

An Application of Multivariate Method for Evaluation of Regional Disparities in Infrastructural Development: A Case Study

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ABSTRACT

Although many of its cities rank very high in overall development, regrettably the state of Uttar Pradesh is always among the lowest ranked states in development in India. As the development of infrastructural sector is the key driver for overall development of a region, the paper is an attempt to study the disparities in the infrastructural growth in the Uttar Pradesh. Owing to several factors, wide disparities are likely to be present in infrastructural development of the state at district level. Therefore, the spatial and temporal differences in the infrastructural development of Uttar Pradesh have been investigated in the present study. Considering various indicators that contribute towards the infrastructural development, weights for each indicator has been calculated using weighted factor analysis (WFA) ascertaining relative importance of various indicators. Using these weights, the composite indices of infrastructural development are constructed for the years 2000-01, 2010-11 and 2017-18 for various districts in Uttar Pradesh. Using K-means cluster analysis, attempts have also been made to categorize the districts into five categories viz highly developed, developed, developing, less developed and least developed districts.

Keywords: Regional infrastructural disparities, Development indicators, Weighted Factor Analysis, K-means Cluster analysis, Uttar Pradesh.

Mathematics Subject Classification: 62C05, 62H25, 62H30

Journal of Economics Literature (JEL) Classification: O18, O21

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. 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., but also 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.

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 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].

Realizing the importance and solemnity of the problem of regional infrastructural imparities in Uttar Pradesh, the present study measures the levels of infrastructural development at district level considering twenty-two indicators pertaining to the infrastructural development using a modified factor analysis approach suggested by Fernando (2012). The methodology comprises performing a preliminary Factor Analysis on all the indicator variables to identify the grouping pattern in the indicator variables and then determining the first principal component for each subset. The composite indices of development are determined using weights for various indicator variables computed using the correlation coefficient between each indicator variable belonging to the particular subset and the corresponding loadings of each PC. K-means cluster analysis has been used to classify the districts of Uttar Pradesh into clusters indicating Highly Developed, Developed, Developing, Less Developed & least Developed Districts on the basis of similarities towards the development pattern.

2. Computation of Infrastructural Developmental Indices

2.1 Selection of Indicators for Infrastructural Sector

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 have been collected at three points of time i.e., Period-I (2000-01), Period II (2010-011) and Period -III (2017-18). The study is carried out for all the seventy-five districts of the state. The data on the following twenty-two infrastructural development indicators have been taken into account for the estimation of composite indices in case of district wise analysis for the state of Uttar Pradesh.

1. No. of hospitals/dispensaries per lakh of population.
2. No of beds in hospitals per lakh of population.
3. No. of Veterinary hospitals per lakh of population.
4. No. of Higher Senior schools per lakh of population.
5. No. of Polytechnic's per lakh of population.
6. No. of villages with distance 5 km. or more from Railway Stations/Halts.
7. No. 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 inhabited villages.
12. No. 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. Livestock development centers per lakh of population.
16. No. of villages with distance 5 km. or more from Industrial/Grameen/Co-operative banks.
17. No. of villages with distance 5 km. or more from Co-operative Milk collection centers.
18. No. of industrial areas per lakh of population.
19. No. of small-scale industries per lakh of population.
20. No. of registered working factories per lakh of population.
21. No. of Scheduled commercial banks per lakh of population.
22. No. of primary agricultural credit societies per lakh of rural Population.

2.2 Estimation of Weights Using Weighted Factor Analysis

For the estimation of weights, a preliminary Factor Analysis was performed on all the twenty-two indicator variables in order to identify the grouping pattern in the indicator variables. After identifying the subsets of indicator variables, a PCA has been carried out for each subset. Since the first principal component accounts the maximum amount of possible variation in the data, only the first principal component has been used in the analysis. If in m subsets there are n_i ($i = 1, 2, 3, \dots, m$) indicators, then using the correlation ρ_{ij} between the first PC of i^{th} subset and j^{th} variable, the weights for various indicators may be computed using

$$(2.1) \omega_{ij} = \frac{\rho_{ij}^2}{\sum_{j=1}^{n_i} \rho_{ij}^2}; i = 1, 2, 3, \dots, m, j = 1, 2, 3, \dots, n_i$$

The weight involves the square of correlation coefficient (ρ_{ij}^2) representing the amount of variation corresponding to each indicator variable out of the total variation accounted by the first PC.

