & Prayagraj. The district of Balrampur ranked last followed by Shrawasti and Mahoba in socio-economic development of Uttar Pradesh. The values of composite indices of socio-economic development varies from 0.7687 to 0.9982 and are closer to 1, which clearly indicates that most of the districts of Uttar Pradesh are at the lower level of development. It is evident from the Table 4.1 that for the time period II, the district of G. B. Nagar secured first rank followed by Lucknow & Varanasi and the district of Shrawasti bagged the last position followed by Mahoba and Hamirpur. The value of composite indices varies from 0.6961 to 0.9915 which is an indicative of low level of socio-economic development. For period III, table reveals that G.B. Nagar remains at first position while district of Mahoba ranked the last position in socio-economic development of Uttar Pradesh. The value of composite indices of Socio-economic development

varies from 0.6791 to 0.9976. Another important thing to be noticed from the table is that district of Lucknow ranked second uninterruptedly for all the three time periods. Here it is also noticed that in view of overall Socio-economic development of Uttar Pradesh the districts, namely G.B. Nagar, Lucknow, Ghaziabad, and Varanasi are found to be more developed in comparison to the remaining districts. It may be further observed that the districts of Mahoba, Shrawasti, Hamirpur, Baghpat & Chitrakoot lagged much behind the other districts of the state in period III. Here, it is also worth mentioning that the increase in the coefficient of variation of socio-economic development indices over the three considered periods is indicative of the high regional disparities and calls for plentiful efforts of the government to get a uniform regional socio-economic development of the state.

4.3 Classification of Districts

A simple ranking does not provide a meaningful picture of the difference among the levels of development in different districts. As explained in section (1.4.3), a meaningful characterization of different levels of development has been obtained through fractile classification from an assumed distribution of the mean of the normalized indices (N.I.). As the index lies between 0 and 1, we assume that it follows a Beta Distribution of first kind. The Beta distribution of first kind is generally skewed which is relevant to characterize the positive valued random variables lying in the interval (0,1). Based on the levels of development, we divide the interval (0, 1) into five subintervals. Here subintervals are chosen in the sense that each interval has the equal probability level to characterize the various stages of development.

Using Beta distribution of first kind, the fractiles for classification of districts over different time periods have been obtained and are given in Table 4.3.

Table 4.3: Values of Fractiles for Classification

Fractile	Probability	I (2000-01)	II (2010-11)	III (2017-18)
$\overline{Y}_1^{(1)}$	0.20	0.154	0.152	0.135
$\overline{Y}_1^{(2)}$	0.40	0.480	0.336	0.262
$\overline{Y}_1^{(3)}$	0.60	0.617	0.521	0.540
$\overline{Y}_1^{(4)}$	0.80	0.803	0.750	0.762

On the basis of these values of the fractile, the districts are categorized into five categories viz highly developed, developed, developing, less developed and least developed districts and are presented in the Table 4.4.

Table 4.4: Classification of Districts

Level of development	Districts		
	Period I (2000-01)	**Period II (2010-11)**	**Period III (2017-18)**
Highly developed	G. B. Nagar, Ghaziabad, Kanpur Nagar, Lucknow, Mirzapur, Prayagraj, Varanasi	G. B. Nagar, Ghaziabad, Lucknow, Prayagraj, Varanasi	G. B. Nagar, Ghaziabad, Lucknow, Varanasi
Developed	Azamgarh, Bijnor, Firozabad, Meerut, Moradabad	Agra, Aligarh, Ghazipur, Gorakhpur, Kanpur Nagar, Meerut, Sharanpur	Agra, Aligarh, Azamgarh, Ghazipur, Gorakhpur, Kanpur Nagar, Meerut, Prayagraj, Sharanpur
Developing	Agra, Aligarh, Ayodhya, Bareily, Basti, Deoria, Fatehpur, Ghazipur, Gorakhpur, Hardoi, Jaunpur, Jhansi, Kanpur Dehat, Kheri, Mainpuri, Mau,Muzaffar Nagar,Raebareli, Shahjahanpur, Saharanpur, Sitapur,Sultanpur	Ambedkar Nagar, Ayodhya, Azamgarh, Balia, Barabanki, Bareily, Basti, Bijnor, Deoria, Firozabad, Hapur, Hardoi, Jaunpur, Kanpur Dehat, Kheri, Kushi Nagar, Mau, Moradabad, Muzaffar Nagar, Pratapgarh, Raebareli,	Ambedkar Nagar, Ayodhya, Amethi, Amroha, Badayun, Barabanki, Basti, Bareily, Bijnor, Bulandsahar, Chandauli, Deoria, Etawah, Farukkhabad, Fatehpur, Firozabad, Gonda, Hapur, Hardoi, Jaunpur,

		Sitapur, Sant Ravidas Nagar, Unnao	Jhansi, Kannauj, Kanpur Dehat, Kausambi, Kheri, Kushi Nagar, Mainpuri, Mathura, Mau, Mirzapur, Moradabad, Muzaffar Nagar, Pratapgarh, Raebareli, Shahjahanpur, Siddharth Nagar, Sitapur, Sant Ravidas Nagar, Sultanpur, Unnao
Less developed	Ambedkar Nagar, Amethi, Amroha, Auraiya, Badayun, Bahraich, Balia, Banda, Barabanki, Bulandsahar, Chandauli, Chitrakoot, Etah, Etawah, Farukkhabad, Gonda, Hamirpur, Hapur, Hathras, Jalaun, Kannauj, Kasganj, Kausambi, Kushi Nagar, Lalitpur, Mahrajganj, Mathura, Pilibhit, Pratapgarh, Rampur, Sant Kabir Nagar, Sambhal, Siddharth Nagar, Sant Ravidas Nagar, Unnao	Amethi, Amroha, Auraiya, Badayun, Bahraich, Banda, Bulandsahar, Chandauli, Chitrakoot, Etah, Etawah, Farrukhabad, Fatehpur, Gonda, Hathras, Jalaun, Jhansi, Kannauj, Kausambi, Lalitpur, Mahrajganj, Mainpuri, Mathura, Mirzapur,Pilibhit, Sambhal, Sonbhadra, Siddharth Nagar, Sultanpur	Auraiya, Bahraich, Banda, Etah, Hathras, Jalaun, Kasganj, Lalitpur, Mahrajganj, Rampur, Sant Kabir Nagar, Sambhal, Shamli, Sonbhadra
Least developed	Baghpat, Balrampur, Mahoba, Shamli, Shrawasti, Sonbhadra	Baghpat, Balrampur, Hamirpur, Kasganj, Mahoba, Shamli, Shrawasti	Hamirpur, Mahoba, Shrawasti

The findings of Table 4.4 are quite interesting and need a deeper introspection by the respective districts. The first thing to be observed is that for all three time periods, G.B. Nagar, Lucknow, Ghaziabad, and Varanasi are the top four districts classified as highly developed, whereas Prayagraj, which was in the highly developed category in the first two time periods, has slipped down into the developed category in the most recent time period III. The districts which have remained continuously in the same category are G. B. Nagar, Ghaziabad, Lucknow & Varanasi as highly developed; Meerut as developed; Ayodhya, Deoria, Hardoi, Jaunpur, Kanpur Dehat, Kheri, Mau, Muzaffar Nagar, Raebareli & Sitapur as developing; Auraiya, Banda, Etah, Hathras, Jalaun, Rampur, Sant Kabir Nagar & Sambhal as less developed; Sonbhadra & Shrawasti as least developed districts throughout the periods under consideration.

Fortunately, several districts have moved up the ladder of socio-economic development. For instance, Ghazipur, Gorakhpur and Saharanpur have upgraded from developing to developed status, whereas Ambedkar Nagar, Amethi, Amroha, Badayun, Bulandsahar, Chandauli, Etawah, Farukkhabad, Fatehpur, Gonda, Jhansi, Kannauj, Kausambi, Mainpuri, Mathura, Mirzapur, Shahjahanpur & Siddharth Nagar have moved from less developed to developing status. During the entire period of the study, the following districts remained in the lower web of socio-economic development: Auraiya, Bahraich, Banda, Etah, Hathras, Jalaun, Kasganj, Lalitpur, Mahrajganj, Rampur, Sant Kabir Nagar, Sambhal, Shamli, Sonbhadra into the less developed category while, Hamirpur, Mahoba & Shrawasti into the least developed category. In Time Periods I and II, more than 53 percent of Uttar Pradesh's total districts were in the less/least developed category, which was highly concerning; however, in Time Period III, there has been a significant improvement in this condition, with this, percentage reduces to 23 percent. Districts that remain in the less/least developed category clearly require a tremendous deal of attention, planning, and, most importantly, political will to improve their socio-economic status.

4.4 Area and Population under Different Levels of Development

One of the most essential aspects of this study is to determine the total area and population of the state at various stages of development almost over the last three decades. As a result, the purpose of this section is to determine the percentage share of area and population affected under various levels of development in the state. The following table provides information on the area and population covered by different districts at various stages of development over different periods.

Table 4.5: Percentage of Area and Population

Level of Development	**Periods**					
	I (2000-01)		**II (2010-11)**		**III (2017-18)**	
	Area	**Population**	**Area**	**Population**	**Area**	**Population**
Highly Developed	8.52	13.47	4.98	9.62	2.71	6.64
Developed	7.27	9.59	9.86	13.44	13.82	19.11
Developing	36.72	36.74	33.80	33.20	62.65	61.23
Less Developed	40.45	35.50	44.96	40.34	17.17	11.47
Least Developed	7.04	4.70	6.40	3.40	3.65	1.55

The above table clearly indicates that the area and population covered by the highly developed group declines due to movement of three important districts Kanpur Nagar, Mirzapur & Prayagraj to the lower categories of development continuously from first period to the last period. The findings include some positive aspects, such as the fact that the developed & developing category's area and population expanded markedly in Period-III. These figures were around 7.27 percent and 9.59 percent in Period I and 13.82 percent and 19.11 percent in Period-III, respectively for developed category while, for developing categories the figures were around 36.72 percent and 36.74 percent in Period I and 62.65 percent and 61.23 percent in Period-III, respectively. This is primarily owing to the fact that most of the districts lying in the less developed category in Period-I altered their status from less developed to developing category during Period-III.

It is also worth noticing that, after rising slightly from Period-I to Period-II, the percentage share of area and people in the less developed group have rapidly declined again in Period-III, implying that the government given enough attention to the less developed category in Period-II. Despite the existence of disparities in districts, the distribution of total area and population in the developed and developing categories suggests that a larger proportion of the state has made significant improvement in the socio-economic sector in the last period.

4.5 Identification of Model Districts and Fixation of Potential Targets

The most important feature of this study is that we have determined the model district for all least and less developed districts of latest time periods that the suitable attention should be given by the planners and policy makers to these districts keeping in mind the model districts. This is done by using the approach given by Rai and Bhatia (2004) explained in Section (**??**). Now, for setting up the potential targets, for particular least/less developed districts, the average value of the indicators of 'model' districts will be referred to as potential target for district for a given indicator and is repeated for all the indicators separately.

4.5.1 Model Districts for Less and Least Developed Districts

Model districts for less and least developed districts have been identified for socio-economic sector on the basis of composite indices of development and the developmental distances among different districts for the latest period (2017-18). The list of model districts identified for various less and least developed districts is given below in the Table 4.6.