2.3 Estimation of Composite Index of Development

Owing to different units of indicators, the set of scaled variables are obtained using the weights obtained in (2.1). The weighted standardized variables are then used to get a composite index of development. As some indicators have a positive effect on the development while others negatively influence it, the optimum standardized value for each indicator (minimum or maximum relevant to the aim of the development) is estimated and the deviations of different indicator variables from the corresponding optimum value are calculated for each indicator. After this, the composite indices of Infrastructural development have been computed using the methodology given by Narain *et al.* (1991). The composite indices of infrastructural development thus obtained are non-negative and lies in the interval $[0, 1]$. The value of composite index closer to one, indicates the lower level of infrastructural development while the value of composite index closer to zero indicate otherwise.

2.3.1 Composite Development Indices-Infrastructural Development in UP

For all the seventy-five districts of Uttar Pradesh the composite indices of development have been computed for infrastructural sector over the three different time periods i.e., Period -I (2000-01), Period- II: (2010-11), and Period -III: (2017-18) for which the data have been obtained from 'District wise Development Indicators Uttar Pradesh' published annually by the Economics and Statistics Division, State Planning Institute, Planning Department (UPDES), Government of Uttar Pradesh. The values of composite indices (C.I.) of various districts along with their ranks are given in table 2.1

Table 2.1: Composite Indices (C.I.) of Infrastructural Development during three periods of time

Districts	Period-I (2000-01)		Period-II (2010-11)		Period-III (2017-18)	
	C.I.	Rank	C.I.	Rank	C.I.	Rank
Agra	0.7970	9	0.8102	21	0.8198	12
Aligarh	0.7943	8	0.7922	18	0.8514	22
Allahabad	0.8661	40	0.8353	31	0.8836	36
Ambedkar Nagar	0.8656	38	0.8904	53	0.8825	35
Amethi	0.9443	70	0.9604	72	0.8149	11
Amroha	0.8750	45	0.7872	15	0.8964	42
Auraiya	0.8141	13	0.8159	25	0.8201	13
Ayodhya	0.8372	24	0.8357	32	0.8674	28
Azamgarh	0.9640	72	0.9403	71	0.9972	73
Badayun	0.8911	50	0.9124	60	0.9847	70
Baghpat	0.8113	12	0.7407	6	0.8128	10
Bahraich	0.9057	58	0.9264	65	0.9838	69
Balia	0.8324	23	0.8136	22	0.8815	33
Balrampur	0.9419	69	0.9219	62	0.9650	63
Banda	0.8799	48	0.8375	36	0.9181	47
Barabanki	0.8619	36	0.8181	27	0.8615	27
Bareilly	0.8482	27	0.8361	33	0.9268	51
Basti	0.9186	66	0.8457	55	0.9326	52
Bijnor	0.8945	52	0.8833	51	0.9603	62
Bulandsaher	0.8192	15	0.7834	14	0.8112	9
Chandauli	0.8549	32	0.8369	35	0.9378	56
Chitrakoot	0.9091	60	0.8724	48	0.9329	53
Deoria	0.8506	28	0.8464	39	0.8841	37
Etah	0.8927	51	0.9100	59	0.7695	5
Etawah	0.8303	22	0.7783	13	0.8201	13
Farukhabad	0.8657	39	0.8217	28	0.9015	45
Fatehpur	0.8442	25	0.8395	37	0.8824	34
Firozabad	0.8287	20	0.8154	24	0.8751	30

G.B. Nagar	0.6107	1	0.5413	1	0.6878	1
Ghaziabad	0.6689	2	0.6793	3	0.7875	7
Ghazipur	0.8614	34	0.8805	50	0.9461	63
Gonda	0.9181	65	0.9371	70	0.9687	66
Gorakhpur	0.8704	43	0.8242	29	0.8869	38
Hamirpur	0.8246	18	0.7911	16	0.8341	15
Hapur	0.9170	64	0.8620	45	0.8414	18
Hardoi	0.9036	62	0.9017	56	0.9660	64
Hathras	0.7991	11	0.7584	10	0.8594	24
Jalaun	0.7749	6	0.7759	12	0.8471	20
Jaunpur	0.8786	46	0.9099	58	0.9774	67
Jhansi	0.7913	10	0.7915	17	0.8385	17
Kannauj	0.9048	57	0.8718	47	0.8907	41
Kanpur Dehat	0.7791	7	0.7498	8	0.7569	4
Kanpur Nagar	0.6851	3	0.7017	4	0.7168	2
Kasganj	0.9978	75	0.9715	74	0.9686	65
Kausambi	0.8616	35	0.8056	19	0.8798	32
Kheri	0.9208	67	0.9230	63	0.9950	72
Kushinagar	0.9144	63	0.9282	66	0.9437	59
Lalitpur	0.8586	33	0.8555	42	0.9197	48
Lucknow	0.7123	4	0.6362	2	0.7238	3
Mahoba	0.8669	41	0.8363	34	0.8994	43
Mahrajganj	0.9089	59	0.9259	64	0.9202	49
Mainpuri	0.8795	47	0.8140	23	0.8610	26
Mathura	0.7991	11	0.7437	7	0.8102	8
Mau	0.8546	31	0.8506	40	0.8602	25
Meerut	0.7314	5	0.7143	5	0.7862	6
Mirzapur	0.9125	61	0.8916	54	0.9983	74
Moradabad	0.8220	16	0.8343	30	0.8385	16
Muzaffar Nagar	0.8283	19	0.7536	9	0.8498	21
Pilibhit	0.8746	44	0.8611	44	0.9226	50
Pratapgarh	0.8654	37	0.8409	38	0.8441	19
Raebareli	0.8291	21	0.8534	41	0.8692	29
Rampur	0.8466	26	0.8637	46	0.9363	54
Sant Kabir Nagar	0.9030	54	0.9089	57	0.8790	31
Shahjahanpur	0.8989	53	0.8734	49	0.9375	55
Sambhal	0.9956	74	0.9840	75	0.9577	61
Shamli	0.9932	73	0.9296	67	0.8876	39
Sharanpur	0.8510	29	0.7738	11	0.9014	44

Shrawasti	0.9396	68	0.9659	73	0.9424	58
Siddharth Nagar	0.9530	71	0.9329	69	0.9399	57
Sitapur	0.9137	62	0.9317	68	0.9775	68
Sonbhadra	0.8880	49	0.9125	61	0.9992	75
Sant Ravidas Nagar	0.9034	55	0.8846	52	0.9893	71
Sultanpur	0.8180	14	0.8172	26	0.8527	23
Unnao	0.8704	42	0.8608	43	0.8906	40
Varanasi	0.8227	17	0.8085	20	0.9118	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 notice from the 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. Classification of Districts into Different Stages of Development Using K-Means Cluster Analysis

In the present study, K-Means Cluster Analysis has been performed for the purpose of grouping all the seventy-five districts of Uttar Pradesh into different levels of infrastructural development. In order to achieve this, we use values of composite indices for each district as variables and districts as cases with K = 5 number of clusters to perform the K-Means Cluster analysis.

For better contemplation table 3.1 provides cluster wise number of districts, mean, standard deviation and coefficient of variation of C.I. during all the three times period under consideration.

Table 3.1: Descriptive Statistics for each cluster during different periods of time

2000-01				
Clusters	No. of Districts	Mean of C.I.	Standard Deviation of C.I.	C.V. of C.I.
1	1	0.6107	0	0
2	4	0.6994	0.2806	40.1187

3	36	0.8343	0.0258	3.0996
4	29	0.9035	0.0199	2.2053
5	5	0.9870	0.0253	2.5657

2010-11				
Clusters	No. of Districts	Mean of C.I.	Standard Deviation of C.I.	C.V. of C.I.
1	1	0.5418	0	0
2	9	0.6478	0.2190	33.8135
3	28	0.8132	0.0211	2.6041
4	18	0.8732	0.0160	1.8331
5	19	0.9333	0.0221	2.3736