Table 4.6: Model Districts for Less and Least Developed Districts

Sr. No.	Less/ Least Developed Districts	Model Districts for Less/ Least Developed Districts
1.	Auraiya	Agra, Aligarh, Meerut, Prayagraj, Amethi, Amroha, Ayodhya, Barabanki, Basti, Bareily, Deoria, Kanpur Dehat, Mathura, Raebareli
2.	Bahraich	Agra, Aligarh, Ayodhya, Bareily, Bijnor, Bulandsahar, Firozabad, Kanpur Nagar, Sitapur, Sultanpur
3.	Banda	Agra, Aligarh, Barabanki, Basti, Bareily, Deoria, Farukkhabad, Hapur, Hardoi, Kannauj, Kanpur Nagar, Mathura, Mau, Raebareli, Varanasi
4.	Etah	Ayodhya, Barabanki, Bareily, Chandauli, Meerut, Prayagraj,Basti, Bareily, Deoria, Kanpur Dehat, Kheri, Mathura, Raebareli, Moradabad, Unnao
5.	Hathras	Agra, Barabanki, Gorakhpur, Gonda, Kanpur Nagar, Meerut, Prayagraj, Pratapgarh, Raebareli, Sitapur, Sultanpur, Unnao
6.	Jalaun	Azamgarh, Ambedkar Nagar, Amroha, Barabanki, Bijnor, Bareily, Chandauli, Deoria, Etawah, Hapur, Jaunpur, Mathura, Mau
7.	Kasganj	Agra, Aligarh, Barabanki, Bareily, Chandauli, Meerut, Prayagraj, Basti, Bareily, Deoria, Kanpur Nagar, Kanpur Dehat, Mathura, Raebareli, Moradabad, Pratapgarh, Sultanpur
8.	Lalitpur	Badayun, Basti, Bareily, Etawah, Farukkhabad, Firozabad, Gorakhpur, Kanpur Dehat, Mathura, Moradabad, Sitapur
9.	Mahrajganj	Azamgarh, Ambedkar Nagar, Amroha, Barabanki, Bijnor, Bareily, Chandauli, Deoria, Etawah, Hapur, Jaunpur, Mathura, Mau, Unnao
10.	Rampur	Agra, Ayodhya, Barabanki, Bareily, Chandauli, Meerut, Prayagraj, Basti, Bareily, Deoria, Kanpur Nagar, Kanpur Dehat, Mathura, Raebareli, Pratapgarh, Sultanpur, Varanasi
11.	Sant Kabir Nagar	Agra, Ayodhya, Barabanki, Bareily, Chandauli, Meerut, Prayagraj, Basti, Bareily, Deoria, Kanpur Nagar, Kanpur Dehat, Kheri, Mathura, Raebareli, Moradabad, Unnao
12.	Sambhal	Ambedkar Nagar, Amroha, Barabanki, Chandauli, Meerut, Prayagraj, Basti, Bareily, Deoria, Kanpur Dehat, Kheri, Mathura, Raebareli, Moradabad, Unnao
13.	Shamli	Ayodhya, Basti, Gorakhpur, Gonda, Kanpur Nagar, Meerut, Prayagraj, Pratapgarh, Raebareli, Sitapur, Sultanpur, Unnao

14.	Sonbhadra	Azamgarh, Ambedkar Nagar, Amroha, Barabanki, Bijnor, Bareily, Chandauli, Deoria, Etawah, Hapur, Jaunpur, Mathura, Mau, Unnao
15.	Hamirpur	Agra, Aligarh, Ayodhya, Bareily, Chandauli, Meerut, Prayagraj, Basti, Bareily, Deoria, Kanpur Dehat, Kheri, Mathura, Raebareli, Moradabad, Unnao
16.	Mahoba	Aligarh, Ambedkar Nagar, Amroha, Barabanki, Chandauli, Meerut, Prayagraj, Basti, Bareily, Deoria, Kanpur Dehat, Kheri, Mathura, Raebareli, Moradabad, Prayagraj, Unnao
17.	Shrawasti	Agra, Aligarh, Ayodhya, Barabanki, Bareily, Meerut, Prayagraj, Basti, Bareily, Deoria, Kanpur Nagar,Mathura, Raebareli, Pratapgarh, Sultanpur, Varanasi

4.5.2 Potential Targets for Less and Least Developed Districts

Potential targets are the extent of improvement required in different indicators of least/less developed districts. It will also provide direction to bring out uniform regional socio-economic development in the state. Such knowledge may assist planners and administrators in reallocating resources to address disparities in development throughout the state's districts. The potential target for all the twenty-two indicators for socio-economic development in respect of less/least developed districts have been calculated as the average value of the indicator of the model districts and are presented in Table 4.7 .

Table 4.7: Potential Targets for Less and Least Developed Districts

1. Infant Mortality Rate (per thousand)								
Auraiya 48 (58)	Bahraich 50 (66)	Banda 49 (55)	Etah 52 (67)	Hathras 47 (57)	Jalaun 54 (65)	Lalitpur 55 (73)	Mahrajganj 58 (78)	Rampur 49 (60)
S.K.Nagar 50 (63)	Sambhal 55 (65)	Shamli 58 (70)	Sonbhadra 56 (69)	Hamirpur 50 (45)*	Mahoba 48 (46) *	Shrawasti 55 (96)	Kasganj 50 (69)	
2. Child Mortality Rate (per thousand)								
Auraiya 65	Bahraich 72	Banda 74	Etah 70	Hathras 66	Jalaun 69	Lalitpur 78	Mahrajganj 58	Rampur 64

(84)	(105)	(96)	(86)	(78)	(97)	(114)	(96)	(86)
S.K.Nagar	Sambhal	Shamli	Sonbhadra	Hamirpur	Mahoba	Shrawasti	Kasganj	
67	59	58	60	62	65	75	61	
(91)	(82)	(80)	(99)	(66)	(73)	(130)	(89)	
3. Sex Ratio								
Auraiya	Bahraich	Banda	Etah	Hathras	Jalaun	Lalitpur	Mahrajganj	Rampur
892	901	899	900	895	898	904	907	905
(864)	(892)	(863)	(873)	(871)	(865)	(906) *	(943) *	(909) *
S.K.Nagar	Sambhal	Shamli	Sonbhadra	Hamirpur	Mahoba	Shrawasti	Kasganj	
915	902	904	908	910	907	904	909	
(972) *	(896)	(878)	(918) *	(861)	(878)	(881)	(880)	
4. No. of Family Welfare Centres								
Auraiya	Bahraich	Banda	Etah	Hathras	Jalaun	Lalitpur	Mahrajganj	Rampur
354	374	367	318	298	357	356	384	341
(206)	(363)	(352)	(224)	(192)	(345)	(231)	(341)	(257)
S.K.Nagar	Sambhal	Shamli	Sonbhadra	Hamirpur	Mahoba	Shrawasti	Kasganj	
374	355	358	366	350	348	345	374	
(219)	(261)	(173)	(208)	(270)	(178)	(193)	(214)	
5. Percentage of decennial growth of population								
Auraiya	Bahraich	Banda	Etah	Hathras	Jalaun	Lalitpur	Mahrajganj	Rampur
24	26	25	23	27	30	28	27	24
(17)	(29) *	(20)	(16)	(17)	(16)	(25)	(24)	(21)
S.K.Nagar	Sambhal	Shamli	Sonbhadra	Hamirpur	Mahoba	Shrawasti	Kasganj	
26	22	22	27	50	28	27	20	
(21)	(24) *	(17)	(24)	(11)	(16)	(31) *	(17)	
6. Population density (per sq. Km.)								
Auraiya	Bahraich	Banda	Etah	Hathras	Jalaun	Lalitpur	Mahrajganj	Rampur
480	561	490	527	745	840	784	580	698
(689)	(666)	(408) *	(730)	(850)	(370) *	(242) *	(910)	(987)
S.K.Nagar	Sambhal	Shamli	Sonbhadra	Hamirpur	Mahoba	Shrawasti	Kasganj	
845	789	879	560	574	489	604	654	
(1042)	(899)	(950)	(270) *	(275) *	(279) *	(681)	(735)	
7. Percentage of urban population to total population (Urbanization)								
Auraiya	Bahraich	Banda	Etah	Hathras	Jalaun	Lalitpur	Mahrajganj	Rampur
38	35	34	37	47	49	34	48	49
(17)	(8)	(15)	(15)	(21)	(25)	(14)	(5)	(25)
S.K.Nagar	Sambhal	Shamli	Sonbhadra	Hamirpur	Mahoba	Shrawasti	Kasganj	
40	55	48	56	50	38	45	34	
(7)	(22)	(29)	(17)	(97)	(21)	(3)	(20)	
8. Schedule caste as percentage of total schedule caste								

Auraiya	Bahraich	Banda	Etah	Hathras	Jalaun	Lalitpur	Mahrajganj	Rampur
1.4	1.7	1.5	1.4	1.6	1.8	1.5	1.4	1.2
(0.95)	(1.23)	(0.94)	(0.68)	(0.94)	(1.13)	(0.58)	(1.19)	(0.74)
S.K.Nagar	Sambhal	Shamli	Sonbhadra	Hamirpur	Mahoba	Shrawasti	Kasganj	
1.2	1.4	1.2	1.1	1.4	1.3	1.7	1.5	
(0.89)	(0.88)	(0.36)	(1.02)	(0.58)	(0.53)	(0.46)	(0.61)	
9. Livestock density								
Auraiya	Bahraich	Banda	Etah	Hathras	Jalaun	Lalitpur	Mahrajganj	Rampur
741	560	741	745	647	540	457	588	551
(318)	(276)	(213)	(264)	(841) *	(176)	(176)	(187)	(377)
S.K.Nagar	Sambhal	Shamli	Sonbhadra	Hamirpur	Mahoba	Shrawasti	Kasganj	
510	747	587	560	554	687	578	547	
(204)	(320)	(300)	(150)	(197)	(179)	(297)	(604) *	
10. Male Literacy Rate								
Auraiya	Bahraich	Banda	Etah	Hathras	Jalaun	Lalitpur	Mahrajganj	Rampur
80	75	80	84	82	80	79	81	84
(86) *	(58)	(78)	(81)	(82)	(83) *	(75)	(76)	(61)
S.K.Nagar	Sambhal	Shamli	Sonbhadra	Hamirpur	Mahoba	Shrawasti	Kasganj	
84	82	77	84	84	83	74	76	
(78)	(64)	(65)	(75)	(80)	(76)	(57)	(72)	
11. Female Literacy Rate								
Auraiya	Bahraich	Banda	Etah	Hathras	Jalaun	Lalitpur	Mahrajganj	Rampur
65	58	62	61	63	67	68	58	55
(71) *	(39)	(54)	(59)	(59)	(62)	(51)	(49)	(44)
S.K.Nagar	Sambhal	Shamli	Sonbhadra	Hamirpur	Mahoba	Shrawasti	Kasganj	
65	60	62	64	61	60	56	54	
(55)	(45)	(45)	(52)	(56)	(53)	(35)	(49)	
12. S.C. Literacy Rate								
Auraiya	Bahraich	Banda	Etah	Hathras	Jalaun	Lalitpur	Mahrajganj	Rampur
67	65	63	62	60	58	61	62	59
(72)	(43)	(57)	(64)	(65) *	(68) *	(59)	(58)	(56)
S.K.Nagar	Sambhal	Shamli	Sonbhadra	Hamirpur	Mahoba	Shrawasti	Kasganj	
62	58	58	59	56	62	58	57	
(60)	(55)	(50)	(56)	(62) *	(57)	(40)	(54)	
13. Rural Literacy Rate								
Auraiya	Bahraich	Banda	Etah	Hathras	Jalaun	Lalitpur	Mahrajganj	Rampur
65	58	66	64	67	64	63	66	60
(78) *	(48)	(64)	(70) *	(72) *	(72) *	(60)	(62)	(52)

S.K.Nagar	Sambhal	Shamli	Sonbhadra	Hamirpur	Mahoba	Shrawasti	Kasganj	
62	59	65	62	57	64	57	62	
(66) *	(51)	(66)	60	(67) *	(63)	(46)	(60)	
14. Urban Literacy Rate								
Auraiya	Bahraich	Banda	Etah	Hathras	Jalaun	Lalitpur	Mahrajganj	Rampur
80	74	78	72	77	75	79	76	75
(86) *	(69)	(80) *	(77) *	(72)	(78) *	(81) *	(78)	(56)
S.K.Nagar	Sambhal	Shamli	Sonbhadra	Hamirpur	Mahoba	Shrawasti	Kasganj	
78	70	72	71	73	76	72	74	
(75)	(62)	(67)	(84) *	(77)*	(74)	(64)	(65)	
15. Literacy gap between male & female								
Auraiya	Bahraich	Banda	Etah	Hathras	Jalaun	Lalitpur	Mahrajganj	Rampur
14	17	19	18	20	17	15	20	16
(16)	(19)	(24)	(22)	(23)	(21)	(24)	(27)	(17)
S.K.Nagar	Sambhal	Shamli	Sonbhadra	Hamirpur	Mahoba	Shrawasti	Kasganj	
18	12	16	20	20	19	16	20	
(24)	(19)	(20)	(23)	(24)	(23)	(22)	(23)	
16. Pupil teacher ratio at higher secondary schools								
Auraiya	Bahraich	Banda	Etah	Hathras	Jalaun	Lalitpur	Mahrajganj	Rampur
40	42	38	37	40	39	41	38	39
(43)	(23) *	(42)	(40)	(54)	(44)	(59)	(45)	(42)
S.K.Nagar	Sambhal	Shamli	Sonbhadra	Hamirpur	Mahoba	Shrawasti	Kasganj	
41	48	42	40	43	38	47	41	
(17) *	(73)	(66)	(46)	(59)	(19) *	(54)	(26) *	
17. No. of employees in registered working factories per lakh of population								
Auraiya	Bahraich	Banda	Etah	Hathras	Jalaun	Lalitpur	Mahrajganj	Rampur
374	210	254	279	297	241	210	247	297
(341)	(41)	(20)	(48)	(168)	(75)	(17)	(31)	(337) *
S.K.Nagar	Sambhal	Shamli	Sonbhadra	Hamirpur	Mahoba	Shrawasti	Kasganj	
250	256	217	287	211	298	246	231	
(47)	(149)	(150)	(653) *	(79)	(20)	(60)	(26)	
18. District wise employment in public sector								
Auraiya	Bahraich	Banda	Etah	Hathras	Jalaun	Lalitpur	Mahrajganj	Rampur
64210	55620	49580	52678	99120	57841	55872	31258	49657
(4557)	(15662)	(10970)	(17330)	(4382)	(12417)	(10711)	(19)	(13398)
S.K.Nagar	Sambhal	Shamli	Sonbhadra	Hamirpur	Mahoba	Shrawasti	Kasganj	
50642	55879	58458	56654	50324	48678	55654	42365	
(3321)	(21327)	(2076)	(24760)	(8705)	(6172)	(327)	(2171)	

19. Per Capita Credit (Rs.)								
Auraiya 2245 (6345)	Bahraich 2461 (1850) *	Banda 2374 (5943)	Etah 4218 (18947)	Hathras 5412 (17041)	Jalaun 2287 (28786)	Lalitpur 3245 (11432)	Mahrajganj 2987 (2767) *	Rampur 4587 (12350)
S.K.Nagar 5781 (8700)	Sambhal 4587 (12365)	Shamli 3547 (15585)	Sonbhadra 4789 (3832) *	Hamirpur 4987 (13967)	Mahoba 3489 (24424)	Shrawasti 5974 (14364)	Kasganj 3517 (9685)	
20. Per Capita Deposits (Rs.)								
Auraiya 98448 (23453)	Bahraich 80550 (13066)	Banda 95470 (24689)	Etah 102587 (31321)	Hathras 103897 (25252)	Jalaun 99874 (25724)	Lalitpur 108517 (20867)	Mahrajganj 99785 (19546)	Rampur 100587 (19052)
S.K.Nagar 102587 (19546)	Sambhal 104789 (15717)	Shamli 105478 (23224)	Sonbhadra 108456 (34440)	Hamirpur 152140 (25343)	Mahoba 103879 (24414)	Shrawasti 98745 (14752)	Kasganj 94532 (16201)	
21. District wise police stations/police post								
Auraiya 27 (24)	Bahraich 29 (24)	Banda 30 (25)	Etah 28 (22)	Hathras 24 (14)	Jalaun 29 (23)	Lalitpur 31 (20)	Mahrajganj 25 (21)	Rampur 26 (21)
S.K.Nagar 22 (10)	Sambhal 21 (13)	Shamli 20 (10)	Sonbhadra 28 (31) *	Hamirpur 27 (20)	Mahoba 29 (15)	Shrawasti 25 (10)	Kasganj 28 (12)	

Note that in the above table the figures within brackets denote actual achievement and the asterisk (*) marked values depict the cases where actual achievement is better than the potential target. It has been observed that some of the indicators have the actual value more than that of potential targets.

4.6 Some Conclusive Remarks

The variations in different socio-economic indicators in all seventy-five districts are quantified using various approaches of development measurement, and the ranking of the districts in socio-economic development is obtained over a time span of twenty-eight years. The study also sug-

gested model districts for less-developed and least-developed districts, as well as potential targets of socio-economic indicators for less-developed and least-developed districts. The important conclusions and policy implications emerging from the present study are as follows:

1. Wide disparities in the levels of overall socio-economic development are seen among all the districts of Uttar Pradesh.

2. In Uttar Pradesh, the districts G.B. Nagar, Lucknow, Ghaziabad, Prayagraj and Varanasi are developing significantly more rapidly than the rest of the state's districts in terms of socio-economic development. The state government and policymakers must deal with this reality in order to decrease the flow of unemployed people to these developed districts by providing jobs and improving health care infrastructure and education facilities in less and least developed areas.

3. It is evident from the present study that the pattern of regional socio-economic development in UP is quite unequal. Wide regional disparities have been observed among all the districts.

4. The C.I. values for the majority of the districts are found to be closer to 1, indicating that the socio-economic sector still need more attention to attain higher development.

5. It is found that the districts of G.B. Nagar, Ghaziabad, Lucknow, Prayagraj, Varanasi, Kanpur Nagar and others were highly developed/developed during the time periods under study. In comparison to other districts, the performance of these districts is remarkably high.

6. In latest period 2017-18, districts like G.B. Nagar, Lucknow, Ghaziabad, Varanasi & Prayagraj are the top five districts with respectively highest level of socio-economic development in the state and their composite index of infrastructural development ranges between 0.6791-0.7780.

7. In latest period 2017-18, districts like Mahoba, Shrawasti, Hamirpur, Baghpat & Chitrakoot are the last five districts with respectively lowest level of infrastructural development in the state and their composite index of infrastructural development ranges between 0.9507-0.9976.

8. The district of G.B. Nagar has been found to be top ranked in all the time periods under study. The performance of this district is remarkably high as compared to other districts.

9. It is observed that, for all the considered periods under study, the level of socio-economic development in less/least developed districts lagged much behind than the highly developed/developed districts and calls for plentiful efforts of the government to get a balanced regional social and economic development of the state.

10. It seems that the important thing in the planning is to pay due attention towards less & least developed districts which are at low level of socio-economic services.

Overall, the regional variations in socio-economic sector in various districts have tended, over time, to decrease slightly. The decline in disparities is nonetheless very modest, that is why there are still regional disparities in socio-economic development in several districts of Uttar Pradesh.

Chapter 5

Regional Disparities in Spatio–temporal Development in Uttar Pradesh

5.1 Introduction

A balanced regional development is the precondition to the growth, prosperity, and progress of any society. It enables a good quality of life for its citizens, rightfully empowering them with equitable economic and social opportunities. It also necessitates competent governance, timely and effective program and policy implementations along with proper resource management. A state's balanced growth is possible only through a reasonable spatial development in every contributing area, be it economic, agriculture, infrastructure, social, or services. Therefore, accurate information about the status of development in these sectors is crucial for planning and allocating various funds and subsidies; eventually leading to achieve the goal of balanced regional development. Consequently, the emphasis of state government, social scientists, and researchers should be focused to carve out the expanse of disparities about the various infrastructural, industrial, agricultural and socio-economic parameters so that befitting attention may be paid by the policymakers and administrators towards lesser developed areas.

In earlier chapters, attempts were directed towards identifying regional disparities in devel-

opment in Agricultural, Infrastructural and Socioeconomic Sectors separately in different districts of Uttar Pradesh. In a very big state like Uttar Pradesh, equitable development in all the sectors, in all the districts, may not be expected owing to their diverse demographic, historic, economic, and ecological conditions. Not only wide inequalities were found in the performance of districts within each sector of development, but a significant variation in the performance of districts was also observed among different sectors of development. For instance, while some of the districts fared very well in agriculture, their performance was not so good in other infrastructure or socioeconomic factors and vice versa. This encouraged us to understand if the performance of different districts may be evaluated on a single scale. Explicably, the basic requisite to achieve this is to combine the developmental efforts in different sectors in such a way so that it gives a picture of the overall development of a region. In view of this, the aim of the present chapter is to identify and understand the differences in overall development in all the districts of the state of Uttar Pradesh. A relative hierarchy of districts in terms of overall development has been established during almost the last three decades, and efforts have been undertaken to identify indicators that are responsible for the existing variation in development.

To quantify the level of development in agricultural, infrastructural, socio-economic sectors, the composite indices based on sixty-five indicators have been used for three different time periods viz Period-I (2000-01), Period-II (2010-11) & period-III (2017-18). In order to assess the overall development of the state, the composite indices obtained sector-wise are combined appropriately to get a weighted mean development index. It is worth mentioning here that each sector of development does not contribute equally to the overall development of any region. Therefore, following the methodology adopted by Dube et.al. (2020) a weighted mean development index has been computed for all the districts of Uttar Pradesh. These weights to various sectors contribute to determining overall development. Such a choice of weights ensures that large variation in any one

indicator will not unduly dominate the contribution of the other indicators. Using these weights, the weighted mean development indices for overall development for different periods were computed as per the method given in Section 1.4.2. These weighted mean development indices were then used to rank all the seventy-five districts of Uttar Pradesh according to their level of overall economic development.

Changes in the performance of different districts in different sector of development over time are inevitable. Therefore, the work in the chapter is also directed towards studying the statistical significance of changes in the level of development over three different time periods with respect to agriculture, infrastructure, socio-economic & overall development.

As done in previous chapters, the districts of the state have been classified into five categories of development viz highly developed, developed, developing, less developed, and least developed districts. Using this classification, model districts and potential targets for less and least districts, which are essential for policy implications and regional planning, have been obtained. Elucidation of concordance between agricultural, infrastructural, and socio-economic sectors of development also forms the subject matter of this chapter. The following is the outline for this chapter: Statistical analysis of various indicators related to agriculture, infrastructure and socio-economic development in Uttar Pradesh is presented in Section 5.2. The section also gives weighted-mean development indices and ranking of the districts in terms of overall development. Section 5.3 is devoted to the classification of districts in view of their overall development. Section 5.4 examines the changes in development patterns over different periods of time and Section 5.5 investigates interrelationships between various sectors of development. Finally, in Section 5.6, some concluding remarks are given.

5.2 Statistical Analysis of Overall Development

The study uses data from all seventy-five districts in Uttar Pradesh on 65 indicators, twenty-two of which are directly related to agricultural development, twenty-two of which depict the progress of development in the infrastructure sector, and the remaining twenty-one indicators present the level of development in the socioeconomic sector. The sixty-five indicators collectively show a region's overall development. The data for the indicators listed in Section (1.5) were collected at three different points of time, namely Period – I (2000-01), Period – II (2010-11), and Period – III (2017-18). Indicators common to all the districts have been included in the analysis for overall development.

To have a better view of development, let us first define the variables that work in either the positive or negative direction of development. Clearly, higher infant and child mortality rates, a higher literacy gap between male and female, a higher pupil teacher ratio, and a higher value of per capita credit are taken in the negative direction of development, whereas higher values of other indicators, primarily from the agricultural and infrastructure sectors, contributes in the positive direction.

5.2.1 Weighted Mean Development Index

The composite indices computed in earlier chapters may be combinedas suchto depict overall development in the state. However, these sectors do not contribute equally in the overall development of the state. Therefore, the weighted mean development index has been estimated by using the procedure given by Iyengar *et al.* (1982) given in Section (1.4.2). The weights of each sector are assigned in such a way that, $0 \leq w_i \leq 1$ with $\sum_{i=1}^{m} w_i = 1$, where w_i represents the weight of i^{th} sector, $\forall\ i = 1, 2, \ldots m$. The weighted mean development index thus obtained, represents

the overall economic development of each district and lies in the interval [0,1]. The value of this index closer to zero indicates a lower level of development whereas its value of closer to zero indicate otherwise. The weights for each different sector for different time periods are computed as described in equation 1.4.7 and are given in the following Table 5.1.

Table 5.1: Weights for Different Sectors of Development

Sr No.	**Sectors**	**Periods**		
		I (2000-01)	**II (2010-11)**	**III (2017-18)**
1.	**Agriculture**	0.323	0.340	0.306
2.	**Infrastructure**	0.386	0.348	0.378
3.	**Socio-economic**	0.291	0.310	0.317

These weights assigned to various sectors enable us to determine overall development. Such weighting ensures that large variations in any one indicator do not overpower the contribution of the other indicators. Weights during the entire study period clearly show that infrastructure and agriculture were and continue to be a dominant sector in Uttar Pradesh. Using these weights, the weighted mean development indices for overall development for different time periods were derived using the approach described in Section (1.4.2). Table 5.2 displays the values of weighted mean development indices as well as the rankings of individual districts.