2017-18				
Clusters	No. of Districts	Mean of C.I.	Standard Deviation of C.I.	C.V. of C.I.
1	3	0.7095	0.0155	2.1930
2	11	0.7992	0.0216	2.7054
3	32	0.8711	0.0213	2.4518
4	25	0.9502	0.0220	2.3190
5	4	0.9974	0.0015	0.1573

In case of infrastructural development, from the above table it may be revealed that for the time period 2000-01, cluster 1 has only one district G.B. Nagar which is the top ranked district in terms of infrastructural development with mean value of C.I. as 0.6107 which is the lowest among all the five clusters during this period. This means that this cluster is more developed as compared to the remaining four clusters. So, we may name this cluster as a **'Highly Developed cluster'**. Also, cluster 2 has 4 districts with mean value of C.I. as 0.6994 which is greater than the value of cluster 1 but less than the values of remaining three clusters, we can name this cluster as **'Developed cluster'**. Here it is worth mentioning that the C.V. of this cluster is 40.1187 which is the highest among all the clusters is indicative of the high regional disparities among all of its four districts. For the cluster 3 there are 36 districts with the mean value of C.I. as 0.8343 so, we may say this cluster as **'Developing cluster'**. In cluster 4 there are 29 districts with mean value C.I. as 0.9035 so, we may say this cluster as **"Less Developed Cluster"**. The cluster 5 contains 5 districts with mean value of C.I. as 0.9870 which is largest among all the five clusters thus, we must name this cluster as **"Least Developed Cluster"**.

In similar manner for the time period 2010-11, cluster 1 has only one district G.B. Nagar which is the top ranked district in terms of infrastructural development with mean value of C.I. as 0.5418 which is the lowest among all the five clusters during this period. This means that this cluster is more developed as compared to the remaining four clusters. So, we may name this cluster as a **'Highly Developed cluster'**. Also, cluster 2 has 9 districts with mean value of C.I. as 0.6478 which is greater than the value of cluster 1 but less than the values of remaining three clusters, we can name this

cluster as **'Developed cluster'**. Here it is worth mentioning that the C.V. of this cluster is 33.8135 which is the highest among all the clusters is indicative of the high regional disparities among all of its nine districts. For the cluster 3 there are 28 districts with the mean value of C.I. as 0.8132 so, we may say this cluster as **'Developing cluster'**. In cluster 4 there are 18 districts with mean value C.I. as 0.8732 so, we may say this cluster as **"Less Developed Cluster"**. The cluster 5 contains 19 districts with mean value of C.I. as 0.9333 which is largest among all the five clusters thus, we must name this cluster as **"Least Developed Cluster"**.

For the latest time period 2017-18, it may be revealed that cluster 1 has three districts namely, G.B. Nagar, Lucknow & Kanpur Nagar which are the top three ranked districts in terms of infrastructural development with mean value of C.I. as 0.7095 which is the lowest among all the five clusters during this period. This means that this cluster is more developed as compared to the remaining four clusters. So, we may name this cluster as a **'Highly Developed cluster'**. Also, cluster 2 has 11 districts with mean value of C.I. as 0.7992 which is greater than the value of cluster 1 but less than the values of remaining three clusters, we can name this cluster as **'Developed cluster'**. For the cluster 3 there are 32 districts with the mean value of C.I. as 0.8711 so, we may say this cluster as **'Developing cluster'**. In cluster 4 there are 25 districts with mean value C.I. as 0.9502 so, we may say this cluster as **"Less Developed Cluster"**. The cluster 5 contains 4 districts with mean value of C.I. as 0.997425 which is largest among all the five clusters thus, we must name this cluster as **"Least Developed Cluster"**. During this time period it is observed that the districts like G.B. Nagar, Lucknow, Kanpur Nagar are at the highest level of infrastructural development while, districts like Sonbhadra, Mirzapur, Azamgarh, Kheri are at lowest level of infrastructural development. The classification of districts for infrastructural sector during three periods of time has been presented in Table 3.2:

Table 3.2: Classification of districts

Cluster	2000-01
1	G. B. Nagar.
2	Ghaziabad, Kanpur Nagar, Lucknow, Meerut.
3	Agra, Aligarh, Ambedkar Nagar, Auraiya, Ayodhya, Baghpat, Baliya, Barabanki, Bareilly, Bulandsahar, Chandauli, Deoria, Etawah, Farrukhabad, Fatehpur, Firozabad, Ghazipur, Hathras, Hamirpur, Jalaun, Jhansi, Kanpur Dehat, Kausambi, Lalitpur, Mathura, Mahoba, Mau, Moradabad, Muzaffar Nagar, Prayagraj, Pratapgarh, Raebareli, Rampur, Saharanpur, Sultanpur, Varanasi.
4	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.
5	Azamgarh, Kasganj, Sambhal, Shamli, Siddharth Nagar.