Table 5.2: Weighted Mean Development Index

Districts	**Period-I (2000-01)**		**Period-II (2010-11)**		**Period-III (2017-18)**	
	W.I.	**Rank**	**W.I.**	**Rank**	**W.I.**	**Rank**
Agra	0.6087	11	0.5329	15	0.6405	5
Aligarh	0.6616	7	0.5503	9	0.5953	9
Ambedkar Nagar	0.4782	43	0.4393	35	0.4850	29
Amethi	0.3302	64	0.1899	71	0.4508	35
Amroha	0.4814	39	0.4510	32	0.5014	26
Auraiya	0.5123	26	0.4740	27	0.5278	20
Ayodhya	0.5552	18	0.5345	14	0.5072	24
Azamgarh	0.3938	57	0.3449	57	0.4123	47

Badayun	0.4604	46	0.3422	58	0.3912	54
Baghpat	0.4924	35	0.4972	20	0.5468	17
Bahraich	0.3883	58	0.2686	68	0.3373	66
Balia	0.4258	51	0.4502	33	0.4731	32
Balrampur	0.1921	74	0.2957	64	0.2828	68
Banda	0.2954	69	0.2686	67	0.2712	70
Barabanki	0.5321	22	0.4957	21	0.4775	31
Bareily	0.5793	16	0.4823	25	0.4881	28
Basti	0.4812	40	0.4228	38	0.3643	61
Bijnor	0.5094	29	0.4415	34	0.5164	22
Bulandsaher	0.6027	12	0.4938	22	0.5923	10
Chandauli	0.4219	55	0.3708	51	0.3438	65
Chitrakoot	0.2236	73	0.1875	72	0.1696	74
Deoria	0.5547	19	0.4679	28	0.3973	52
Etah	0.4962	33	0.4120	42	0.5165	21
Etawah	0.5270	24	0.5503	10	0.5283	19
Farukkhabad	0.5138	25	0.5447	11	0.4499	37
Fatehpur	0.5100	28	0.3959	46	0.3304	67
Firozabad	0.6130	9	0.4900	24	0.5380	18
G.B. Nagar	0.7942	2	0.9417	1	1.0000	1
Ghaziabad	0.8901	1	0.8604	2	0.7812	2
Ghazipur	0.5109	27	0.4757	26	0.4504	36
Gonda	0.3783	60	0.3549	55	0.4417	38
Gorakhpur	0.5336	21	0.5087	19	0.4651	34
Hamirpur	0.3043	67	0.2778	65	0.3619	62
Hapur	0.4438	47	0.4565	30	0.6020	8
Hardoi	0.4613	45	0.3929	47	0.4250	45
Hathras	0.4940	34	0.5121	18	0.5111	23
Jalaun	0.4223	53	0.4046	43	0.4320	41
Jaunpur	0.5006	31	0.3806	49	0.4073	51
Jhansi	0.4850	36	0.4044	44	0.4401	39
Kannauj	0.4623	44	0.4669	29	0.4100	50
Kanpur Dehat	0.5918	14	0.5531	8	0.5722	12
Kanpur Nagar	0.7933	3	0.6665	5	0.6349	6
Kasganj	0.3109	66	0.2585	69	0.4276	43
Kausambi	0.3310	63	0.3852	48	0.4111	48

Kheri	0.4349	49	0.3692	52	0.4270	44
Kushinagar	0.4220	54	0.3498	56	0.3598	63
Lalitpur	0.3110	65	0.2752	66	0.2801	69
Lucknow	0.7510	4	0.7892	3	0.7233	3
Mahoba	0.2325	72	0.1737	73	0.2333	73
Mahrajganj	0.3871	59	0.3308	59	0.3781	56
Mainpuri	0.5270	23	0.4930	23	0.4887	27
Mathura	0.5708	17	0.5156	17	0.5515	15
Mau	0.4830	38	0.4376	36	0.4779	30
Meerut	0.7490	5	0.6655	6	0.6822	4
Mirzapur	0.4830	37	0.3138	61	0.2519	71
Moradabad	0.6089	10	0.5397	13	0.5672	14
Muzaffar Nagar	0.6019	13	0.5400	12	0.5708	13
Pilibhit	0.4800	41	0.4156	41	0.3734	59
Pratapgarh	0.4224	52	0.4166	39	0.3777	57
Prayagraj	0.6249	8	0.5798	7	0.5504	16
Raebareli	0.5060	30	0.3971	45	0.3760	58
Rampur	0.5337	20	0.3566	53	0.4688	33
Sant Kabir Nagar	0.3603	61	0.3095	65	0.3497	64
Shahjahanpur	0.4986	32	0.4363	37	0.4239	46
Sambhal	0.2508	70	0.2179	70	0.3694	60
Shamli	0.3000	68	0.3040	63	0.5063	25
Sharanpur	0.5815	15	0.5258	16	0.5913	11
Shrawasti	0.2349	71	0.1235	74	0.2336	72
Siddharth Nagar	0.3336	62	0.3282	60	0.3833	55
Sitapur	0.4377	48	0.3768	50	0.4292	42
Sonbhadra	0.1802	75	0.1192	75	0.1037	75
Sant Ravidas Nagar	0.4335	50	0.4517	31	0.3943	53
Sultanpur	0.4794	42	0.4167	40	0.4336	40
Unnao	0.3983	56	0.3560	54	0.4105	49
Varanasi	0.7196	6	0.7402	4	0.6103	7
Mean	0.4785		0.4314		0.4554	
C.V.	29.438		34.505		29.859	

The Table 5.2 clearly shows that in Period-I, the districts of Ghaziabad, G.B. Nagar, Kanpur

Nagar, Lucknow, and Meerut are the top five ranked districts in terms of overall development of the state, whereas the districts of Shrawasti, Mahoba, Chitrakoot, Balrampur, and Sonbhadra are the bottom five. It can also be noticed that the weighted mean development indices of overall development range between 0.1802-0.8901. In Period II, the districts of G.B. Nagar, Ghaziabad, Lucknow, Varanasi, and Kanpur Nagar were top ranked districts, where as Amethi, Chitrakoot, Mahoba, Shrawasti, and Sonbhadra are the lowest ranked districts. It may be seen that the values of weighted mean development indices for the Period-II lies between 0.1192-0.9417. G. B. Nagar, Ghaziabad, Lucknow, Meerut, and Agra are the top five ranked districts in Period-III, whereas Mirzapur, Shrawasti, Mahoba, Chitrakoot, and Sonbhadra are the bottom five. Furthermore, the value of weighted mean development indices spans from 0.1037 to 1.000. It was also discovered that G. B. Nagar, Ghaziabad, and Lucknow are the top performing districts in all the time periods, while Sonbhadra, Chitrakoot, and Shrawasti are the worst performing districts in terms of overall development of the state. It should be noted that C.V. is greatest in Period-III, indicating that the highest regional disparity has been seen during this period.

5.3 Classification of Districts

The weighted mean development indices are now used to classify the districts as highly developed, developed, developing, less developed and least developed using Beta distribution following the methodology in Section (1.4.3) of Chapter I. The subintervals $(0, \overline{Y}_4^{(1)})$, $(\overline{Y}_4^{(1)}, \overline{Y}_4^{(2)})$, $(\overline{Y}_4^{(2)}, \overline{Y}_4^{(3)})$, $(\overline{Y}_4^{(3)}, \overline{Y}_4^{(4)})$ and $(\overline{Y}_4^{(4)}, 1)$ for the purpose of classification have been chosen in such a way that each interval has the same probability level to characterize the various levels of development. The values of fractile $\overline{Y}_4^{(1)}, \overline{Y}_4^{(2)}, \overline{Y}_4^{(3)}$ and , $\overline{Y}_4^{(4)}$ were obtained using Beta distribution, for overall time periods given by in Table 5.3 .

Table 5.3: Values of Fractiles for Classification

Fractile	Probability	I (2000-01)	II (2010-11)	III (2017-18)
$\overline{Y}_4^{(1)}$	0.20	0.296	0.240	0.146
$\overline{Y}_4^{(2)}$	0.40	0.531	0.518	0.397
$\overline{Y}_4^{(3)}$	0.60	0.684	0.625	0.602
$\overline{Y}_4^{(4)}$	0.80	0.764	0.748	0.715

Using the Beta distribution, districts were classed as highly developed, developed, developing, less developed, and least developed. Table 5.4 shows the classification of districts based on their level of development over time.

Table 5.4: Classification of Districts

Level of Development	**2000-01**	**Area (%)**	**Population (%)**
Highly Developed	Ghaziabad, G. B. Nagar	0.99	2.58
Developed	Kanpur Nagar, Lucknow, Meerut, Varanasi	3.94	8.13
Developing	Agra, Aligarh, Ayodhya, Bareily, Bulandsahar, Deoria, Firozabad, Gorakhpur, Mathura, Moradabad, Muzaffar Nagar, Prayagraj, Rampur, Saharanpur	20.01	25.16
Less Developed	Amroha, Amethi, Ambedkar Nagar, Auraiya, Azamgarh, Badayun, Barabanki, Bahraich, Basti, Baliya, Bijnor, Chandauli, Etah, Etawah, Farrukhabad, Fatehpur, Gonda, Hapur, Hardoi, Hathras, Hamirpur, Jalaun, Jhansi, Jaunpur, Kasganj, Kannauj, Kanpur Dehat, Kausambi, Kheri, Kushi Nagar,	68.20	60.75
	Lalitpur, Mainpuri, Mahrajganj, Mau, Mirzapur, Pratapgarh, Pilibhit, Raebareli, Sant Ravidas Nagar, Sant Kabir Nagar, Shamli, Shahjahanpur, Sitapur, Siddharth Nagar, Sultanpur, Unnao		
Least Developing	Banda, Balrampur, Chitrakoot, Mahoba, Sambhal, Shrawasti, Sonbhadra	6.82	3.37
Level of Development	**2010-11**	**Area (%)**	**Population (%)**
Highly Developed	G. B. Nagar, Ghaziabad, Lucknow	2.02	4.80

Developed	Kanpur Nagar, Meerut, Varanasi.	2.92	5.89
Developing	Agra, Aligarh, Ayodhya, Amroha, Baghpat, Bulandsahar, Etawah, Farukkhabad, Kanpur Dehat, Moradabad, Muzaffar Nagar, Prayagraj	15.01	16.19
Less Developed	Ambedkar Nagar, Auraiya, Azamgarh, Badayun, Bareily, Barabanki, Banda, Bahraich, Balrampur, Basti, Baliya, Bijnor, Chandauli, Deoria, Etah, Fatehpur, Firozabad, Ghazipur, Gonda, Gorakhpur, Hapur, Hathras, Hardoi, Hamirpur, Jaunpur, Jalaun, Jhansi, Kasganj, Kannauj, Kausambi, Kheri, Kushi Nagar, Lalitpur, Mathura, Mainpuri, Mahrajganj, Mau, Mirzapur, Pratapgarh, Pilibhit, Rampur, Raebareli, Saharanpur, Sambhal, Shahjahanpur, Sant Kabir Nagar, Sant Ravidas Nagar, Sitapur, Siddharth Nagar, Shamli, Sultanpur, Unnao	73.06	69.79
Least Developing	Amethi, Chitrakoot, Mahoba, Shrawasti, Sonbhadra	6.97	3.36
Level of Development	**2017-18**	**Area (%)**	**Population (%)**
Highly Developed	G. B. Nagar, Ghaziabad, Lucknow	2.02	4.80
Developed	Agra, Kanpur Nagar, Meerut, Varanasi	4.56	8.07
Developing	Aligarh, Ayodhya, Amroha, Ambedkar Nagar, Amethi, Auraiya, Azamgarh, Barabanki, Baliya, Bareily, Baghpat, Bijnor, Bulandsahar, Etah, Etawah, Farrukhabad, Firozabad, Ghazipur, Gonda, Gorakhpur, Hapur, Hathras, Hardoi, Jaunpur, Jalaun, Jhansi, Kasganj, Kannauj, Kanpur Dehat, Kausambi, Kheri, Mau, Mathura, Mainpuri, Moradabad, Muzaffar Nagar, Prayagraj, Rampur, Saharanpur, Shamli, Shahjahanpur, Sitapur, Sultanpur, Unnao,	59.33	60.67

Less Developed	Badayun, Balrampur, Banda, Bahraich, Basti, Chandauli, Chitrakoot, Deoria, Fatehpur, Hamirpur, Kushi Nagar, Lalitpur, Mahoba, Mahrajganj, Mirzapur, Pilibhit, Pratapgarh, Raebareli, Sambhal, Sant Kabir Nagar, Sant Ravidas Nagar, Siddharth Nagar, Shrawasti,	31.30	25.51
Least Developing	Sonbhadra	2.79	0.92

The above Table 5.4 gives very interesting results and suggests a deeper introspection for the less and least developed districts. It is observed that G. B. Nagar & Ghaziabad were classified into highly developed category continuously throughout the periods under study. While, Lucknow which was classified into developed category during period I shifted its position from developed to highly developed category during Period II and Period III. Also, these three districts in period III share about 0.99 percent area of the total area and 2.58 percent population of the total population of the state. The districts of Kanpur Nagar, Meerut, Varanasi remained in the developed category in all the three periods. It is worth mentioning here that despite the smaller number of districts were classified in the highly developed & developed category, the population density is very high as compared to percentage area covered by these districts indicating the more inflow of population towards these districts due to better health care services, educational facilities, transport connectivity, employment opportunities and easy availability of livelihood resources. It is also observed that the most of the districts which remains in the less or least developed categories in Period I & II improves their position and are classified into developing category during Period III and shares about 59.33 percent area of total area and 60.67 percent population of the total population of the state implying that between the time period 2011 to 2018 there has been an unprecedented increase in the level of development in the state.

It is reasonable to mention that some of the districts such as Sonbhadra, Chitrakoot, Mahoba, Shrawasti, Banda, Badayun etc. remained in the less/least developed categories in all the time periods implying that more than 25 percent population of the state resides in the least/less developed districts. Thus at least one fourth of state requires extensive attention of the policy makers, administrators and the government officials so that a balanced development of the state does not remain a distant dream.

5.4 Changes in Development Over Different Time Periods

In order to examine the statistical significance of changes in the level of development over three different time periods with respect to agriculture, infrastructure, socio-economic & overall development the Kruskal-Wallis test as described in Section 1.5.4 have been applied.

Under the null hypothesis that there is no significant change in the development of various sectors over three different period of time, from the Table 5.5 given below, it is observed that the Kruskal-Wallis H statistic is highly significant for Infrastructure and Socio-economic sector while it is near significant for overall development of Uttar Pradesh. It indicates that there is a significant change in infrastructural and socio-economic development of Uttar Pradesh over three different periods of time. Here it is clearly observed that the median ranks of the infrastructure and socio-economic sector got a boost in the period 2010-11 but slightly declined in period 2017-18, implying the overall significant change in the development. Here, it is also observed that the median ranks for agricultural sector increases in the period 2010-11 but goes downwards in the time period 2017-18 which means necessary steps need to be taken to promote agricultural sector.

Table 5.5: Effect of Time Periods on Sector-wise Development (Kruskal Wallis Test)

Median Ranks					
Period	**No. of Districts**	**Agriculture**	**Infrastructure**	**Socio-economic**	**Overall**
2000-01	75	109.61	87.21	93.77	100.48
2010-11	75	123.16	131.09	123.25	126.15
2017-18	75	106.23	120.69	121.97	112.37
d. f.		2	2	2	2
Chi-Square Value		2.842	18.611	9.829	5.840
p- value		0.241	0.000	0.007	0.054

(Level of significance: 5%)

5.5 Inter Relationship between Various Sectors

As explained in Section 1.5.6 of Chapter I, to assess the overall development level over different periods of time it is necessary to examine the extent to which sector of the economy is influencing the other, in other words to identify the concordant pairs among agriculture, infrastructure, socio-economic and overall development. Working with the rankings of the states, obtained for different time periods using composite indices, the rank correlations have been computed and presented in Table 5.6.

The Table clearly indicates that, the value of correlation coefficient between agricultural and infrastructural sector is positive for all the three time periods and are significant for the period-I and period-II only. Here it is observed that over the periods the value of correlation coefficient is steadily decreasing which clearly implies that the pace of development differs significantly in both the sectors and agriculturally developed districts were lagging much behind in the infrastructural sector and vice-versa. The correlation coefficient between agricultural and socio-economic sector is also positive over the periods and statistically significant for the period-I and period-III

only. Similarly, the correlation between infrastructural and socio-economic sector is also positive over the periods and statistically significant for the period-I and period-III only. Here it is very important to mention that, the value of correlation coefficient between overall development to all the sectors viz agriculture, infrastructure & socio-economic is positive and highly significant for all the periods under consideration indicating that all these sectors are contributing highly towards the overall economic development of the state.

Table 5.6: Spearman's Rank Correlation Between Different Pair of Sectors

Pair of Sectors	**Items**	**2000-01**	**2010-11**	**2017-18**
Agriculture & Infrastructure	correlation p-value significance	0.480* 0.000 significant	0.420* 0.000 significant	0.142 0.024 insiginficant
Agriculture & Socio-economic	correlation p-value significance	0.347* 0.002 significant	0.168 0.151 insignificant	0.297* 0.010 significant
Agriculture & Overall	correlation p-value status	0.799* 0.000 significant	0.745* 0.000 significant	0.679* 0.000 significant
Infrastructure & Socio-economic	correlation p-value significance	0.394* 0.000 significant	0.207 0.075 insignificant	0.497* 0.000 significant
Infrastructure & Overall	correlation p-value significance	0.777* 0.000 significant	0.734* 0.000 significant	0.619* 0.000 significant
Socio-economic & Overall	correlation p-value significance	0.693* 0.000 significant	0.599* 0.000 significant	0.783* 0.000 significant
No. of Districts		75	75	75

(Note: *Correlation is significant at 1% level of Significance)

5.6 Some Conclusive Remarks

In order to obtain truly unsegregated and extensive analysis of regional disparities in the overall development of Uttar Pradesh the joint assessment of agricultural, infrastructural & socio-economic sector is required. In view of this, the exploratory analysis used in this study elucidated the com-

posite relationship between various sectors of the economy viz. agriculture, infrastructure, socio-economic. In this study, the level of development of all the seventy-five districts of Uttar Pradesh has been measured by using optimum combination of sixty-five indicator variables related to agricultural, infrastructural & socio-economic sector of the economy. The important conclusions and policy implications emerging from the present study are as follows:

1. The weighted mean development indices show the presence of high regional disparities in the state and calls the plentiful efforts of government and policy makers to give impetus and genuine support to least or less developed districts for balanced regional development.

2. The weighted mean development index shows that the districts of G. B. Nagar, Ghaziabad and Lucknow are the top ranked districts in the period-III in overall economic development and are classified into highly developed category Unfortunately, the total area under the highly developed category is only about 2.02 percent with a population of 4.80 percent. Unfortunately, the total area under the highly developed category is only about 2.02 percent with a population of 4.80 percent. Only three districts of the state i.e., Kanpur Nagar, Meerut and Varanasi could be classified in the developed category with respect to overall development with about 2.92 and 5.89 percent of the area and population respectively.

3. Sadly, the district of Sonbhadra lagged behind to all the districts and falls under the category of least developed districts in all the periods.

4. The study also reveals that about 59.33 percent of the state area and 60.67 percent of the state population is occupied by those districts which are classified under the developing category and 31.30 percent of the state area and 25.51 percent of the state population resides in the less developed districts. Thus, despite being the agricultural power house of India, Uttar Pradesh has immense regional disparities and development is confined to few districts only.

5. The Kruskal-Wallis H test indicates that there is a significant change in infrastructural & socioeconomic development of the state over the different periods of time. The median ranks for agricultural sector increased in the period 2010-11 but goes downwards in the period 2017-18, implying that necessary steps are required for the sustainable growth of agricultural sector in the state.

6. The correlation coefficient between the overall development and other sectors is positive and highly significant for all the periods under study indicating that all these sectors significantly influencing the overall economic development.

Chapter 6

An Exploratory Analysis of Regional Disparities in Development of Uttar Pradesh

6.1 Introduction

While studying the potential targets in previous chapters, it was discovered that the actual achievement of several less and least developed districts was higher than the specified potential targets of various indicators. This clearly shows that all of the variables included into the analysis are not equally responsible for the variation in development at the district level. For example, in the agricultural sector, we included twenty-two indicators in the study, and it is critical to understand which one is contributing the most to agricultural development and which indicators are responsible for the maximum variation in the agricultural development of the state. Thus, the problem is caused by the dimensionality or the inherent factor structure of the data, and identifying such inherent factors or constructs is equally important for each contributing sector be it Agriculture, Infrastructure or Socio-economic sector of the development.

To solve this problem, in the present chapter we have proposed an 'Exploratory Factor Analytic Model (EFA)' using Principal Component Analysis to uncover the principal factors or di-

mensions responsible for the disparities in development for each sector.

The state of Uttar Pradesh is divided into four administrative regions: Western region, Central region, Bundelkhand region and Eastern region, however, as discussed in previous chapters, the level of development of the districts in each of these regions is not the same. For example, if we consider the infrastructural development of Western region, it is found that G. B. Nagar is classified as highly developed district, while Badayun, Kasganj, and other districts are classified as least developed districts. This obviously shows that government policies have not been as effective as they could have been in developing all regions equally. To address this issue, in the present chapter an attempt has been made to group districts with similar levels of development together, and on this premise, the entire state of Uttar Pradesh has been grouped into a few clusters. This allows various policies for each cluster to be created for the development of each district. To achieve this, we attempted to divide Uttar Pradesh into five clusters using Multivariate Cluster Analysis, with the goal of minimising disparities in the level of development of the districts within each cluster.

The outline for this chapter is as follows: Section 6.2 contains Principal Component Analysis of 22 agricultural variables, 21 infrastructural variables, and 21 variables related to socio-economic sector of Uttar Pradesh. The Section 6.3 is devoted to identify the inherent developmental dimensions of Uttar Pradesh using Exploratory Factor Analysis. Section 6.4 provides the classification of districts in view of overall development using Cluster Analysis. Finally, in Section 6.5, some concluding remarks are given.

6.2 Principal Component Analysis

In the present chapter data from all the seventy-five districts of Uttar Pradesh on 64 indicators has been used, twenty-two of which are directly related to agricultural development, twenty-one of

which depict the progress of development in the infrastructure sector, and the remaining twenty-one indicators present the level of development in the socioeconomic sector. Thus, the sixty-four indicators collectively measure the overall development of Uttar Pradesh. The data for the indicators listed in Section (**??**) of Chapter I were used for the time period: 2018-19. Indicators common to all the districts have been included in the analysis for overall development of the state. It is important to mention that the variable "Percentage of electrified villages to total inhibited villages" from the infrastructure sector has been removed because Uttar Pradesh has electrified 100 percent of its total inhibited villages as of 2018.

Large datasets are usually difficult to interpret. To interpret such datasets, methods are required to drastically reduce their dimensionality in an interpretable way, such that most of the information in the data is preserved. Principal component analysis (PCA) is a technique for reducing the dimensionality of such datasets, increasing interpretability but at the same time minimizing information loss. It does so by creating new uncorrelated variables that successively maximize variance. Its idea is simple—reduce the dimensionality of a dataset, while preserving as much 'variability' (i.e., statistical information) as possible.

Sector-wise Principal Component Analysis (PCA) has been performed in the first stage of EFA to discover which variables are highly significant for the development of the respective sector based on communalities calculated in PCA. Following Hair et al. (2010), the variables from each sector that are discovered to be highly loaded (greater than 0.8) with communalities are then combined together in the second step to perform Exploratory Factor Analysis.

6.2.1 Principal Component Analysis for Agricultural Sector

Table 6.1 provides the communalities for agricultural sector for all the twenty-two variables. We assess the communalities for each indicator variable presented in Table 6.1 to identify which vari-

ables from agricultural sector will be retained for the EFA in the second step.