Cluster	2010-11
1	G. B. Nagar.
2	Baghpat, Ghaziabad, Hathras, Kanpur Nagar, Kanpur Dehat, Lucknow, Mathura, Meerut, Muzaffar Nagar.
3	Agra, Aligarh, Amroha, Auraiya, Ayodhya, Baliya, Banda, Barabanki, Bareilly, Bulandsahar, Chandauli, Etawah, Farrukhabad, Fatehpur, Firozabad, Gorakhpur, Hamirpur, Jalaun, Jhansi, Kausambi, Mahoba, Mainpuri, Moradabad, Pratapgarh, Prayagraj, Saharanpur, Sultanpur, Varanasi.
4	Ambedkar Nagar, Basti, Bijnor, Chitrakoot, Deoria, Ghazipur, Hardoi, Hapur, Kannauj, Lalitpur, Mau, Mirzapur, Pilibhit, Raebareli, Rampur, Sant Ravidas Nagar, Shahjahanpur, Unnao.
5	Amethi, Azamgarh, Badayun, Bahraich, Balrampur, Etah, Gonda, Jaunpur, Kasganj, Kheri, Kushi Nagar, Mahrajganj, Sambhal, Sant Kabir Nagar, Shamli, Shrawasti, Sitapur, Siddharth Nagar, Sonbhadra.
Cluster	2017-18
1	G. B. Nagar, Lucknow, Kanpur Nagar.
2	Agra, Amethi, Auraiya, Baghpat, Bulandsahar, Etah, Etawah, Ghaziabad, Kanpur Dehat, Mathura, Meerut.
3	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, Sant Kabir Nagar, Shamli, Sharanpur, Sultanpur, Unnao, Varanasi.
4	Badayun, Bahraich, Balrampur, Bareilly, 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.
5	Azamgarh, Kheri, Mirzapur, Sonbhadra.

The first important thing we notice from the above table is that for the time period 2000-01 & 2010-11 G. B. Nagar is the only district which is classified into cluster 1. 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 cluster 1 is more developed in infrastructural sector as compared to other clusters. For the latest time period 2017-18, G.B. Nagar, Lucknow & Kanpur Nagar are classified under cluster 1 which are the top three ranked districts during this interval of time. It is also observed that, the level of infrastructural development in cluster 4 & 5 lagged much behind than the clusters 1 & 2 and calls for plentiful efforts of the government to get a balanced regional infrastructural development of the state.

4. CONCLUSION AND POLICY IMPLICATIONS

The important conclusions and policy implications emerging from the present study are as follows:

- The first and most important conclusion of the present study is that the 'Weighted Factor Analysis' & 'K-means Clustering' techniques were successfully utilized in allowing to quantify the regional disparities in infrastructural development of the state, and the level of infrastructural development with different grade of development.
- 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 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 and education facilities in less and least developed areas.
- 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.
- 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.
- It was found that the districts of G. B. Nagar, Lucknow, Ghaziabad, Kanpur Nagar, Meerut, and others were highly developed and developed during the time periods under study. When compared to other districts, the performance of these districts is remarkably high.
- 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.
- 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.
- 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.
- For all the time periods under study, the mean and coefficient of variation of C.I.'s found to be maximum in the cluster 5 named as "least developed districts" indicating that this cluster has maximum amount of regional disparities among the districts in terms of infrastructural services.
- It is observed that, for the latest time period 2017-18, the level of infrastructural development in cluster 4 & 5 lagged much behind than the clusters 1 & 2 and calls for plentiful efforts of the government to get a balanced regional infrastructural development of the state.
- It seems that the important thing in planning is to pay due attention towards less & least developed clusters which are at low level of infrastructural facilities.

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