Table 6.1: Communalities for Agricultural Indicators

	Communalities		
S No.	Indicators	Initial	Extraction
1	Percentage of gross irrigated area to gross area sown	1.000	.776
2	Percentage of net area sown to cultivated land	1.000	.625
3	Percentage of cultivable land to total reporting area	1.000	.716
4	Productivity of total food grains (Qtls. /Hect)	1.000	.936
5	Percentage of net irrigated area by canal to total net irrigated area	1.000	.557
6	Percentage of net irrigated area by government tube wells to total net irrigated area	1.000	.566
7	Cropping Intensity	1.000	.674
8	Distribution of Nitrogen per hectare of gross area sown (Kg)	1.000	.859
9	Number of regulated mandis per lakh hectare of net area sown	1.000	.694
10	Availability of gross area sown per Tractor (hectare)	1.000	.834
11	Productivity of Wheat (Quintals/Hectare)	1.000	.895
12	Productivity of rice (Quintals/Hectare)	1.000	.750
13	Productivity of oilseeds (Quintals/hectare)	1.000	.693
14	Productivity of Sugarcane (Quintals/hectare)	1.000	.840
15	Per capita production of food grains (Kg)	1.000	.672
16	Per capita production of pulses (Kg)	1.000	.807
17	Percentage of area under commercial crops to gross sown area	1.000	.720
18	Production of Fish per hectare in departmental area of fisheries (Kg)	1.000	.805
19	Per capita milk availability (Kg)	1.000	.766
20	Percentage share of area under kharif crops	1.000	.857
21	Percentage share of area under Rabi crops	1.000	.922
22	Distribution of Phosphate per hectare of gross area sown (Kg)	1.000	.881
	Extraction Method: Principal Component Analysis.		

The above mentioned Table demonstrates that the variables, productivity of total food grains, distribution of Nitrogen per hectare of gross area sown, availability of gross area sown per tractor, productivity of wheat, productivity of sugar cane, per capita production of pulses, production of fish per hectare in departmental area of fisheries, percentage share of area under Kharif crops, percentage share of area under Rabi crops, distribution of Phosphate per hectare of gross area sown, were included in the EFA performed in the second step. The other variables are omitted from further analysis since their communality values are less than 0.8.

6.2.2 Principal Component Analysis for Infrastructural Sector

Table 6.2 provides the communalities for infrastructural sector for all the twenty-one variables included in the present study. We assess the communalities for each indicator variable presented in the Table to identify which variables from infrastructural sector will be retained for the EFA in the second step.

Table 6.2: Communalities for Infrastructural Indicators

	Communalities		
S No.	Indicators	Initial	Extraction
1	No. of villages with distance 5 Km. or more from railway stations/halts.	1.000	.938
2	No. of villages with distance 5 Km. or more from bus stations/stops	1.000	.880
3	Total no. of hospitals/dispensaries per lakh of population	1.000	.702
4	No. of Higher secondary schools per lakh of population	1.000	.412
5	No. of polytechnics per lakh of population	1.000	.308
6	Total length of pucca roads per thousand Sq. Km.	1.000	.597
7	Per capita consumption of electricity (KWH)	1.000	.860
8	Percentage of electricity consumption in industry to total consumption	1.000	.586

9	No. of beds in hospitals per lakh of population	1.000	.629
10	No. of L.P.G. consumers per lakh of population	1.000	.836
11	No. of Veterinary hospitals per lakh of livestock	1.000	.715
12	No. of post offices per lakh of population	1.000	.788
13	A.I. centres/subcentres per lakh of population	1.000	.584
14	Livestock development centres per lakh of livestock	1.000	.810
15	No. of industrial areas per lakh of population	1.000	.620
16	No. of small-scale industries per lakh of population	1.000	.567
17	No. of registered working factories per lakh of population	1.000	.785
18	No. of scheduled commercial banks per lakh of population	1.000	.853
19	No. of villages with distance 5 Km. or more from industrial/Grameen/Co-operative banks	1.000	.889
20	No. of villages with distance 5 Km. or more from Co-operative milk collection centre	1.000	.820
21	No. of primary agricultural credit societies per lakh of rural population	1.000	.779
	Extraction Method: Principal Component Analysis.		

The above Table demonstrated that the variables, No. of villages with distance 5 Km. or more from railway stations/halts, No. of villages with distance 5 Km. or more from bus stations/stops, Per capita consumption of electricity (KWH), No. of L.P.G. consumers per lakh of population, Livestock development centres per lakh of livestock, No. of scheduled commercial banks per lakh of population, No. of villages with distance 5 Km. or more from industrial/Grameen/Co-operative banks, No. of villages with distance 5 Km. or more from Co-operative milk collection centre, were included in the EFA performed in the second step. The other variables are omitted from further analysis since their communality value is less than 0.8.

6.2.3 Principal Component Analysis for Socio-economic Sector

Table 6.3 provides the communalities for socio-economic sector for all the twenty-one variables included in the present study. We assess the communalities for each indicator variable presented in the Table to identify which variables from socio-economic sector will be retained for the EFA in the second step.

Table 6.3: Communalities for Socio-economic Indicators

	Communalities		
S No.		Initial	Extraction
1	Infant Mortality Rate (per thousand)	1.000	.740
2	Child Mortality Rate (per thousand)	1.000	.669
3	No. of family welfare centres	1.000	.856
4	Population density (per Sq. Km.)	1.000	.854
5	Percentage of decennial growth of population	1.000	.748
6	Sex Ratio	1.000	.596
7	Urbanisation	1.000	.885
8	Schedule caste as percentage of total schedule caste	1.000	.778
9	Male Literacy Rate	1.000	.966
10	Female Literacy Rate	1.000	.946
11	Literacy gap between male and female	1.000	.547
12	Schedule caste Literacy Rate	1.000	.837
13	Rural Literacy Rate	1.000	.919
14	Urban Literacy Rate	1.000	.709
15	Pupil teacher ratio at higher secondary schools	1.000	.212
16	Livestock density	1.000	.711
17	No. of employees in registered working factories per lakh of population	1.000	.924
18	Per capita credit	1.000	.883
19	Per capita deposits	1.000	.880
20	District-wise police station & police post	1.000	.837
21	District-wise employment in public sector	1.000	.801
	Extraction Method: Principal Component Analysis.		

The above Table demonstrates that the variables, No. of family welfare centres, Population density (per Sq. Km.), Urbanisation, Male Literacy Rate, Female Literacy Rate, Schedule caste Literacy Rate, Rural Literacy Rate, No. of employees in registered working factories per lakh of population, Per capita credit, Per capita deposits, District-wise police station & police post, District-wise employment in public sector, were included in the EFA performed in the second step. The other variables are omitted from further analysis since their communality values are less than 0.8.

Thus, a total of 30 indicators, consisting of 10 indicators from agriculture, 8 indicators from infrastructure, and 12 indicators from the socioeconomic sector, were deemed to be meaningful for the EFA due to their high communality values (greater than 0.8).

6.3 Dimensions of Development: An Exploratory Factor Analysis

To identify development dimensions 'Exploratory Factor analysis (EFA)' has been used to extract smaller numbers of constructs or factors that sufficiently summarize the statistics hidden in the original set of indicators. The Exploratory Factor Analysis (EFA) using PCA is a multivariate method used to investigate the constructs or dimensions assumed to underlie a set of inter dependent variables. With minimal information loss, Exploratory Factor Analysis condenses the information contained in a set of original variables into a smaller group of factors (or dimensions). The factors obtained through exploratory factor analysis are linearly related set of original variables which are highly correlated with each other.

Various steps are involved in factor analysis (Norusis, 1990). Firstly, the adequacy of the factor model must be assessed using the correlation matrix for all variables. Secondly, we must

determine which factor model to employ, how many components to extract, and how well the model fits the original data. Thirdly, in order to make factors more interpretable, the rotation method must be chosen. Finally, the computed factor scores can be employed in further statistical studies. This methodology has been employed in this chapter.

6.3.1 Analyzing the Adequacy of EFA

Analyzing the adequacy of EFA means determining whether the indicators are significantly and sufficiently correlated with each other so that their dimension can be reduced by applying the factor analytic model. This can be achieved by computing various statistics, such as the Bartlett test of sphericity and the Keiser–Meyer–Olkin measure of sampling adequacy.

In case of EFA, from the Table 6.4 both the KMO index, with a measure 0.717, and the Bartlett test of sphericity, with a value 2898.566 with p-value 0.000 (less than 0.05) suggests that Confirmatory Factor analysis can be proceeded (see; Field 2009, Pallant 2010).

Table 6.4: KMO and Bartlett's Test of Sphericity

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.717
Bartlett's Test of Sphericity	Approx. Chi-Square	2898.566
	df	435
	Sig.	.000

6.3.2 Method of Factor Extraction

Kline (1994) suggests that to check for the stability and robustness of the solution, data should be subjected to principal components factor analysis and to maximum likelihood factor analysis. However, in the present chapter Principal Component Analysis has been used because it does not require to meet specific assumptions such as multivariate normality of the indicators.

6.3.3 Criteria for Determining the Number of Factors

The number of factors to extract is often determined using four criteria. The eigenvalue criterion, the Scree test criterion (Catell, 1966), the percentage of variance criterion, and the interpretability of the factor structure solution are the four criteria (Hair et al., 2010).

According to the eigenvalue criterion, any factors with eigenvalues greater than 1 should be kept. The rationale for the eigenvalue criteria is that any factor should account for at least the variance of a single variable. The Scree test determines the maximum number of components that can be extracted. This is determined by the point at which the curve begins to level off and become horizontal. The percentage of variance criterion recommends that any factors that account for at least 60% (approximately) of the variation of the original variables should extracted. Although no specific cut off point has been established for all data, this value is generally regarded as satisfactory in the Social Sciences. After determining the number of candidate factor solutions using the aforementioned criteria, the final number of factors to extract must pass the interpretability test. In practice, the ability to interpret and assign some meaning to the factors, works as a crucial requirement in deciding the final number of factors to extract (Hair et al., 2010).

Following Hair et al. (2010), Table 6.5 clearly indicates that the eight factors having eigen values larger than one has been retained which is also in agreement with the scree plot 6.1. The percentage of variance criterion, postulates that more than 84.812 % of the total variance of the original set of variables can be used to decide the number of factors to be extracted. In view of this, Table1 is suggestive of extracting minimum eight factors. Last but not the least, the ability of interpretative ability and an eloquent assignment to the extracted factors, is yet another enormously important criterion in reaching a decision about the final number of factors to be extracted.

We notice that in our study eight factors, which accounted for 84.812 % of the total variance

of the original set of variables, were sufficient to be retained to reveal and highlight the results of the exploratory factor analysis model.

Lastly, Varimax orthogonal rotation with Kaiser Normalization has been used to provide more reasonable factor model. Varimax rotation, which imposes an orthogonal structure on the data, should always be utilized when the resulting factor scores are to be evaluated by other statistical procedures, as is the case in the present study (Hair et al., 2010). The rotated component matrix is presented in Table 6.5 .

Table 6.5: Eigen Values and Percentage of Variance Explained

Component	**Initial Eigen values**			**Extraction Sums of Squared Loadings**		
	Total	Percentage of Variance	Cumulative Percentage	Total	Percentage of Variance	Cumulative Percentage
1	8.145	27.151	27.151	8.145	27.151	27.151
2	5.190	17.301	44.453	5.190	17.301	44.453
3	4.358	14.526	58.979	4.358	14.526	58.979
4	2.560	8.532	67.511	2.560	8.532	67.511
5	1.718	5.727	73.238	1.718	5.727	73.238
6	1.372	4.574	77.812	1.372	4.574	77.812
7	1.086	3.620	81.431	1.086	3.620	81.431
8	1.014	3.381	84.812	1.014	3.381	84.812
9	.934	3.115	87.927			
10	.692	2.306	90.234			
11	.515	1.718	91.952			
12	.489	1.630	93.582			
13	.382	1.272	94.854			
14	.274	.915	95.769			
15	.248	.828	96.596			
16	.217	.724	97.320			
17	.162	.541	97.861			
18	.124	.413	98.274			
19	.094	.315	98.589			

20	.080	.266	98.856			
21	.076	.253	99.108			
22	.063	.209	99.317			
23	.057	.188	99.506			
24	.043	.144	99.650			
25	.031	.104	99.754			
26	.023	.078	99.832			
27	.021	.069	99.901			
28	.018	.059	99.959			
29	.010	.033	99.993			
30	.002	.007	100.000			

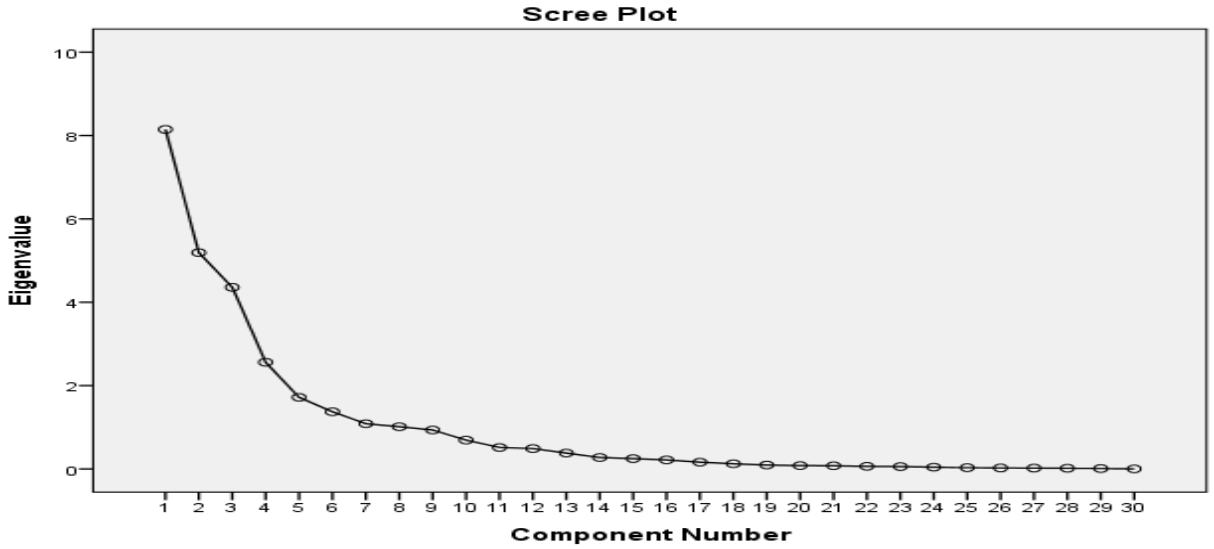

Figure 6.1: Scree Plot for EFA

In an ideal component matrix, factor loadings larger than 0.30 are considered as significant; and loadings larger than 0.50 are recognized as highly significant [see; Soares *et al.* (2003)]. From Table 6.6, it is clear that in the present analysis factor loadings greater than 0.30 are used to determine the developmental dimensions of Uttar Pradesh. The **first factor**, labeled as **"Employment in industries, Energy resources & Banking"**, has high loadings on No. of employees in registered working factories per lakh of population, per capita credit, per capita deposit, per capita electricity consumption (KWH), No. of scheduled commercial banks per lakh of population, No.

of LPG consumers per lakh of population.

The **second factor**, labeled as **"Infrastructure facilities in villages"** has high loadings on No. of villages with distance 5 Km. or more from Railway station/halts; bus stations/stops; Industrial/Grameen/Co-operative banks; cooperative milk collection center.

The **third factor** has high loadings on distribution of Phosphate and Nitrogen per hectare of gross area sown, Percentage share of area under Rabi and Kharif crops. This factor was labeled as **"Agricultural input"**.

The **fourth factor**, named **"Literacy rate"** has high loading on various types of literacy rates.

The **fifth factor**, represents mainly, productivity of total food grains, productivity of Wheat, Per capita production of pulses, Productivity of sugar cane named as **"Agricultural output"**.

The **sixth factor** has high loadings on district-wise employment in public sector, district-wise police stations & police posts and significant loading on Urbanization. This factor was labeled as **"employment in public sector, police stations and urbanization"**.

The **seventh factor**, labeled as **"Fisheries"** has high loadings on production of Fish per hectare in departmental area of fisheries and significant loading on population density.

The **eighth factor**, named **"Agricultural infrastructure"** has high loading on availability of gross area sown per tractor.

Table 6.6: Roated Component Matrix

Rotated Component Matrix[a]								
Indicator variables	Component							
	1	2	3	4	5	6	7	8
No of employees in registered working factories per lac of population	.968	-	-	-	-	-	-	-

Per capita credit	.928	-	-	-	-	-	-	-
per capita deposit	.871	-	-	-	-	-	-	-
Per capita electricity consumption	.821	-	-	-	-	-	-	-
No. of scheduled commercial banks per lakh of population	.805	-	-	-	-	-	-	-
No. of LPG consumers per lakh of population	.764	-	-	-	-	-	-	-
No. of villages with distance 5 km or more from railway stations/halts	-	.950	-	-	-	-	-	-
No. of villages with distance 5km or more from bus stations/stops	-	.914	-	-	-	-	-	-
No of villages with distance 5 km or more from Industrial/Grameen/Cooperative banks	-	.882	-	-	-	-	-	-
No. of villages with distance 5 km or more from Cooperative milk collection centre	-	.862	-	-	-	-	-	-
No of family welfare centres	-	.643	-	-	-	-	-	-
Distribution of Phosphate per hectare of gross area sown	-	-	.939	-	-	-	-	-
Distribution of total fertilizers per hectare of gross area sown	-	-	.938	-	-	-	-	-
Percentage share of area under kharif crops	-	-	.801	-	-	-	-	-
Percentage share of area under Rabi crops	-	-	-.790	-	-	-	-	-
Male Literacy rate	-	-	-	.928	-	-	-	-
Female Literacy rate	-	-	-	.880	-	-	-	-
Sc literacy rate	-	-	-	.845	-	-	-	-
Urban literacy rate	-	-	-	.800	-	-	-	-
Productivity of total food grains	-	-	-	-	.839	-	-	-
Productivity of Wheat	-	-	-	-	.814	-	-	-
livestock development centres per lac of livestock	-	-	-	-	.672	-	-	-
Per capita production of pulses	-	-	-	-	-.578	-	-	-

Productivity of Sugarcane	-				.524			
District-wise employment in public sector	-	-	-	-	-	.891	-	-
District-wise police stations & police post	-	-	-	-	-	.795	-	-
Percentage of urban population to total population (Urbanization)	-	-	-	-	-	.596	-	-
Production of Fish per hectare in departmental area of fisheries	-	-	-	-	-	-	.685	-
Population density	-	-	-	-	-	-	.436	-
Availability of gross area sown per Tractor (hectare)	-	-	-	-	-	-		.881

Using Exploratory Factor Analysis, the sixty-five variables from all three sectors of the economy resulted in primarily eight components (constructs) or dimensions for overall development of Uttar Pradesh. To attain the goal of uniform regional development, the government and policy-makers should focus on these eight pointed out developmental characteristics.

6.4 Classification of Districts Using Cluster Analysis

Cluster analysis was performed to identify groups of districts with similar levels of developmental characteristics. This technique is acknowledged as an appropriate methodology for identifying groups of cases and has been widely used in the Social Sciences. Cluster methods were applied using weighted mean development indices derived in Section 5.2.1 of Chapter V. The Ward hierarchical technique was used in the first step to define the number of clusters and compute the group centroids. A non-hierarchical cluster technique (K-means) was then used to "fine-tune" the outcomes of the best cluster solution produced by the hierarchical procedures by using the cluster centres of the best hierarchical solution as the initial seed points.

The K-mean approach assigns cases (districts) to clusters based on their distance from centroids and updates centroids' locations based on the mean values of the cases in each cluster. These steps were repeated until any reassignment of cases did not result in the cluster becoming more internally cohesive (homogeneous) and clearly differentiated from one another. As a result, the K-mean method has been successfully utilized to improve the outcomes of Ward's method.

6.4.1 Hierarchical Cluster Analysis and Determination of Value of "K"

The number of clusters or initial seed points for K-mean cluster analysis is determined by observing the Dendogram and agglomeration schedule. Based on the dendogram 6.2, it was determined that 5-cluster solutions are appropriate for grouping districts based on the basis of their developmental characteristics. However, number of clusters are also determined by analysing the agglomeration scheduled computed in the Ward's method. While, observing the coefficients presented in Table 6.7, it is clear that the difference between coefficients at stage 70 and 71 is increased drastically i.e., major jump is observed at the stage 70 & 71, thus the number of clusters are then obtained as, the difference between the number of cases and number of stages.

i.e.; Number of clusters = Number of cases – Number of stages = 75 – 70 = 5

The visual inspection of scree plot (6.3) also suggests that number of clusters (K) should be equal to 5.

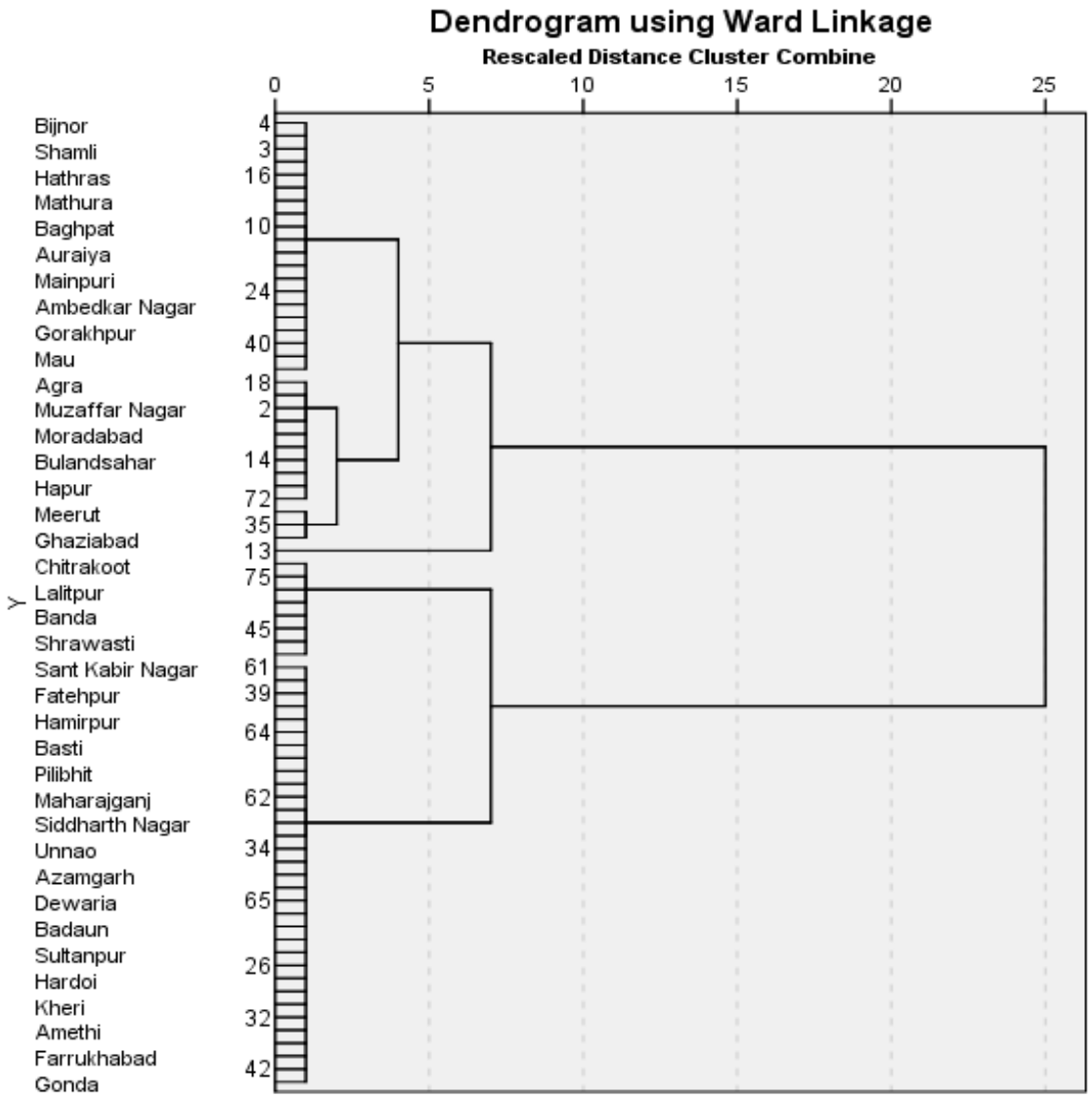

Figure 6.2: DENDOGRAM

Table 6.7: Agglomeration Schedule

Agglomeration Schedule						
Stage	Cluster Combined		Coefficients	Stage Cluster First Appears		Next Stage
	Cluster 1	Cluster 2		Cluster 1	Cluster 2	
1	4	20	.000	0	0	49
2	45	56	.000	0	0	52

3	48	62	.000	0	0	22
4	54	70	.000	0	0	10
5	40	67	.000	0	0	34
6	28	34	.000	0	0	12
7	29	30	.000	0	0	44
8	21	31	.000	0	0	21
9	22	24	.000	0	0	27
10	27	54	.000	0	4	48
11	3	51	.000	0	0	33
12	28	49	.000	6	0	20
13	1	14	.000	0	0	29
14	26	33	.000	0	0	36
15	17	50	.000	0	0	31
16	2	37	.000	0	0	32
17	41	53	.000	0	0	43
18	42	58	.000	0	0	48
19	44	64	.000	0	0	26
20	28	66	.000	12	0	30
21	21	32	.000	8	0	36
22	36	48	.000	0	3	40
23	43	57	.000	0	0	45
24	65	73	.000	0	0	35
25	7	63	.000	0	0	47
26	44	60	.000	19	0	54
27	22	52	.000	9	0	53
28	6	25	.000	0	0	46
29	1	15	.000	13	0	51
30	28	69	.000	20	0	55
31	10	17	.000	0	15	56
32	2	5	.000	16	0	59
33	3	16	.000	11	0	42
34	40	68	.000	5	0	47
35	23	65	.000	0	24	55
36	21	26	.000	21	14	43
37	18	38	.000	0	0	64
38	61	71	.000	0	0	50

39	39	55	.000	0	0	50
40	36	59	.000	22	0	46
41	12	72	.000	0	0	51
42	3	8	.000	33	0	49
43	21	41	.000	36	17	58
44	19	29	.000	0	7	56
45	43	46	.000	23	0	61
46	6	36	.001	28	40	54
47	7	40	.001	25	34	53
48	27	42	.001	10	18	58
49	3	4	.001	42	1	63
50	39	61	.001	39	38	62
51	1	12	.001	29	41	59
52	45	74	.002	2	0	61
53	7	22	.002	47	27	67
54	6	44	.002	46	26	62
55	23	28	.003	35	30	66
56	10	19	.003	31	44	63
57	9	35	.004	0	0	65
58	21	27	.005	43	48	66
59	1	2	.007	51	32	64
60	47	75	.009	0	0	68
61	43	45	.011	45	52	68
62	6	39	.014	54	50	69
63	3	10	.017	49	56	67
64	1	18	.021	59	37	70
65	9	11	.025	57	0	70
66	21	23	.030	58	55	69
67	3	7	.041	63	53	71
68	43	47	.063	61	60	72
69	6	21	.093	62	66	72
70	1	9	.133	64	65	71
71	1	3	.250	70	67	73
72	6	43	.438	69	68	74
73	1	13	.631	71	0	74
74	1	6	1.387	73	72	0

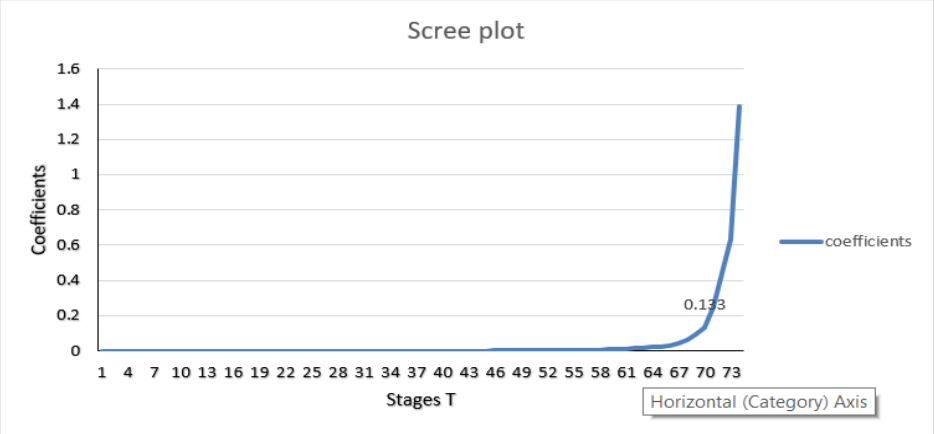

Figure 6.3: SCREE PLOT

6.4.2 K-Means Cluster Analysis

In this step, we use the values of weighted mean development indices of overall development for each district as a variables and districts as cases with K = 5 number of clusters to perform the K-Means Cluster analysis. For intensive study of the results the following Table 6.8 represents the district wise values, the mean and coefficient of variation for the different clusters:

Table 6.8: Classification of Districts

Cluster 1 (Number of districts =1)		
Districts	**Weighted Mean Index**	**Rank**
G. B. Nagar	1	1
Mean Value or Final cluster Centres	1	-
C. V.	0	-
Cluster 2 (Number of districts =5)		
Ghaziabad	0.7812	2
Lucknow	0.7233	3
Meerut	0.6822	4
Agra	0.6405	5
Kanpur Nagar	0.6349	6
Mean Value or Final cluster Centres	0.6932	-

CV	8.0755	-
Cluster 3 (Number of districts =27)		
Varanasi	0.6103	7
Hapur	0.6020	8
Aligarh	0.5953	9
Bulandsahar	0.5923	10
Sharanpur	0.5913	11
Kanpur Dehat	0.5722	12
Muzaffar Nagar	0.5708	13
Moradabad	0.5672	14
Mathura	0.5515	15
Prayagraj	0.5504	16
Baghpat	0.5468	17
Firozabad	0.5380	18
Etawah	0.5283	19
Auraiya	0.5278	20
Etah	0.5165	21
Bijnor	0.5164	22
Hathras	0.5111	23
Ayodhya	0.5072	24
Shamli	0.5063	25
Amroha	0.5014	26
Mainpuri	0.4887	27
Bareily	0.4881	28
Ambedkar Nagar	0.4850	29
Mau	0.4779	30
Barabanki	0.4775	31
Balia	0.4731	32
Rampur	0.4688	33
Mean Value or Final cluster Centres	0.5319	-
CV	0.8094	-
Cluster 4 (Number of districts =34)		
Gorakhpur	0.4651	34
Amethi	0.4508	35
Ghazipur	0.4504	36
Farukkhabad	0.4499	37

Gonda	0.4417	38
Jhansi	0.4401	39
Sultanpur	0.4336	40
Jalaun	0.4320	41
Sitapur	0.4292	42
Kasganj	0.4276	43
Kheri	0.4270	44
Hardoi	0.4250	45
Shahjahanpur	0.4239	46
Azamgarh	0.4123	47
Kausambi	0.4111	48
Unnao	0.4105	49
Kannauj	0.4100	50
Jaunpur	0.4073	51
Deoria	0.3973	52
Sant Ravidas Nagar	0.3943	53
Badayun	0.3912	54
Siddharth Nagar	0.3833	55
Mahrajganj	0.3781	56
Pratapgarh	0.3777	57
Raebareli	0.3760	58
Pilibhit	0.3734	59
Sambhal	0.3694	60
Basti	0.3643	61
Hamirpur	0.3619	62
Kushi Nagar	0.3598	63
Hardoi	0.3497	64
Sant Kabir Nagar	0.9295	65
Bahraich	0.3373	66
Fatehpur	0.3304	67
Mean Value or Final cluster Centres	0.4010	
CV	8.9461	
Cluster 5 (Number of districts =8)		
Balrampur	0.2828	68
Lalitpur	0.2801	69
Banda	0.2712	70

Mirzapur	0.2519	71
Shrawasti	0.2336	72
Mahoba	0.2333	73
Chitrakoot	0.1696	74
Sonbhadra	0.1037	75
Mean Value or Final cluster Centres	0.2283	-
CV	25.4771	-

Cluster 1, named **"Highly developed areas"**, consists of only G.B. Nagar which is the top ranked district in terms of overall development with mean value of C.I or Final cluster center as 1 which is the highest among all the five clusters during this period. This means that this cluster is more developed as compared to the remaining four clusters.

Cluster 2, named **"Developed areas"**, consists of five districts which are ranked from 2 to 6 with mean value of C.I. as 0.6932 which is less than the value of cluster 1and greater than the remaining clusters also, value of Coefficient of Variation (CV) as 8.0755 which means that the districts of this cluster are similar in terms of overall development.

Cluster 3, named **"Developing areas"**, consists of twenty-seven districts which are ranked from 6 to 33 with mean value of C.I. as 0.5319 which is less than the values of cluster 1 and 2 and value of CV is 0.8.0941 which implies that all the districts lying in this cluster having almost same level of developmental characteristics.

Cluster 4, named as **"Less developed areas"**, consists of maximum number of districts viz. 34 with mean value of C.I. as 0.4010 which is smaller than the previous clusters indicating that this cluster has low level of overall development as compared to cluster 1, 2 & 3. The value of CV in this cluster is 8.9461.

Cluster 5, named, **"Least developed areas"**, consists of eight districts with lowest rank

ranging from 68 to 75. The mean value of C.I. as 0.2283 which is lowest among all the five clusters indicating that districts falling under this cluster are poorly developed in terms of overall development. Also, value of CV in this cluster is maximum viz. 25.4772, indicative of the high regional disparities among all the five clusters and calls for plentiful efforts of the government to get a balanced regional development in this cluster.

The distance between pairs of centroids (in standardized scale) has been presented in Table 6.9, the largest distance 0.772 has been obtained between cluster 1 & 5 while distance between 1 & 4 is also high indicating that the districts of Clusters 4 & 5 lagged much behind the districts of Cluster 1 in terms of developmental characteristics. The lowest distance 0.131 has been observed between cluster 3 & 4 which shows that these clusters have somewhat similar developmental characteristics.

Table 6.9: Distance Between Final Cluster Centres

Cluster	**1**	**2**	**3**	**4**	**5**
1	–	.307	.468	.599	.772
2	.307	–	.161	.292	.465
3	.468	.161	–	.131	.304
4	.599	.292	.131	–	.173
5	.772	.465	.304	.173	–

6.5 Some Conclusive Remarks

The first and most important conclusion of the present study is that the 'Exploratory Factor Analysis' and 'Cluster Analysis' were successfully utilized in quantifying (a) the principal dimensions of developmental characteristics (factors), and (b) the level of overall development of Uttar Pradesh with different grades of development.

The eight Principal factors or dimensions extracted from Exploratory Factor Analysis that

are responsible for the overall sectoral development of Uttar Pradesh are as follows:

1. (a) Employment in industries, Energy resources & Banking

   (b) Infrastructure facilities in villages

   (c) Agricultural input

   (d) Literacy rate

   (e) Agricultural output

   (f) Employment in public sector, police stations and urbanization

   (g) Fisheries

   (h) Agricultural infrastructure

The next inference of the analysis reinforces a widely-known fact in Uttar Pradesh: that G.B. Nagar, Lucknow, Ghaziabad and Kanpur Nagar are developing far better than the other districts of the state in terms of overall sectoral development. The state government and policy makers have to handle with this fact, in order to reduce the migration of unemployed population to these developed districts by creating employment and better health care and education facilities in less and least developed areas of the state.

Further, remarkable disparities in regional development have been observed in each of the four administrative regions viz. Central region, Eastern region, Bundelkhand region and, Western region of Uttar Pradesh through classification of districts using clustering. Therefore, the government and policy makers will have to decide the policies in Uttar Pradesh according to each cluster so that uniform development of the state can be achieved.

The methodology used in this study may be applied to any of the states of India as well as to the whole nation. Similarly, the same may be used to any state of the nation or any country of the

world to remove the disparities in the development patterns.

Thus, in order to achieve the goal of uniform regional development in Uttar Pradesh, necessary steps should be taken to optimize the Employment in industries, Energy resources & Banking, Infrastructure facilities in villages, Agricultural input, Literacy rate, Agricultural output, Employment in public sector, police stations and urbanization, Fisheries and Agricultural infrastructure in least & less developed districts. For the socio-economic upliftment of the rural population, it is necessary to create such an employment opportunity which is easily sustainable in the rural environment like agriculture and dairy based industries, food processing industries etc. This way, the employment opportunities will not only be available in the rural areas, but also there will be opportunities for achieving prosperity in the agricultural sector which will prevent the migration of youths to the cities. This will require a collaborative attempt of the state and the central government.

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